

City of San Diego

CONTRACTOR'S NAME: _____
ADDRESS: _____
TELEPHONE NO.: _____ FAX NO.: _____
CITY CONTACT: **ROLF LEE**, 600 B Street Suite 800 MS 908A, San Diego, CA 92101
Email: rlee@sandiego.gov, Phone: (619) 533-4660, Fax: (619) 533-5278
CA/NB/egz

CONTRACT DOCUMENTS FOR



CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

VOLUME 1 OF 2

BID NO.: _____ **K-12-5525-DBB-C**
SAP NO. (WBS/IO/CC): _____ **S-00308**
CLIENT DEPARTMENT: _____ **2011**
COUNCIL DISTRICT: _____ **1**
PROJECT TYPE: _____ **BP**

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.

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

Adel Bassyouni
Professional Engineer or Licensed Architect

Seal:



((((((((((((((((((((**ATTENTION**))))))))))))))))))))

The 2010 edition of the City of San Diego Standard Specifications for Public Works Construction (“The WHITEBOOK”) now contains the following distinct Contract Documents:

- 1) ***Equal Opportunity Contracting Program Requirements*** - This Contract Document sets forth the standard requirements for the City’s equal opportunity contracting program. When additional requirements by the funding source e.g., federal or state agencies are physically included in the contract documents or by reference and there is a discrepancy, the funding source requirements shall govern unless specified otherwise in the Special Provisions.

- 2) ***City Supplement*** – The City Supplement shall be used in conjunction with the Standard Specifications for Public Works Construction (“The GREENBOOK”), 2009 Edition. The specifications contained in City Supplement take precedence over the specifications contained in The GREENBOOK, 2009 Edition.

Certain parts of the City Supplement have been highlighted in yellow for the convenience of the users only and shall not affect the interpretation of the Contract.

To obtain The GREENBOOK contact the publisher at: <http://www.bnibooks.com>

The WHITEBOOK is available only in electronic format under Engineering Documents and References at: <http://www.sandiego.gov/engineering-cip/>

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REQUIRED DOCUMENTS SCHEDULE

This table is intended to serve as a convenient tool for listing forms and documents required at different times. It is neither exhaustive nor must be considered a Contract Document by itself. Therefore, the users must review the entire Contract Documents and become familiar with the required documentation and the submittal schedule associated with each document.

Bidder’s attention is directed to the City’s Municipal Code §22.0807(e),(3)-(5) for important information regarding required documentation.

The specified EOC forms are all available for download from the EOC Program’s web site at:

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

ITEM	WHEN	BY	WHAT
1.	BID DUE DATE/TIME	ALL BIDDERS	Proposal (Bid)
2.	BID DUE DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID DUE 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 DUE DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions
5.	BID DUE DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	WITHIN 1 WORKING DAY OF BID OPENING	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
7.	BID DUE DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
8.	BID DUE DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
9.	WITHIN 1 WORKING DAY OF BID OPENING	ALL BIDDERS	SLBE-ELBE Good Faith Documentations
10.	WITHIN 1 WORKING DAY OF BID OPENING	ALL BIDDERS	Form AA60 – List of Work Made Available
11.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER’S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	Pre-Award Schedule
12.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principle individual owners of the Apparent Low Bidder - In the event the firm is employee owned or publicly held, then the fact should be stated and the names of the firm’s principals and officers shall be provided.
13.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report
14.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture, the following information must be submitted: <ul style="list-style-type: none"> o Joint Venture Agreement o Joint Venture License
15.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER’S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	List of Proposed Substitutions for “an equal” (“or equal”) item along with data substantiating the substitution(s)
16.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Agreement

REQUIRED DOCUMENTS SCHEDULE

ITEM	WHEN	BY	WHAT
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
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
22.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER'S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	Phased Funding Schedule Agreement
23.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC20 - Monthly Employment Report
24.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC25 - Monthly Invoicing Report
25.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC10 - Contract Change Order (CCO)
26.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC15 - Final Summary Report
27.	PRIOR TO ACCEPTANCE	CONTRACTOR	Affidavit of Disposal

**SPECIAL NOTICE
SMALL LOCAL BUSINESS ENTERPRISES (SLBE)
AND
EMERGING LOCAL BUSINESS ENTERPRISES (ELBE)
PROGRAM**

This contract is subject to the requirements of the SLBE Program as specified in the SLBE-ELBE section of the City's EOCB Requirements included in The WHITEBOOK. The Bidders are required to review The WHITEBOOK and become familiar with the detailed specifications including the required documentation and the submittal schedule as related to SLBE-ELBE program.

To The WHITEBOOK, GENERAL EQUAL OPPORTUNITY CONTRACTING PROGRAM REQUIREMENTS CONSTRUCTION CONTRACTOR REQUIREMENTS, Equal Employment Opportunity Outreach Program (A), **DELETE** in its entirety and **SUBSTITUTE** with the following:

- A. Competitive Bids. If a contract is competitively solicited, the Apparent Low Bidder shall submit a Work Force Report (Form BB05) or an Equal Employment Opportunity (EEO) Plan, 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.

To The WHITEBOOK, SLBE-ELBE PROGRAM REQUIREMENTS, Section VIII(2)(b), "What Are The Six Good Faith Efforts?", **DELETE** in its entirety and **SUBSTITUTE** with the following:

"Make information of forthcoming opportunities available to SLBE-ELBE firms and arrange time for contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by SLBE-ELBE firms in the competitive process. This includes posting solicitations for bids or proposals for a minimum of 10 days before the Bid or Proposal due date."

To The WHITEBOOK, SLBE-ELBE PROGRAM REQUIREMENTS, Section VIII (3) and (4), **DELETE** in their entirety and **SUBSTITUTE** with the following:

3. Good Faith Effort Documentation Requirements

If the stated SLBE-ELBE subcontractor participation percentages are not met, the Bidder shall submit, within 1 day of the Bid opening, information necessary to establish adequate good faith efforts were taken to meet the contract subcontractor participation percentages. The required documentation includes the following:

A. ADVERTISEMENT REQUIREMENTS

Advertisements for subcontract work must comply with the following requirements:

1. Advertisements must be placed at least 10 Working Days prior to bid opening. Provide the names and dates of each publication of where the advertisement was published.

Note: The advertisement is not required to be placed everyday for the 10 Working Days prior to bid opening.

2. There must be at least 2 advertisements published, 1 advertisement in a trade publication and 1 in a focus group publication. Additional advertising for SLBE-ELBE participation may be placed in newspapers, trade papers and on the Internet. For a listing of publications accepting advertisements, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>.

- 2.1 Newspaper advertisements must be in the Bids Wanted, Legal Notices section of the Classified Ads, Subcontracting Opportunities or Business Opportunities **NOT** the Employment Opportunities Section.

3. Advertisements must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 3.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet specified subcontracting participation percentage and at a minimum an amount of work equal to the specified subcontracting participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces or supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
4. Advertisements must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
5. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders **MUST** provide proof of publication of each advertisement by providing the publication affidavit which must include a legible copy of the entire advertisement and the original **ENTIRE** page of the publication in which the advertisement appears.

B. SLBE-ELBE WRITTEN SOLICITATION REQUIREMENTS

Bidders must directly solicit SLBE-ELBE firms on the City's approved SLBE-ELBE list. Solicitations for Subcontractor or Supplier work must comply with the following requirements:

1. The solicitation must be dated and list the name of the SLBE-ELBE firm. Solicitations must be made to the SLBE-ELBE firms at least 10 Working Days prior to bid opening.
2. Solicitation must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 2.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the specified subcontractor participation percentage and at a minimum an amount of work equal to the subcontractor participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
3. Solicitation must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
4. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE subcontractors in obtaining necessary equipment, supplies, or materials.

5. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
6. Bidder must solicit **ALL** SLBE-ELBE firms on the City's approved list, who have the NAICS code for the subcontract work sought by the Contractor.
7. Bidders must provide copies of **ALL** solicitations with one of the following forms of verification that the solicitations were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

C. SLBE-ELBE WRITTEN SOLICITATION FOLLOW-UP REQUIREMENTS

Bidders must follow-up with all SLBE – ELBE firms that were notified of the subcontracting opportunities to determine their level of interest and commitment to bid the Project. When following up with the SLBE – ELBE firms, the Bidder must do the following:

1. Follow up communications must start no less than 5 Working Days prior to bid opening.
2. Bidders must follow up with all SLBE-ELBE firms in writing. Bidders must provide copies of **ALL** written follow up notices with one of the following forms of verification that the follow up notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

3. Bidders must make at least 3 follow-up telephone calls to each SLBE – ELBE firm at least 5 days prior to bid opening date. Bidders must submit a telephone log as identified below.
 - 3.1 Submit a telephone log, as proof of telephone call, with the following requirements: project name, name of person making the phone call, name of firm contacted, contact person's name, date of call, time of call, and details of conversation.

D. SUBCONTRACT AWARD SUMMARY

Bidders must act in good faith with interested SLBE-ELBE firms and may only reject bids for legitimate business reasons. The Bidder must submit the following documentation:

1. A **DETAILED** summary sheet which includes Bid item number, scope of work, Subcontractor or Supplier name, bid amount, certification type, Subcontractor or Supplier selection and reason for selection or non-selection of all the Subcontractor or Supplier that responded.
2. Copies of all Subcontractor or Suppliers bids received including bids for areas of work that were not included in the outreach and quotes from both certified and non-certified Subcontractors or Suppliers. Subcontractor bid amounts **MUST** match the bid-listed dollar amounts on form AA35 and AA40 submitted with Bidders sealed

bid and the summary sheet dollar amounts **MUST** also match these amounts. If the Bidder decides to self-perform a scope of work, the Bidder **MUST** submit a detailed quote to show that the Bidder's price is competitive to the price of the subcontractors that responded to outreach efforts. All dollar amounts and scopes of work on the Subcontractor or Supplier bid must not be altered by the prime Bidder. If a revision is necessary, a revised quote must be obtained and provided. All verbal quotes **MUST** be substantiated by corresponding written quote from the Subcontractor or Supplier.

E. OUTREACH ASSISTANCE REQUIREMENTS

Written notice of subcontractor opportunities must be forwarded to local organizations or groups to assist with outreach efforts. When contacting local organizations or groups, the Bidder **must do** the following:

1. Contact a minimum of 5 local organizations or groups to provide assistance in contacting, recruiting and using SLBE-ELBE firms by written notice. For a listing of organizations or groups offering assistance, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>
2. Written notice must indicate the date of the notice and name of the local organization or group. Written notices must be forwarded to the organizations or groups at least 10 Workings Days prior to bid opening.
3. Written notice must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 3.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the subcontractor participation percentage, and at a minimum an amount of work equal to the subcontracting participation amount. If necessary to reach the subcontractor participation percentage, the work should include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
4. Written notice must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
5. Written notice must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Written notice must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders must provide copies of **ALL** notices with one of the following forms of verification that the notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

The Bidders are encouraged to take positive steps to diversify and expand their subcontractor solicitation base and to offer contracting opportunities to all certified Subcontractors including SLBEs, ELBEs, DBEs, MBEs, WBEs, DVBEs and OBEs.

Mandatory SLBE-ELBE Subcontractor Participation. The City has incorporated a 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:

9.6% SLBE
14.0% ELBE
=====

23.6% Mandatory

For the purpose of achieving the subcontractor participation level (percentage), Additive, Deductive, and Allowance Bid Items will not be included in the calculation.

Pre-Bid Conference: A Pre-Bid Conference is scheduled for this contract as specified in the Invitation to Bids. The purpose of this meeting is to inform Bidders of the submittal requirements and provisions relative to the SLBE Program. Bidders are strongly encouraged to attend the Pre-Bid Conference to better understand the Good Faith Effort requirements of this contract.

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

1. Bidder's inclusion of SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**
2. Bidder's submission of Good Faith Effort documentation demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 1 Working Day of the Bid opening if the overall mandatory participation percentage is not met.

Bid Discount: This contract is **not** subject to the Bid Discount program as described in The WHITEBOOK, SLBE-ELBE Program Requirements, Section IV(2).

Resources: The current list of certified SLBE-ELBE firms can be found on the EOC Department website.

CITY OF SAN DIEGO, CALIFORNIA

INVITATION TO BIDS

1. **RECEIPT AND OPENING OF BIDS:** Bid(s) will be received at the Public Works Contracting Group (PWCG) at **1200 THIRD AVENUE, SUITE 200, SAN DIEGO, CA 92101 UNTIL 2:00 PM ON JANUARY 18, 2012** for performing work on the following project (Project):

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

2. **DESCRIPTION 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 below:

The Work is to upgrade Sewer Pump Station 84 and to abandon Sewer Pump Station 62, together with gravity and force main upgrades and other work as defined by the contract documents.

The Work shall be performed in accordance with:

- Bid No. **K-12-5525-DBB-C** and Plans numbered **36196-01-D** through **36196-118-D**, inclusive.
3. **ENGINEER'S ESTIMATE:** The Engineer's estimate of the most probable price for this contract is **\$8,603,000.00**.
 4. **LOCATION OF WORK:** The location of Work is Citywide unless specified otherwise as follows:

Rancho Bernardo and Rancho Penasquitos

5. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **365 Calendar Days**.
6. **SUPPLEMENTAL AGREEMENTS:** Supplemental agreements attached to this contract for the items of Work such as extended revegetation maintenance and monitoring and emulsion aggregate slurry shall be signed upon the request from the Engineer and prior to Acceptance. The signed agreements shall be accompanied by the evidence of separate bond (i.e., labor and materials) and insurance (i.e., Commercial General Liability Insurance, Commercial Automobile Liability Insurance, and Workers' Compensation Insurance) as specified in 2-4, "CONTRACT BONDS," 7-3, "LIABILITY INSURANCE," and 7-4 WORKERS' COMPENSATION INSURANCE. Bonds shall be in amount of the Contract Price for the Work included in the supplemental agreements.
7. **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.

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

- CLASS A

- 8. PRE-BID CONFERENCE:** There will be a Pre-Bid Conference to discuss the scope of the project, bidding requirements and Equal Opportunity Contracting Program requirements and reporting procedures in the Public Works Contracting Group Conference Room at 1200 Third Avenue, Suite 200, San Diego, CA 92101 at **10:00 AM**, on **DECEMBER 15, 2011**.

All potential bidders are encouraged to attend.

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 Contracting Group at (619) 236-6000 at least 5 Working Days prior to the Pre-Bid Conference to ensure availability.

- 9. CITY PROJECT MANAGER CONTACT INFORMATION:** See the cover of the Contract Documents.

- 10. REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

1. STANDARD SPECIFICATIONS

Document No.	Filed	Description
PITS0504091	05-04-09	Standard Specifications for Public Works Construction (The GREENBOOK), 2009 Edition
PITS090110-1	09-01-10	City of San Diego Standard Specifications for Public Works Construction (The WHITEBOOK), 2010 Update*
AEC1231064	12-31-06	California Department of Transportation, Manual of Uniform Traffic Control Devices (MUTCD 2006)
769023	09-11-84	Standard Federal Equal Employment Opportunity Construction Contract Specifications and the Equal Opportunity Clause

NOTE: *The City of San Diego Supplement, 2010 Update now consolidates various City Public Works Construction Standard Specifications which in the past were included in the Supplementary Special Provisions. The Bidders' attention is directed to this edition of the City Supplement for a close review to ensure no important information is missed for the preparation of the Bids.

2. STANDARD DRAWINGS

Document No.	Filed	Description
AEC1230163	12-31-06	City of San Diego Standard Drawings
N/A	Varies	City Standard Drawings - Updates Approved For Use**(when specified)
AEC0925061	09-25-06	Caltrans 2006 U.S. Customary Unit Standard Plans

NOTE: *Available online under Engineering Documents and References at: <http://www.sandiego.gov/engineering-cip>.

11. WAGE RATES: Prevailing wages are not applicable to this project unless specified otherwise on the cover page of these specifications and when included in these specifications. See Funding Agency Provisions that follow this Invitation to Bid for more information.

12. 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 Contracting Group at (619) 236-6000 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: 1:00 PM
Date: DECEMBER 15, 2011
Location: 15706 Camino Crisalida; San Diego, CA 92128

13. INSURANCE REQUIREMENTS: Upon receipt of the City’s Notice of Intent to Award letter, the Contractor will be asked to submit all certificates of insurance and endorsements to the City.

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.

You must ensure all required insurance certificates and endorsements are submitted accurately and on time. Failure to provide the requisite insurance documents by the date stated in the City’s Notice of Intent to Award will result in delay of contract award and may result in annulment of the contract award or other more severe sanctions as provided in the City’s Municipal Code §22.0807(e),(3)-(5).

14. PHASED FUNDING: The Apparent Low Bidder will be required to provide a Pre-award Schedule in accordance with sections 9-3 and 6-1 of the Supplementary Special Provisions (SSP) prior to award of Contract.

Tony Heinrichs, Director
Public Works Department

INSTRUCTIONS TO BIDDERS

- 1. PREQUALIFICATION OF CONTRACTORS:** The contractor(s) who intend to submit Bid or Proposal in response to this invitation to bid, or RFP's for GRC or As-Needed Design-Build Task Orders valued over \$50,000, must be pre-qualified for the City estimated Contract Price or the specified Task Order limits prior to the date of Bid 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 or a Task Order authorization. Complete information and prequalification questionnaires are available at:

<http://www.sandiego.gov/engineering-cip/services/consultcontract/prequal.shtml>

The completed questionnaire, financial statement, and bond letter or a copy of the contractor's SLBE-ELBE certification and bond letter, must be submitted no later than 2 weeks prior to the bid opening to the Public Works Department Prequalification Program, 1010 Second Avenue, Suite 1200, San Diego, CA 92101. For additional information or the answer to questions about the prequalification program, please contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

- 2. CONTRACTOR REGISTRATION:** Prospective bidder(s) as well as existing contractors and suppliers are required to register with the City's EOCP. Refer to 2-17, "CONTRACTOR REGISTRATION" for details.
- 3. 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.
- 4. CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Invitation to 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 Invitation to Bid shall be the sole responsibility of each bidder. The Invitation to Bid creates or imposes no obligation upon the City to enter a contract.
- 5. 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 unless specified otherwise such as as-needed contracts e.g., GRC in the Contract Documents.
- 6. SUBMITTAL OF "OR EQUAL" ITEMS:** See 4-1.6, "Trade Names or Equals."
- 7. AWARD PROCESS:** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award, including the submittal of acceptable insurance and surety bonds pursuant to San Diego Municipal Code § 22.3007. If the responsible Bid does not exceed the City's engineering estimate, the City will, in most cases, prepare contract documents for execution within 3 weeks of the date of the Bid opening and award the Contract within 5 Working Days of receipt of properly executed Contract, bond, and insurance documents.

This contract is deemed to be awarded, and effective, only upon the signing of the Contract by the Mayor or designee of the City.
- 8. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" which requires the Contractor to perform not less than the amount therein stipulated with its own forces. Failure to comply with these requirements may render the Bid **non-responsive** and ineligible for award.

9. AVAILABILITY OF PLANS AND SPECIFICATIONS: Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/engineering-cip/services/consultcontract/advertising.shtml>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracting Group.

10. QUESTIONS: Questions about the meaning or intent of the Contract Documents as related to the scope of Work and of technical nature shall be directed to the Project Manager prior to Bid opening. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda, which will be uploaded to eBidboard (or mailed or delivered to all parties recorded by the City as having received the Contract Documents for Minor Construction contracts).

The Director (or designee), Public Works Department is the officer responsible for opening, examining, and declaring of competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Questions in these areas of responsibility (e.g., i.e. Pre-qualification, SCOPE information, bidding activities, bonds and insurance, etc. as related to this contract shall be addressed to the Contract Administration, Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California, 92101, Telephone No. (619) 236-6000.

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

11. ELIGIBLE BIDDERS: No person, firm, or corporation shall be allowed to make, file, or be interested in more than 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.

12. SAN DIEGO BUSINESS TAX CERTIFICATE: All Contractors, including 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, before the Contract can be executed.

13. 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.

The entire specifications for the bid package do not need to be submitted with the bid. Bidder shall complete and submit, only, 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 City may require any Bidder to furnish a statement of experience, financial responsibility, technical ability, equipment, and references.

Bids and certain other specified forms and 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.

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

14. BIDDERS' GUARANTEE OF GOOD FAITH (BID SECURITY): With the exception of the contracts valued \$5,000 or less, GRC and Design-Build contracts, and contracts subject to the Small and Local Business Program of \$250,000 or less e.g., ELBE contracts, each Bidder shall accompany its Bid with either a cashier's check upon some responsible bank, or a check upon such

bank properly certified or an approved corporate surety bond payable to the City of San Diego, for an amount of not less than 10% of the aggregate sum of the Bid, which check or bond, and the monies represented thereby shall be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into such contract and furnish the required final bonds.

The Bidder agrees that in case of Bidder's refusal or failure to execute this contract and give required final bonds, the money represented by a cashier's or certified check shall remain the property of the City, and if the Bidder shall fail to execute this contract, the Surety agrees that it will pay to the City damages which the City may suffer by reason of such failure, not exceeding the sum of 10% of the amount of the Bid.

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

- 15. AWARD OF CONTRACT OR REJECTION OF BIDS:** This contract may be awarded to the lowest responsible and reliable Bidder (for Design-Build contracts refer to the RFP for the selection and award information). Bidders shall complete the entire Bid schedule (e.g., schedule of prices). Incomplete price schedules will be rejected as being **non-responsive**.

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.

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.

A non-selected Bidder may protest award of the Contract to the selected Bidder by submitting a written "Notice of Intent to Protest" including supporting documentation which shall be received by Public Works Contracting Group no later than 10 days after the City's announcement of the selected Bidder or no later than 10 days from the date that the City issues notice of designation of a Bidder as non-responsible in accordance with San Diego Municipal Code Chapter 2, § 22.3029, "Protests of Contract Award."

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.

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 Invitation to Bids.

The City reserves the right to evaluate all Bids and determine the lowest Bidder (or winner for Design-Build contracts) on the basis of any proposed alternates, additive items or options, at its discretion.

- 16. BID RESULTS:** The Bid opening by the City shall constitute the public announcement of the Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts). In the event that the Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts) is subsequently deemed non-responsive or non-responsible, a public announcement will be posted in the City's web page, with the name of the newly designated Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts).

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. Due to time constraints, Bid results cannot be given out over the telephone.

- 17. THE CONTRACT:** 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 10 Working Days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.

If the Bidder takes longer than 10 Working 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.

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.

For contracts that are not Design-Build, 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 10 Working 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.

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.

18. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK: The Bidder shall examine carefully the Project Site, the Plans and Specifications, the GRC Unit Price Books if applicable, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents) therefore. The submission of a Bid or GRC Task Order Proposal 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.

19. DRUG-FREE WORKPLACE:

a) General:

City projects are subject to City of San Diego Resolution No. R-277952 adopted on May 20, 1991. Bidders shall become aware of the provisions of Council Policy 100-17 which was established by Resolution No. R-277952. The policy applies equally to the Contractor and Subcontractors. The elements of the policy are outlined below.

b) Definitions:

"Drug-free workplace" means a site for the performance of work done in connection with a contract let by City of San Diego for the construction, maintenance, or repair of any facility or public work by an entity at which employees of the entity are prohibited from engaging in the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance in accordance with the requirements of this section.

"Employee" means the employee of a contractor directly engaged in the performance of work pursuant to a contract as described in Section 3, "City Contractor Requirements."

"Controlled substance" means a controlled substance in schedules I through V of Section 202 of the Controlled Substances Act (21 U.S.C. Sec. 812).

"Contractor" means the department, division, or other unit of a person or organization responsible to the contractor for the performance of a portion of the work under the contract.

c) City Contractor Requirements:

Every person or organization awarded a contract or grant by the City of San Diego for the provision of services shall certify to the City that it will provide a drug-free workplace by doing all following:

- a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's organization's workplace and specifying the actions that will be taken against employees for violations of the prohibition.
- b. Establishing a drug-free awareness program to inform employees about all of the following:
 - i. The dangers of drug abuse in the workplace.
 - ii. The person's or organization's policy of maintaining a drug-free workplace.
 - iii. Any available drug counseling, rehabilitation, and employee assistance programs.
 - iv. The penalties that may be imposed upon employees for drug abuse violations.
- c. Posting the statement required by subdivision (1) in a prominent place at contractor's main office. For projects large enough to necessitate a construction trailer at the job site, the required signage would also be posted at the Site.

The Contractor shall include in each subcontract agreement language which indicates the Subcontractor's agreement to abide by the provisions of subdivisions a) through c) above. The Contractors and Subcontractors shall be individually responsible for their own drug-free workplace programs.

Note: The requirements of a drug-free awareness program can be satisfied by periodic tailgate sessions covering the various aspects of drug-abuse education. Although an in-house employee assistance program is not required, contractors should be able to provide a listing of drug rehabilitation and counseling programs available in the community at large.

Questions about the City's Drug-free Workplace Policy shall be referred to the Contract Specialist of the Public Works Contracting Group.

20. AMERICANS WITH DISABILITIES ACT:

- a) General: City projects are subject to City of San Diego Resolution No. R-282153 adopted on June 14, 1993. The Bidders shall become aware of the provisions of Council Policy 100-04 which was established by Resolution No. R-282153. The policy applies equally to the Contractor and all Subcontractors. The elements of the policy are outlined below.
- b) Definitions:

"Qualified individual with a disability" means an individual with a disability who satisfies the requisite skill, experience, education and other job-related requirements of the employment position such individual holds or desires, and who, with or without reasonable accommodation, can perform the essential functions of such position.

"Employee" means the employee of the Contractor directly engaged in the performance of Work.
- c) The City Requirements: Every person or organization entering into a contractual agreement with or receiving a grant from the City of San Diego shall certify to the City of San Diego that it will comply with the ADA by adhering to all of the provisions of the ADA listed below.
 - i. The Contractor shall not discriminate against qualified persons with disabilities in any aspects of employment, including recruitment, hiring, promotions, conditions and privileges of employment, training, compensation, benefits, discipline, layoffs, and termination of employment.
 - ii. No qualified individual with a disability may be excluded on the basis of disability, from participation in, or be denied the benefits of services, programs, or activities by the Contractor or Subcontractors providing services for the City.

- iii. The Contractor shall post a statement addressing the requirements of the ADA in a prominent place at the worksite. The Contractor shall include in each subcontract agreement, language which indicates the Subcontractor's agreement to abide by the provisions of subdivisions (a) through (c) inclusive of Section 3. The Contractor and Subcontractors shall be individually responsible for their own ADA employment programs. Questions about the City's ADA Policy should be referred to the Contract Administrator.

21. CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE: This contract is subject to City of San Diego Municipal Code §22.3224 as amended 11/24/08 by ordinance O-19808. Bidders shall become aware that the requirements apply to Contractors and Subcontractors for contracts greater than \$50,000 in value.

Upon award, amendment, renewal, or extension of this contract, the Contractors shall complete a Pledge of Compliance attesting under penalty of perjury that they complied with the requirements of this section.

The Contractors shall ensure that their Subcontractors whose subcontracts are greater than \$50,000 in value complete a Pledge of Compliance attesting under penalty of perjury that they complied with the requirements of this section. Subcontractors may access the Pledge of Compliance at:

http://www.sandiego.gov/purchasing/pdf/contractor_standards_questionnaire.pdf

The Contractors shall include in each subcontract agreement, language which requires Subcontractors to abide by the provisions of City of San Diego Municipal Code §22.3224. A sample provision is as follows:

“**Compliance with San Diego Municipal Code §22.3224:** Subcontractor acknowledges that it is familiar with the requirements of San Diego Municipal Code §22.3224 (“Contractor Standards”), and agrees to comply with requirements of that section. The Subcontractor further agrees to complete the Pledge of Compliance, incorporated herein by reference.”

22. NOTICE OF LABOR COMPLIANCE PROGRAM APPROVAL: The City of San Diego received initial approval as a Labor Compliance Program on August 11, 2003. The Labor Compliance Program Manual is available at:

<http://www.sandiego.gov/eoc/laborcompliance/#manual>.

The limited exemption from prevailing wages pursuant to Labor Code §1771.5(a) does not apply to contracts under jurisdiction of the Labor Compliance Program. Inquiries, questions, or assistance about the Labor Compliance Program should be directed to: Equal Opportunity Contracting Program, 1200 Third Ave., Suite 200 MS56P, San Diego, CA 92101, Tel. 619-236-6000.

23. PAYROLL RECORDS: The Contractor's attention is directed to the City of San Diego Labor Compliance Program, Section IV, pages 4-7, and the State of California Labor Code §§ 1771.5(b) and 1776 (Stats. 1978, Ch. 1249). These require, in part, that the Contractor and Subcontractors maintain and furnish to the City, at a designated time, a certified copy of each weekly payroll containing a statement of compliance signed under penalty of perjury.

The Contractor and Subcontractors shall submit weekly certified payrolls online via Prism® i.e., the City’s web-based labor compliance program. Instructions on how to use the system will be provided to the Contractor after the award.

The Contractor shall be responsible for the compliance with these provisions by Subcontractors. The City shall withhold contract payments when payroll records are delinquent or inadequate, or when it is established after investigation that underpayment has occurred.

24. APPRENTICES ON PUBLIC WORKS: The Contractor shall abide by the requirements of §§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.

25. EQUAL BENEFITS: This contract is subject to the City’s Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of the San Diego Municipal Code (SDMC).

In accordance with the EBO, Bidders shall certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the Contract (SDMC §22.4304(f)). Failure to maintain equal benefits is a material breach of the Contract (SDMC §22.4304(e)). The Contractor shall notify employees of their equal benefits policy at the time of hire and during open enrollment periods and shall post a copy of the following statement in an area frequented by employees:

“During the performance of a contract with the City of San Diego, this employer will provide equal benefits to its employees with spouses and its employees with domestic partners.”

The Contractor shall give the City access to documents and records sufficient for the City to verify the contractors are providing equal benefits and otherwise complying with EBO requirements.

Full text of the EBO and the Rules Implementing the Equal Benefits Ordinance are posted on the City’s website at www.sandiego.gov/purchasing/ or can be requested from the Equal Benefits Program at (619) 533-3948.

26. LIMITED COMPETITION: When designated as such in the Special Notice page, this contract may only be bid by the Contractors on the approved SLBE-ELBE Construction Contractors List. For information regarding the SLBE-ELBE Construction Program and registration visit the City’s website: <http://www.sandiego.gov>.

27. PRE-AWARD ACTIVITIES:

Pre-award Submittals - The Apparent Low Bidder (or winner in case of Design-Build contracts) 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**.

If the Bid is rejected as non-responsive, the Apparent Low Bidder (or winner in case of Design-Build contracts) shall forfeit the Bid Security required under Invitation to Bids, of this bid package. The decision that the Apparent Low Bidder (or winner in case of Design-Build contracts) is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

Pre-Award Cost Loaded Schedule and Phased Funding. For phased funded contracts, one of the Pre-award Submittals is the Pre-award Cost Loaded Schedule, which is a cost-loaded CPM schedule prepared in accordance with Section 01309 - PRE-AWARD COST LOADED SCHEDULE, of this bid package. The Apparent Low Bidder shall submit the Pre-award Cost Loaded Schedule to the Owner within **21 Calendar Days** after receipt of the Owner's Notice of Intent to Award. Upon receipt of the Pre-award Cost Loaded Schedule, the Owner will review the Pre-award Cost Loaded Schedule and provide comments, as appropriate, to the Apparent Low Bidder.

Pre-Award Data Substantiating a Request for Substitution of “an equal” Item. In accordance with California Public Contract Code §3400(a), the Apparent Low Bidder, prior to the award of the contract, shall submit its list of proposed substitutions for “an equal” (“or equal”) item, along with data substantiating the substitution of “or equal” item within 21 Calendar Days after receipt of the Owner’s Notice of Intent to Award. If no “or equal” items are submitted, a negative response is required from the Apparent Low Bidder. Upon receipt of the proposed substitution of “or equal” item, the Owner will review the submission and provide comments in accordance with SECTION 01600, Article 1.8 – PROPOSED SUBSTITUTES OR “OR-EQUAL” ITEM, of the Contract Documents. Award of the contract SHALL NOT constitute an acceptance of a submitted “an equal” item.

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 _____ TC CONSTRUCTION COMPANY, INC. _____, herein called "Contractor" for construction of **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**; Bid No. **K-12-5525-DBB-C**; in the amount of SIX MILLION TWO HUNDRED FORTY SIX THOUSAND FIVE HUNDRED DOLLARS AND 00/100 (\$6,246,500.00), which is comprised of the Base Bid alone.

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


1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) That certain documents entitled **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**, on file in the office of the City Clerk as Document No. S-00308, as well as all matters referenced therein.
2. 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 **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**, Bid Number **K-12-5525-DBB-C**, 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 Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.


**CONTRACT FORMS (continued)
AGREEMENT**

IN WITNESS WHEREOF, this agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Resolution No. R - _____ or Municipal Code 22.3102 authorizing such execution.

THE CITY OF SAN DIEGO

APPROVED AS TO FORM AND LEGALITY

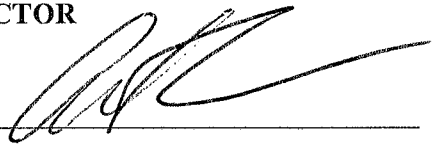
By  _____
Print Name Jay Goldstone
Chief Operating Officer

Jan I. Goldsmith, City Attorney
By  _____
Print Name: Jeremy Jung
Deputy City Attorney

Date: 7/18/12

Date: 7-17-12

CONTRACTOR

By  _____
Print Name: Austin Cameron

Title: Secretary
Date: 06/19/2012

City of San Diego License No.: B1907004773
State Contractor's License No.: 402459

CONTRACT FORMS (continued)
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

_____ TC CONSTRUCTION COMPANY, INC., a corporation, as principal, and _____ Liberty Mutual 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 SIX MILLION TWO HUNDRED FORTY SIX THOUSAND FIVE HUNDRED DOLLARS AND 00/100 (\$6,246,500.00) for the faithful performance of the annexed contract, and in the sum of SIX MILLION TWO HUNDRED FORTY SIX THOUSAND FIVE HUNDRED DOLLARS AND 00/100 (\$6,246,500.00) for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**, Bid Number **K-12-5525-DBB-C**, 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.

CONTRACT FORMS (continued)
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

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

Dated June 14, 2012

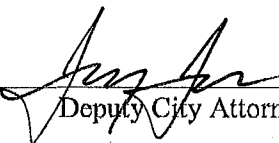
Approved as to Form and Legality

TC Construction Company, Inc.

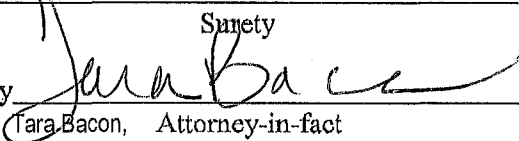
Principal
By 

Austin Cameron, Secretary
Printed Name of Person Signing for Principal

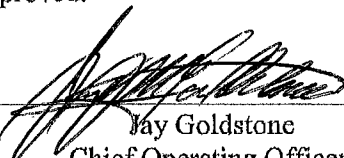
Jan I. Goldsmith, City Attorney

By 
Deputy City Attorney

Liberty Mutual Insurance Company

Surety
By 
Tara Bacon, Attorney-in-fact

Approved:


Jay Goldstone
Chief Operating Officer

790 The City Drive, Suite 200

Local Address of Surety

Orange, CA 92868

Local Address (City, State) of Surety

(800) 763-9268

Local Telephone No. of Surety

Premium \$41,708.00

Bond No. 024046035

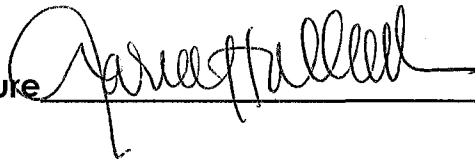
ACKNOWLEDGMENT

State of California
County of San Diego

On June 14, 2012 before me, Maria Hallmark, Notary Public, personally appeared Tara Bacon, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that she executed the same in her authorized capacity, and that by her signature on the instrument the person, or the entity upon behalf of which the person 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 



(Seal)

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

5216686

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

Certificate No. _____

American Fire and Casualty Company
The Ohio Casualty Insurance Company
West American Insurance Company

Liberty Mutual Insurance Company
Peerless Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That American Fire & Casualty Company and The Ohio Casualty Insurance Company are corporations duly organized under the laws of the State of Ohio, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, that Peerless Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, **DALE G. HARSHAW, BRADLEY R. ORR, GEOFFREY SHELTON, TARA BACON,**

all of the city of SAN DIEGO, state of CALIFORNIA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 2nd day of March, 2012.



American Fire and Casualty Company
The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
Peerless Insurance Company
West American Insurance Company

By: *Gregory W. Davenport*
Gregory W. Davenport, Assistant Secretary

STATE OF WASHINGTON ss
COUNTY OF KING

On this 2nd day of March, 2012, before me personally appeared Gregory W. Davenport, who acknowledged himself to be the Assistant Secretary of American Fire and Casualty Company, Liberty Mutual Insurance Company, The Ohio Casualty Company, Peerless Insurance Company and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Seattle, Washington, on the day and year first above written.



By: *KD Riley*
KD Riley, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of American Fire and Casualty Company, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, West American Insurance Company and Peerless Insurance Company, which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes Gregory W. Davenport, Assistant Secretary to appoint such attorney-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, David M. Carey, the undersigned, Assistant Secretary, of American Fire and Casualty Company, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, West American Insurance Company and Peerless Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 14th day of June, 20 12.



By: *David M. Carey*
David M. Carey, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

State of California

County of San Diego

On June 19, 2012 before me, Sandra Weeks, Notary Public

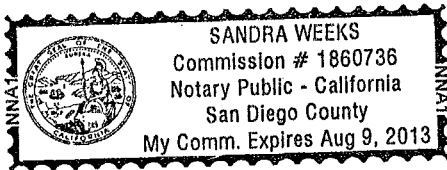
Date

Here Insert Name and Title of the Officer

personally appeared Austin Cameron

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: Sandra Weeks

Signature of Notary Public

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 this 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: _____ Signer's Name: _____

Corporate Officer — Title(s): _____ Corporate Officer — Title(s): _____

Individual Individual

Partner — Limited General Partner — Limited General

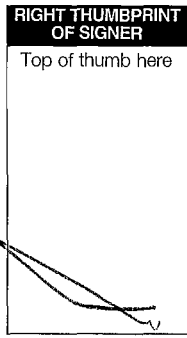
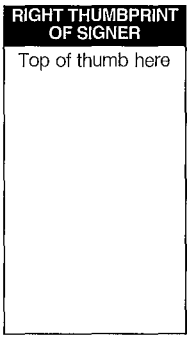
Attorney in Fact Attorney in Fact

Trustee Trustee

Guardian or Conservator Guardian or Conservator

Other: _____ Other: _____

Signer Is Representing: _____ Signer Is Representing: _____



CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

PROJECT TITLE: CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

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 INSTRUCTION TO BIDDERS, "Drug-Free Workplace", of the project specifications, and that;

TC Construction Co, 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  _____

Printed Name Austin Cameron _____

Title Secretary _____

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

PROJECT TITLE: CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

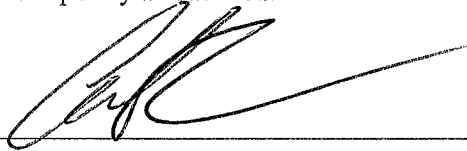
I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the American With Disabilities Act (ADA) outlined in the INSTRUCTION TO BIDDERS, "American With Disabilities Act", of the project specifications, and that;

TC Construction Co, Inc.

(Name under which business is conducted)

has in place a 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 _____



Printed Name _____

Austin Cameron

Title _____

Secretary

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

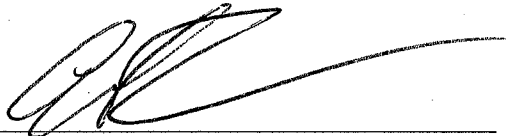
PROJECT TITLE: CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

I declare under penalty of perjury that I am authorized to make this certification on behalf of TC Construction Co, Inc., as Contractor, that I am familiar with the requirements of City of San Diego Municipal Code § 22.3224 regarding Contractor Standards as outlined in INSTRUCTION TO BIDDERS ("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 § 22.3224.

Dated this 19th Day of June, 2 012.

Signed _____



Printed Name _____

Aushin Cameron

Title _____

Secretary

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:

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT
(PROJECT)

as particularly described in said contract and identified as Bid No. **K-12-5525-DBB-C**; SAP No. (WBS/IO/CC) **S-00308**; and **WHEREAS**, the specifications 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 _____, 2_____.

by _____ Contractor

ATTEST:

State of _____
County of _____

On this _____ DAY OF _____, 2____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared _____
_____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

PHASED FUNDING SCHEDULE AGREEMENT

Check one:

- First Phased Funding Schedule Agreement
- Final Phased Funding Schedule Agreement

BID NUMBER: K-12-5525-DBB-C

CONTRACT TITLE: City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment

CONTRACTOR: TC Construction Company, Inc.

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	This allows us to move forward while the FY2013 Appropriation Ordinance (AO) is approved and the budget is downloaded. At that point, additional project funding will be available. Work shall be in accordance with the contract documents.	Notice To Proceed (NTP)	12/31/2012	\$4,800,000.00
2	Work to be completed in Phase Two shall include all remaining work as defined by the contract documents.	12/31/2012	Notice Of Completion (NOC)	\$1,446,500.00
Total				\$6,246,500.00

Notes:

- (1) City Supplement 9-3.6, "PHASE FUNDING COMPENSATION" applies.
- (2) The total of all funding phases shall be equal to the TOTAL BID PRICE as shown on BID SCHEDULE 1 - PRICES.
- (3) This PHASE FUNDING SCHEDULE AGREEMENT will be incorporated into the CONTRACT and shall only be revised by a written modification to the CONTRACT.

CITY OF SAN DIEGO

By: Rolf H. Lee

Name: Rolf H Lee
Project Manager

Department Name: Eng. & Capital Projects

Date: June 20, 2012

CONTRACTOR

By: Austin Cameron

Name: Austin Cameron

Title: Vice President

Date: 6/14/12

-END OF PHASE FUNDING SCHEDULE-

RECEIVED

JUN 20 2012

BY: _____

SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

THESE SUPPLEMENTARY SPECIAL PROVISIONS CONFORM TO THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (THE GREENBOOK) CURRENTLY ADOPTED BY THE CITY, INCLUDING ITS CURRENT SUPPLEMENT AMENDMENTS (CITY SUPPLEMENTS INCLUDED IN THE WHITEBOOK), EXCEPT FOR THE FOLLOWING:

STYLE OF SPECIFICATIONS

The City is gradually standardizing the style and language of the standard specifications for the public works construction. The new style and language follows the Federal guidelines for “Plain Language” to the extent possible.

The use of this new style does not change the meaning of a specification not yet using this style. Where used in the Contract Documents, statement or command type phrases (i.e., active voice and imperative mood) refer to and are directed at the Bidder or Contractor as applicable. The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's." Similarly, interpret "we" and “us” as "the City" and "our" as "the City's.”

PART 1 – GENERAL PROVISIONS

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

1-2 TERMS AND DEFINITIONS.

Agency – ADD the following:

Regulatory activities handled by the City of San Diego Developmental Services, Fire and Planning Departments, or any other City Department are not subject to the responsibilities of the City under this contract.

Certificate of Compliance – To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Certificate of Compliance – A written document signed and submitted by a supplier or manufacturer that certifies that the material or assembled material supplied to the Work site complies with the requirements of the Contract Documents.

Contract Documents – To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

The Agreement, Addendum, Invitation to Bid, Instructions to Bidders, special notice page, funding agency provisions, Bid and documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award when attached as an exhibit to the Contract, Bonds, permits from jurisdictional regulatory agencies, Supplementary Special Provisions (SSP), City’s EOC Requirements, City Supplement, Plans, Standard Plans, Construction Documents, Reference Specifications listed in the Invitation to Bid or the RFP for Design-Build contracts, Request for Qualifications (RFQ), Statement of Qualifications (SOQ), Request for Proposals (RFP), modifications issued after the execution of the Contract e.g., Change Orders, Construction Manager At Risk’s Guaranteed Maximum Price including written qualifications, assumptions and conditions thereto and Pre-construction Services Agreement.

Limited Notice To Proceed – A written notice given from the City to the Contractor that authorizes the Contractor to start a limited amount of work that is not Construction Work, such as finalizing subcontract agreements, ordering materials, mobilization, furnishing a field office, and any other preliminary work done prior to performing Construction Work.

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

The Normal Working Hours shall be 7:00 AM to 4:00 PM.

Notice of Completion (NOC) – ADD the following:

See California Civil Code section 3093.

Samples - Physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be evaluated.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-1.2.2 Joint Venture Contractors. To the City Supplement, last paragraph, DELETE in its entirety and SUBSTITUTE with the following:

The Joint Venture shall designate an on-site representative and an alternate in writing. The on-site representative and the alternate shall have the full authority to bind all Joint Venture partners.

The Joint Venture shall provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receipt by the Bidder of Contract forms.

2-3.1.2 Subcontractor List. ADD the following:

For Extra Work, the Contractor shall submit Form CC10, “CONTRACT CHANGE ORDER (CCO)” with each CCO proposal. Form CC10 is available for download from the EOCP site at: <http://www.sandiego.gov/eoc/pdf/cc10.pdf>

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

The Contractor shall perform, with its own organization, Contract work amounting to at least **50 percent** 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 determining the Apparent Low Bidder as specified. The self performance percentage requirement will be waived for contracts when a “B” License is required or allowed.

2-3.3 Status of Subcontractors. ADD the following:

With every request for payment, the Contractor shall submit to the Engineer a breakdown showing monthly and cumulative amounts of the Work performed under Change Order by the Contractor and the Subcontractors. The reporting format shall be approved by the Engineer.

2-3.4 Subcontract Requirements. To the City Supplement, ADD the following:

The Contractor shall ensure that all of its Subcontractors are licensed at the time of the execution of their subcontract agreements. In the event a Subcontractor is not properly licensed, the Contractor shall cease payment to Subcontractor for all work performed when the Subcontractor was improperly licensed. Any payment made by the Contractor to a Subcontractor for work performed when the Subcontractor was unlicensed shall be returned to the City.

Where the Contract Documents require that a particular product be installed or applied by an applicator approved by the manufacturer, it is the Contractor’s responsibility to ensure the Subcontractor or Supplier employed for such work is approved by the manufacturer.

2-5.2 Precedence of Contract Documents. To the Cit Supplement, DELETE in its entirety and SUBSTITUTE with the following:

2-5.2 Precedence of Contract Documents. If there is a conflict between any of the Contract Documents, the document highest in the order of precedence shall control. The order of precedence, from highest to lowest, shall be as follows:

- 1) Permits (i.e., issued by jurisdictional regulatory agencies)
- 2) Change Orders and Supplemental Agreements; whichever occurs last
- 3) Contract and Agreement
- 4) Addenda
- 5) Bid (e.g., price Proposal for Design-Build contracts)
- 6) Request for Proposal (RFP)
- 7) Invitation to Bid
- 8) Instruction to Bidders
- 9) Request for Qualifications (RFQ)
- 10) Special Provisions (i.e., City's EOCB Requirements, City Supplement, and Supplementary Special Provisions (SSP))
- 11) Plans
- 12) Construction Documents (for Design-Build contracts)
- 13) Standard Drawings
- 14) Reference Specifications (e.g., GREENBOOK)
- 15) Technical Proposal (for Design-Build contracts)
- 16) Statement of Qualifications (SOQ)

When additional requirements by the funding sources are physically or by reference incorporated in the Contract Documents, the funding source's requirements shall govern **unless specified otherwise**.

Figured dimensions shall take precedence over scaled dimensions. Detailed drawings shall take precedence over general drawings.

2-5.3.1 General. DELETE in its entirety and SUBSTITUTE with the following:

When required by the Contract Documents or when requested by the Engineer, the Contractor shall provide the submittals as specified in 2-5.3.2, 2-5.3.3, and 2-5.3.4 to the Engineer. Materials shall neither be furnished nor fabricated, nor shall any work for which submittals are required be performed before the required submittals have been reviewed and accepted by the Engineer. The payment for the submittals shall be included in the various Bid items. Neither review nor acceptance of submittals by the Engineer shall relieve the Contractor from responsibility for errors, omissions, or deviations from the Contract Documents, unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal. The Contractor shall be responsible for the correctness of the submittals.

The Contractor shall allow a minimum of 20 working days for review of submittals unless otherwise specified in the Special Provisions. Each submittal shall be accompanied by a letter of transmittal.

2-5.4.1 General. ADD the following:

Source Identification e.g., RFI numbers and Change Order numbers as required to identify the source of the change to the Contract Documents shall be noted.

2-5.4.2 Asset Specific Red-lines (d). ADD the following:

- Dimensional changes to the drawings.
- Revisions to details shown on drawings.
- Depths of foundations below first floor.
- Locations and depths of underground utilities.
- Revisions to routing of piping and conduits.
- Revisions to electrical circuitry.
- Actual equipment locations.
- Duct size and routing.
- Locations of concealed internal utilities.
- Changes made by Change Order.
- Details not on original Plans.

ADD the following:

- h) Slurry Seal and Asphalt Overlay Red-Lines: The Contractor shall clearly record on the City provided forms in MS Excel format the actual dates and quantity of each Bid item applied to each street segment and comments regarding each segment. The Contractor shall record reasons if no work is performed.

2-6 WORK TO BE DONE. ADD the following:

In accordance with the provisions of California Law, the Contractor shall possess or require the Subcontractor(s) to possess valid appropriate license(s) for the Work being performed.

2-7 SUBSURFACE DATA. ADD the following:

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

1. Report dated July 21, 2010 (project #106854001) prepared by Ninyo & Moore Geotechnical and Environmental Sciences Consultants, entitled "GEOTECHNICAL EVALUATION SEWER PUMP STATION 84 UPGRADE PROJECT SAN DIEGO, CALIFORNIA", consisting of 21 pages, plus figures, appendices, etc.
2. Report dated August 13, 2003 (project #104967001) prepared by Ninyo & Moore Geotechnical and Environmental Sciences Consultants, entitled "GEOTECHNICAL EVALUATION CITY OF SAN DIEGO SEWER PUMP STATION UPGRADE PROJECT PUMP STATION NO. 84 SAN DIEGO, CALIFORNIA", consisting of 15 pages, plus figures, appendices, etc.
3. Report dated November 13, 2001 (project #104488001) prepared by Ninyo & Moore Geotechnical and Environmental Sciences Consultants, entitled "GEOTECHNICAL EVALUATION CITY OF SAN DIEGO SEWER PUMP STATION NO. 62", consisting of 19 pages, plus figures, appendices, etc.

The reports listed above are available for review by contacting the City Project Manager or visiting:

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

2-9.2 Survey Services. DELETE in its entirety and SUBSTITUTE the following:

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

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

2-10 AUTHORITY OF BOARD AND ENGINEER. ADD the following:

Regulating agencies of the City, such as Developmental Services, Fire and Planning Departments, enforce Legal Requirements and standards. These enforcement activities are not subject to the responsibilities of the Engineer under this Agreement.

2-11 INSPECTION. ADD the following:

The City may utilize field inspectors to assist the Engineer during construction in observing performance of the Contractor. The inspector is for the purpose of assisting the Engineer and shall not be confused with an inspector with a City regulatory agency or with a Special Inspector.

Code compliance testing (including all Geotechnical requirements) and inspections required by codes or ordinances, or by a plan approval authority, shall be the responsibility of and shall be paid by the Contractor, unless otherwise provided in the Contract Documents.

The Contractor's quality control testing and inspections shall be the sole responsibility of the Contractor and paid by the Contractor included in the Bid price.

2-16 TECHNICAL STUDIES AND DATA. To the City Supplement, ADD the following:

In preparation of the Contract Documents, the designer has relied upon the following studies, data, reports of explorations, and tests:

1. As-Built information from D-sheet drawing numbers: 13939, 23173, 23369, 23389, 23506, 23688, 24131, and 31648.
2. Report of Biological Studies, dated October 2011, from Helix Environmental Planning.

The reports listed above are available for review by contacting the City Project Manager or visiting:

<ftp://ftp.sannet.gov/OUT/ECP/2-16%20TECHNICAL%20STUDIES%20AND%20DATA/>

ADD: 2-17 CONTRACTOR REGISTRATION. The Contractor, Subcontractors, and Suppliers shall register with the City's EOCP via Prism® i.e., the City's web-based contract compliance portal at: <https://pro.prismcompliance.com/contractor/plugins/pages/contractormenu.aspx>.

The Contractor shall ensure that proposed Subcontractors and Suppliers have completed the registration prior to Notice of Intent to Award. If the Contractor fails to have its Subcontractors and Suppliers registered after the NTP has been issued, the City will withhold a minimum of 10% in addition to the Retention from all invoices submitted until the Contractor and all listed Subcontractors and Suppliers are properly registered in PRISM.

SECTION 3 – CHANGES IN WORK

3-3.2.2 Basis for Establishing Costs (a) Labor. To the City Supplement, 1st and 2nd paragraphs, DELETE in their entirety and SUBSTITUTE with the following:

The City reserves the right to request financial records of salaries for an employee, wages, bonuses and deductions to substantiate the actual cost of labor certified by a California licensed Certified Public Accountant. The Contractor shall use the City provided form i.e., "PUBLIC WORKS PAYROLL REPORTING FORM" which is available at <http://www.sandiego.gov/eoc/pdf/payrollreport.pdf> to list the labor rates of its personnel and Subcontractors who work on this Project. An initial submittal shall be made prior to NTP.

The payment for payroll records shall be included in the various Bid item unless a separate Bid item has been provided.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.2 Inspection of Materials Not Locally Produced. ADD the following:

The Engineer will perform inspection of out-of-town manufacturer for the items of Work specified here:

- a) New pumps for sewer pump station 84

4-1.5 Certificates of Compliance. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

4-1.5 Certificates of Compliance. DELETE in its entirety and SUBSTITUTE with the following:

Certificates of Compliance shall be furnished to the Engineer prior to the use of any material or assembled material for which these Specifications so require or if so required by the Engineer.

The Engineer may waive the materials testing requirements of the Specifications and accept a Certificate of Compliance. Manufacturing test data may be required by the Engineer to be included with the submittal.

Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The submission of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the Work which conforms to the requirements of the Contract Documents, and any material not conforming to the requirements will be subject to rejection whether in place or not.

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

4-1.6 Trade Names or Equals. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required. Unless stated otherwise, materials or equipment of other Suppliers may be accepted if sufficient information is submitted to the Owner for review to determine whether the material or equipment proposed is equivalent or equal to that named.

- a) The Contractor shall submit its list of proposed substitutions, fully completed forms and justifications for “an equal” (“or equal”) item(s). **no later than 21 calendar Days after the receipt of the Notice of Intent to Award.**
- b) The request for substitution shall include all information identified in 01600.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1.2 Commencement of Work. To the GREENBOOK and the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Unless specified otherwise, construction shall start within 5 Working Days after NTP and be diligently prosecuted to completion within the Contract Time. The Contractor shall not start any construction activity at the Site until the Pre-construction Meeting is held and the NTP has been issued by the Engineer.

Upon the Contractor’s written request, the City may delay the NTP as follows:

- a) Up to 5 Working Days from the Pre-construction Meeting, or
- b) Up to 40 Working Days from the Limited NTP for the preparation, submittal, obtaining approval for and filing of the PRDs in accordance with 801, “STORM WATER POLLUTION CONTROL,” or

- c) Up to 60 Working Days from the Limited NTP for the preparation, submittal, and approval of the TCP on “D-sheets” when specified in 7-10.2, “Traffic Control.”

For areas that do not require engineered TCP on D-sheets, the Contractor may at any time after the Pre-construction Meeting obtain a TCP Permit via Working Drawings or the City’s over the counter process and start the Work. If the Contractor decides to commence the construction work before the completion of the D-sheet TCPs, the Contractor shall forfeit the 60 Working Days specified here. The D-sheet TCP shall be done concurrently and no additional time will be granted.

For paving Work, the Contractor shall coordinate the Work to facilitate the installation and protection of the new curb ramps and associated concrete work prior to commencing the asphalt overlay operations. The Work at a specific location shall not commence until all layouts and measurements are agreed upon by both the Contractor and the Engineer.

6-1.4 Phased Funding. To the City Supplement, ADD the following:

This contract is subject to Phased Funding.

ADD: 6-1.8 Pre-construction Meeting. Within 20 Working Days from the Limited NTP the Engineer will schedule a mandatory pre-construction meeting (Pre-construction Meeting) with the Contractor. The agenda will include items such as NTP, design services and submittal and review process for Design-Build contracts, critical elements of the work schedule, submittal schedule, cost breakdown of major lump sum items, payment requests and processing, environmental and community concerns, coordination with the involved utility firms, the level of record project documents required and emergency telephone numbers for all representatives involved in the course of construction.

6-7.1 General. To the City Supplement, ADD the following:

- d) If weather condition is suitable, the Contractor shall complete each street segment within 15 Working Days from the day the slurry seal or asphalt overlay is placed. Each completed segment shall include other incidental Work items e.g., weed abatement, damaged asphalt pavement replacement, asphalt patching, resurfacing, striping, markings, raised pavement markers, and inlet markers.

ADD: 6-8.1 Completion. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.1 Completion. The Contractor shall submit a written assertion that the Work has been completed. If, in the Engineer’s judgment, the Work has been completed in accordance with the Contract Documents, the Engineer will set forth in writing the date the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect and maintain the Work.

6-8.2 Acceptance. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.2 Acceptance. Acceptance will occur after all of the requirements contained in the Contract Documents have been fulfilled. If, in the Engineer’s judgment, the Contractor has fully performed the Contract, the Engineer will accept the Contractor’s performance of the Contract.

6-8.3 Warranty. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.3 Warranty. Unless specified otherwise, the Work shall be warranted by the Contractor against defective workmanship and materials for a period of 1 year.

- a) The warranty period shall start on the date of completion of the Work as determined by the Engineer.
- b) The Contractor shall provide an unconditional warranty on all installed fiber optic cable for a minimum period of 2 years.
- c) The warranty period for the following items of the Work shall be 3 years:
 - 1. Work under Section 500 (requires Long Term Warranty Contract (LTWC))
 - 2. DWT Construction (requires manufacturer's warranty)
 - 3. LED signal modules (requires manufacturer's warranty)
 - 4. Private sewer pumps including the alarm panel and all other accessories. The Contractor shall provide the City and property owner a copy of the warranty. (requires manufacturer's warranty)
- d) The Contractor shall involve the manufacturer in the installation and startup as needed to secure any extended warranty required.
- e) The warranty period for specific items covered under manufacturers' or suppliers' warranties shall commence on the date they are placed into service at the direction of or as approved by the Engineer in writing.
- f) All warranties, express or implied, from Subcontractors or Suppliers, of any tier, for the work performed and materials furnished shall be assigned, in writing, to the City, and such warranties shall be delivered to the Engineer prior to acceptance of the Contractor's performance of the Contract.
- g) The Contractor shall replace or repair defective Work in a manner satisfactory to the Engineer, after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such replacement or repairs within the time specified in the notice, the City may perform the replacement or repairs at the Contractor's expense. If the Contractor fails to reimburse the City for the actual costs, the Contractor's Surety shall be liable for the cost thereof.
- h) Nothing in this warranty is intended to limit any manufacturer's warranty which provides the City with greater warranty rights than set forth in this section or the Contract Documents.
- i) These specifications are not intended to constitute a period of limitations or waiver of any other rights or remedies City may have regarding the Contractor's other obligations under the Contract Documents or federal or state law.
- j) The Contractor shall respond and initiate corrective action within 24 hours of notice of nonconforming Work that poses an imminent threat to person or property.

6-9 LIQUIDATED DAMAGES. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

MODIFY to increase the daily value from \$250 to \$3,000.00.

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 this contract.

ADD: 7-3.1 Policies and Procedures.

- a) You must procure the insurance described below, at your 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.
- b) Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
- c) 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 this contract, e.g., your indemnity obligations, will not be deemed limited to the insurance coverage required by this contract.
- d) 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.
- e) 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 this contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of this contract may be treated by the City as a material breach of contract.

ADD: 7-3.2 Types of Insurance.

7-3.2.1 Commercial General Liability Insurance.

- a) 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.
- b) 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).
- c) 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.
- d) All costs of defense must be outside the policy limits. Policy coverage must be in liability limits of not less than the following:

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

7-3.2.2 Commercial Automobile Liability Insurance.

- a) 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").

- b) All costs of defense must be outside the limits of the policy.

7-3.2.3 Commercial Pollution Liability Insurance.

- a) You must procure and maintain at your expense or require Subcontractor, as described below to procure and maintain, the Contractors Pollution Liability Insurance including contractual liability coverage to cover liability arising out of cleanup, removal, storage, or handling of hazardous or toxic chemicals, materials, substances, or any other pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit for bodily injury and property damage.
- b) All costs of defense must be outside the limits of the policy. Any such insurance provided by Subcontractor instead of you must be approved separately in writing by the City.
- c) For approval of a substitution of Subcontractor's insurance, you must certify that all activities for which the Contractors Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance. The deductible must not exceed \$25,000 per claim.
- d) Contractual liability must include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There must be no endorsement or modification of the coverage limiting the scope of coverage for either "insured vs. insured" claims or contractual liability.
- e) Occurrence based policies must be procured before the Work commences and must be maintained for the Contract Time. Claims Made policies must be procured before the Work commences, must be maintained for the Contract Time, and must include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies must continue to be maintained for 12 months after the completion of the Work without advancing the retroactive date.
- f) 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.

7-3.2.4 Contractors Hazardous Transporters Pollution Liability Insurance.

- a) You must provide at your expense or require Subcontractor to provide, as described below Contractors Hazardous Transporters Pollution Liability Insurance including contractual liability coverage to cover liability arising out of transportation of hazardous or toxic, materials, substances, or any other pollutants by you or any subcontractor in an amount not less than \$2,000,000 limit per occurrence/aggregate for bodily injury and property damage.
- b) All costs of defense must be outside the limits of the policy. The deductible must not exceed \$25,000 per claim. Any such insurance provided by a subcontractor instead of you must be approved separately in writing by the City.
- c) For approval of the substitution of Subcontractor's insurance you must certify that all activities for which Contractors Hazardous Transporters Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance.
- d) Contractual liability must include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There must be no endorsement or modification of the coverage limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. Occurrence based policies must be procured before the Work commences and must be maintained for the duration of this contract. Claims Made policies must be procured before the Work commences, must be maintained for the duration of this contract, and must include a 12 month extended

Claims Discovery Period applicable to this contract or the existing policy or policies must continue to be maintained for 12 months after the completion of the Work under this contract without advancing the retroactive date.

- e) 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.

7-3.2.5 Contractors Builders Risk Property Insurance.

- a) You must provide at your 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 plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
- b) 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.
- c) 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, you, 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.
- d) 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. You 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.
- e) 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.

ADD: 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 Eligible Surplus Lines Insurers (LESLI 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.

ADD: 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.

ADD: 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.
 1. 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.
 2. 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 the Contractor's 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.

7-3.5.3 Contractors Pollution Liability Insurance Endorsements.

7-3.5.3.1 Additional Insured.

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

your behalf, or (d) premises owned, leased, controlled, or used by you; except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of § 2782 of the California Civil Code apply, this endorsement must not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.

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

7-3.5.3.2 Primary and Non-Contributory Coverage. The policy or policies must be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives must be in excess of your insurance and must not contribute to it.

7-3.5.3.3 Severability of Interest. For Contractors Pollution Liability Insurance, the policy or policies must provide that your insurance must apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and must provide cross-liability coverage.

7-3.5.4 Contractors Hazardous Transporters Pollution Liability Insurance Endorsements.

7-3.5.4.1 Additional Insured.

- a) The policy or policies must be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of: (a) Ongoing operations performed by you or on your behalf, (b) your products, (c) your work, e.g., your completed operations performed by you or on your behalf, or (d) premises owned, leased, controlled, or used by you; except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of §2782 of the California Civil Code apply, this endorsement must not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.
- b) In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that is not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and its respective elected officials, officers, employees, agents, and representatives must be limited to obligations permitted by California Insurance Code §11580.04.

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

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

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 we desire to occupy or use a portion or portions of the Work prior to Acceptance in accordance with this contract, we 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.

ADD: 7-3.6 Deductibles and Self-Insured Retentions. You are responsible for the payment of all deductibles and self-insured retentions. Disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.

ADD: 7-3.7 Reservation of Rights. We reserve 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. We 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.

ADD: 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.

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

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

- a) For contracts with required engineering services (e.g., Design-Build, preparation of engineered Traffic Control Plans (TCP), etc. by you) for all of your employees or Subcontractors who provide professional engineering services under this contract, you must keep or must require your Subcontractor keep in full force and effect, Professional Liability coverage with a limit of **\$1,000,000** per claim and **\$2,000,000** annual aggregate.
- b) You must ensure both that: (a) the policy retroactive date is on or before the date of commencement of the Project; and (b) the policy will be maintained in force for a period of 3 years after completion of the Project or termination of this contract whichever occurs last. You agree that for the time period specified above, there will be no changes or endorsements to the policy that affect the specified coverage.
- c) If professional engineering services are to be provided solely by the Subcontractor, you must (a) certify this to the City in writing and (b) agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth above.

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

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

a) In accordance with the provisions of §3700 of the California Labor Code, you must provide at its 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.

b) Limits for this insurance must be not less than the following:

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

c) By signing and returning this 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 will 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.

7-5 PERMITS, FEES, AND NOTICES. To the City Supplement, DELETE item e) in its entirety and ADD the following:

The City will obtain, at no cost to the Contractor; the following permits:

a) Site Development Permit.

7-8.6 Water Pollution Control. ADD the following:

- a) The Project is subject to the Storm Water Pollution control requirements listed on the Plans or as specified in these specifications.
- b) For contracts subject to Construction General Permit (CGP), the Contractor's QSD shall verify the City's assessment prior to submittal through SMARTS.
- c) The Contractor's attention is directed to Section 801, "WATER POLLUTION CONTROL" of these specifications for more information.

Based on a preliminary assessment by the City, this contract is subject to SWPPP.

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. ADD the following:

In any emergency affecting the safety of persons or property, the Contractor shall act, at its discretion, to prevent threatened damage, injury or loss. Any change in Contract Price or Contract Time resulting from emergency work shall be determined as provided in SECTION 3, "CHANGES IN WORK."

7-10.1 Traffic and Access. To the City Supplement, DELETE the agency notification listing in its entirety and SUBSTITUTE with the following:

The Contractor shall notify Metropolitan Transit System (MTS), a minimum of 5 Working Days prior to excavation, construction, or traffic control affecting bus stops. The Contractor shall notify the remaining agencies a minimum of two 2 Working Days prior to construction activities affecting the agencies:

Fire Department Dispatch	(Street or alley closure)	(858) 573-1300
Police Department Traffic	(Street or alley closure)	(858) 495-7800
Street Division/Electrical	(Traffic signals)	(619) 527-7500
U.S. Navy	(32nd Street Naval Station)	(619) 556-1319
Underground Service Alert	(Any excavation)	(800) 422-4133
MTS	(Street Closure and Bus Stops)	(619) 238-0100 Ext 6451

7-10.2.2 ENGINEERED Traffic Control Plans Provided by the Contractor. To the City Supplement, ADD the following:

Engineered “D” size TCP shall be required for the following areas:

- a) All City street rights-of-way.

7-10.2.6 Traffic Control Signs and Notices for Resurfacing and Slurry Sealing. To the City Supplement, 1st paragraph, ADD the following:

For each street segment in addition to resurfacing and slurry sealing, the Contractor shall be posted “NO PARKING” for any required preparatory work such as, but not limited to, damaged asphalt pavement replacement (mill & pave), crack seal, and tree trimming.

7-10.6 Traffic Plate Bridging. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Transverse or longitudinal cuts, voids, trenches, holes, and excavations in the right-of-way that cannot be properly completed within 1 Working Day shall be protected by adequately designed barricades and structural steel plates [plates] that will support legal vehicle loads in such a way as to preserve unobstructed traffic flow.

The Contractor shall secure approval, in advance, from authorities concerning the use of any bridging proposed on the Work.

Plates shall conform to the following:

- a) The trench shall be adequately shored to support the bridging and traffic loads.
- b) Plates shall be designed for HS 20-44 truck loading in accordance with Caltrans Bridge Design Specifications Manual.
- c) For the minimum thickness of plates refer to Table 7-10.6(A):

Table 7-10.6(A) - Trench Width / Minimum Plate Thickness

Trench Width	Minimum Plate Thickness
10" (0.25 m)	1/2" (13 mm)
1'-11" (0.58 m)	3/4" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.6 m)	1 1/4" (32 mm)

For spans greater than 5'-3" (1.6 m), a structural design shall be prepared by a California Registered Civil Engineer and approved by the Engineer.

- d) Plates shall have a skid-resistant surface with a nominal Coefficient Of Friction (COF) of 0.35 as determined by California Test Method 342.
- e) Plates shall extend a minimum of 12" (300 mm) beyond the edges of the trench.
- f) Plates shall provide complete coverage to prevent any person, bicycle, motorcycle or motor vehicle from being endangered due to plate movement causing separations or gaps.
- g) Plates shall be secured against movement or displacement by using adjustable cleats, shims, welding, or other devices, and shall be installed in a manner that will minimize noise as traffic drives over them. Plates shall be installed using either Method (1) or (2):
 - i. Method 1 [For speeds greater than 45 mph (70 Km/hr)]: The pavement shall be cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.
 - ii. Method 2 [For Speeds less than 45 mph (70 Km/hr)]: Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2" (50 mm) into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope 8.5 % with a minimum 12" (305 mm) taper to cover all edges of the plates.

Alternative installation method may be submitted in accordance with 2-5.3, "Submittals" for the Engineer's approval.

- h) The Contractor shall be responsible for maintenance of the plates, shoring, and asphalt concrete ramps or any other approved device used to secure the plates. The Contractor shall immediately mobilize necessary personnel and equipment after being notified by the Engineer, the City's station 38, or a member of the public of a repair needed e.g., plate movement, noise, anchors, and asphalt ramps. Failure to respond to the emergency request within 2 hours will be grounds for the City to perform necessary repairs that will be invoiced at actual cost including overhead or \$500 per incident, whichever is greater. Failure by the Contractor to comply may result in automatic grounds suspension of permit, Contract, or both.
- i) When plates are removed, any damage to the pavement shall be repaired with fine graded asphalt concrete mix or slurry seal satisfactory to the Engineer.

Payment for traffic plate bridging shall be included in the various Bid items unless a Bid Item has been provided for steel plate bridging.

ADD: 7-16.2.2 Weekly Updates Recipients. The following recipients shall receive 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).

- Rolf H Lee, Project Manager, rlee@sandiego.gov
- Luis Chavez, Project Engineer, lchavez@sandiego.gov
- Resident Engineer, TBD

ADD: 7-21 ELECTRONIC COMMUNICATION. The Contractor shall post all communications addressed to the Engineer concerning construction including RFIs, submittals, and transmittals to the Virtual Project Manager (VPM) website established for the Project. The Contractor shall maintain a list of scheduled activities including planned and actual execution dates for all major construction activities and milestones defined in the approved Schedule. The Contractor shall review and act on all communications addressed to the Contractor in the VPM project website. A user's guide to the VPM system is available on the City's website and will be provided to the Contractor at the preconstruction meeting. The payment for electronic communications shall be included in the various Bid items.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-2 FIELD OFFICE FACILITIES. To the City Supplement, DELETE in its entirety.

PART 2 - CONSTRUCTION MATERIALS

SECTION 207 – PIPE

ADD: 207-17.2.3 Pipe Manufacturer. Pipe, fittings, couplings, and joints as manufactured or distributed by J-M Manufacturing Company shall not be used on this contract.

SECTION 210 – PAINT AND PROTECTIVE COATINGS

ADD: 210-6 Anti-graffiti Coating. Anti-graffiti coating shall be as manufactured by Monopole, Inc. (or approved equal).

Materials shall be applied as specified below:

- a) 1st Coat: Aquaseal ME12 (Item 5200)
- b) 2nd Coat: Permashield Base (Item 6100)
- c) 3rd Coat: Permashield Premium (Item 5600 for matte finish or Item 5650 for gloss finish)
- d) 4th Coat: Permashield Premium (Item 5600 for matte finish or Item 5650 for gloss finish)

SECTION 216 – DETECTABLE WARNING TILES

216-1.2 Materials. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Materials for DWT specified herein shall be per the City's Approved Materials List (AML). The tiles shall have the manufacturer's logo stamped permanently on the product with identifying information such as model number and type.

- a) The Stainless Steel Cast in Place DWT shall be of 16 gauge Type 304L with an integral micro-texture non-slip surface stamped into the stainless steel plate on the top of the domes and in the field surface between the domes. It shall have an ultra violet stabilized coating.
- b) Vitrified Polymer Composite (VPC) Cast in Place DWT shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. VPC Product shall be provided with a 5-year manufacturer written warranty form materials and installation.
- c) For others materials and a complete listing of material physical property requirements refer to the City's AML.

PART 3 – CONSTRUCTION METHODS

SECTION 302 – ROADWAY SURFACING

302-1.9 Traffic Signal Loop Detectors. To the City Supplement, DELETE the second paragraph and SUBSTITUTE with the following:

Traffic detector loops shall be reinstalled prior to resurfacing of the related street within 15 days from completion of all preparatory work including milling, cutting and grinding. The Contractor shall contact the City of San Diego's Street Division, Traffic Signal Maintenance at 619-527-8052 north of Interstate 8 or 619-527-8053 south of Interstate 8 to request loop layout.

ADD: 302-5.2 Pavement Restoration Adjacent to Trench. Pavement restoration adjacent to trench shall include the replacement of existing pavement adjacent to the proposed trench and outside the trench limits, that was previously broken or displaced.

Prior to the commencement of the Work, the Contractor shall meet with the Engineer and determine the limits of the pavement to be replaced. If the Contractor does not meet with the Engineer before removing the pavement, all replacement outside the limits of the proposed trench resurfacing shall be at the Contractor's expense.

Existing pavement shall be removed in accordance with Section 300-1.3.2. Prior to pavement restoration, existing subgrade shall be prepared in accordance with 301-1, "SUBGRADE PREPARATION." If any existing unsuitable subgrade as determined by the Engineer is encountered, it shall be replaced with imported backfill in accordance with 306-1.3.7, "Imported Backfill" prior to preparation.

302-5.2.1 Measurement and Payment. Payment for pavement restoration adjacent to trench will be made on a square foot basis as shown in the Bid in accordance with 302-6.8, "Measurement and Payment." Unless Bid includes separate Bid item(s), the following shall be included in the payment for pavement restoration adjacent to trench:

- a) saw-cutting existing edges,
- b) removal and disposal of existing pavement,
- c) subgrade preparation including imported backfill material,
- d) form work,
- e) placement, curing, and protection of new pavement, and
- f) placing full depth AC per CSDSD SDG-107-Type "A".

302-6.1 General. To the City Supplement, Last paragraph, DELETE in its entirety and SUBSTITUTE with the following:

Prior to placing concrete, existing subgrade shall be prepared in accordance with 301-1, "SUBGRADE PREPARATION."

If any existing unsuitable subgrade, as determined by the Engineer, is encountered it shall be replaced in accordance with 300-2.2, "Unsuitable Material."

302-6.8 Measurement and Payment. To the City Supplement, DELETE in its entirety.

302-13.4 Application. To the City Supplement, DELETE the second paragraph and SUBSTITUTE with the following:

Sealant shall be applied from the bottom of the crack up to the surface in a manner which does not result in sealant bridging or pockets of entrapped air. The sealant shall be applied to a slightly overfilled condition and then leveled with a squeegee. The width of sealant remaining on the surface shall not exceed 1.5" on either side of the crack. Any debris blown onto adjacent gutters, sidewalks, parkways, medians, intersections or other areas shall be removed prior to the end of the Working Day.

SECTION 306 – UNDERGROUND CONDUIT CONSTRUCTION

306-1.4.8 Televising Sewer Mains and Storm Drains. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

ADD: 306-1.4.8 Televising Sewer Mains, Sewer Laterals, and Storm Drains.

306-1.4.8.1 General. The Contractor in coordination with the Engineer shall televise new sewer mains and storm drains, rehabilitated existing sewer mains when performing parallel replacement to locate existing laterals, and existing sewer pipe segments and laterals after the cleaning process and prior to commencing rehab work. The Contractor shall provide the video records with compressed audio in digital file format on digital video discs (DVD's).

306-1.4.8.2 Submittals. The Contractor shall make several submittals during construction as follows:

- a) The Contractor shall provide an initial submittal at the start of televising work demonstrating the typical video and audio quality to be provided for acceptance by the Engineer. This submittal shall note any proposed changes to the specification listed below regarding video format, data processing, compression or other conditions for review and approval by the Engineer.
- b) When televising existing mains proposed to be replaced, the Contractor shall provide the televising DVD(s) and a red-lined set of Plans showing the location of the existing laterals to the Engineer before constructing the new sewer mains. Service lateral video inspection shall be submitted on a separate DVD.
- c) Post Cleaning Videos prior to rehabilitation of mains - The Contractor shall televise the sewer pipe segments after the cleaning process has been completed and prior to commencing rehabilitation work. If point repairs are necessary, the Contractor shall identify the location of the proposed point repairs and submit the post cleaning video within 5 Working Days of completion of the segment cleaning and at least 5 Working Days prior to commencing the rehab work to obtain prior approval by the Engineer. The Engineer will review each video submittal within 10 Working Days of receiving submittal. Each video submittal shall be limited to 20 segments. The post cleaning video for the remainder of the mainline segments shall be submitted in accordance with 2-5.3, "Submittals."
- d) Post Cleaning Videos for rehabilitated laterals or lateral launch videos - The Contractor shall televise the lateral segments after the cleaning process has been completed and prior to commencing any work on laterals. The post cleaning video for service lateral launch shall be submitted within 5 Working Days of segment cleaning. The Engineer will review each video submittal within 10 Working Days of receiving each submittal. Each DVD submittal shall be limited to 20 segments. The video inspection shall include inspection of service lateral a minimum of 30' in length from the mainline or up to the property line unless an obstruction is encountered.

If the property line clean-outs are not known to exist, service lateral video may be obtained with camera equipment designed to launch into the service lateral from the mainline or access from the private property with homeowner's permission. Each service lateral shall be identified by the Facility Sequence Number (FSN) of the mainline (when FSN are included in the Contract Documents) and the address of the property which it serves. Failure to comply with these specifications may result in one or more of the following:

- i. A delay of the review and approval of the submittal(s).
- ii. Delay in progress payments.

- iii. Require the Contractor to re-televising the pipelines at no cost to the City.
- e) Final Televising, Post-Rehabilitation Videos and Red-lines – New sewer mains shall be inspected by CCTV and recorded on DVD not less than 22 working days after completion of permanent trench restoration and finished grading, but prior to final resurfacing. The Contractor shall review the DVD for any discrepancies or deficiencies in the installation of the pipe or liner. The Contractor shall notify the Engineer at least 30 Working Days in advance of the anticipated date that Acceptance will be requested. If the specified advance notice is not given, Acceptance and bond release may be delayed.
- f) Ten Working Days shall be allowed for the Engineer to review each individual video disc of each and every reach documented on that particular videodisc. In the event that any deficiencies are discovered by the Engineer or City, either by the Contractor’s televising or the City’s re-televising, 5 Working Days shall be allowed for City to judge whether the deficiencies or sags are repairable, in place. If the judgment is made that the deficiencies are non-repairable in place, the affected portion(s) shall be reconstructed at no cost to the City. The Contractor shall not be entitled to Contract Time extension due to delays resulting from correcting deficiencies or sags as determined by televised inspections.
 - i. The City reserves the right to re-televising any new sewer main after the placement of permanent trench restoration and before final acceptance to determine the existence and extent of any foreign material or obstructions such as cement grout, wood, rocks, sand, concrete, or pipe fragments, and any structural deficiencies, or sags precipitated by the permanent trench restoration operations or other items of Work.

Post-rehabilitation videos shall be submitted within 30 days of completion of the Work. The final video recording shall clearly show the condition of the liner with ends sealed at the manholes, service lateral and connection seals. The submittal of this final video recording shall also include MS Access database and marked up Field Book pages or Plans as attachments. Failure to deliver the submittal(s) within the time identified or if a total of more than 20 segments are submitted in a single video may result in one or more of the following:

1. A delay of the review and approval of the submittal(s).
2. Delay in progress payments.
3. Require the Contractor to re-televising the sewer main segments.

306-1.4.8.3 Video Operator Qualifications. The video operator shall have at least 1 year of experience with a project of a similar nature within the last 3 years.

306-1.4.8.4 Equipment for Televising. Camera and lighting quality shall be suitable to provide a clear, continuously in-focus picture of the entire inside periphery of the sewer pipe or storm drain for all conditions encountered during the work. The equipment shall be capable of televising the entire length from manhole to manhole in one direction. When televising storm drains/sewer mains the camera shall be capable of scanning the joints for 360 degrees.

If necessary, the Contractor shall provide a self-propelled camera, capable of extended videotaping lengths and operation in remotely accessed areas without direct vehicular access. The system used to move the camera through the pipe shall not obstruct the camera’s view. The remote-reading footage counter device which measures the distance traveled by the camera in the pipe shall be displayed on the television monitor and shall be accurate to plus or minus 1’ (0.3 meters) in 1000’ (300 meters) (+0.3m:300 meters). The Contractor shall calibrate the measuring device each day with a known distance to the satisfaction of the Engineer prior to starting the inspection and videotaping process.

306-1.4.8.5 Televising Procedures.

- a) The Engineer shall be notified a minimum of 2 Working Days in advance of televising. The entire televising inspection process shall be done in the presence of the Engineer.
- b) The Contractor shall clean the sewer mains prior to televising as necessary to adequately perform the video recording operations.
- c) The camera shall be moved through the sewer at a uniform rate, stopping when necessary to ensure proper documentation of the condition of the sewer line but in no case shall the television camera be pulled at a speed greater than 30' (9 meter) per minute. The camera shall be moved by means of power cable winches or self propelled tractors at each manhole, and rotating the camera head at each lateral connection, defect, or both to allow for adequate evaluation. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a measuring device. Footages shown on the DVD(s) shall coincide with horizontal lengths from stationing as shown on the plans. Footage measurements shall begin at the centerline of the upstream manhole or storm drain access point, unless permission is given by the Engineer to do otherwise. Both pre and post video inspections shall be submitted to the Engineer.
- d) Televising shall be done in one direction for the entire length between manholes. Each section shall be isolated from the remainder of the storm drain or sewer line with the upstream sewage flow bypassed as required. Sufficient water shall be supplied to the isolated section to cause drainage reaching the downstream manhole prior to televising. If existing flows are high, pre-construction video inspection can be done with partial flow. Depth of the flow shall not exceed:
 - i. 6" - 10"(150 mm. - 250 mm) pipes - 20% of the pipe diameter.
 - ii. 12" - 24" (0.3 meters - 0.6 meters) pipes - 25% of the pipe diameter.
 - iii. 27" (0.7 meters) and up pipe - 30% of the pipe diameter.
- e) The Contractor shall televise the pipeline with maximum flow diverted from the pipeline. In the event that the existing flow is interfering with the video operation, a bypass shall be performed by the Contractor to lower the flow volume sufficiently to allow for a clear video picture.
- f) Obstructions may be encountered during the course of the internal inspection that prevents the travel of the camera. If an obstruction is not passable, the Contractor shall withdraw the equipment and begin internal inspection from the opposite end of the sewer reach. Should an additional obstruction be encountered after employment of the equipment from the opposite end of the sewer and no means are available for moving the television camera past the obstruction, the Contractor shall notify the Engineer, and the inspection shall be cancelled or postponed until the obstruction is removed. The Contractor shall remove the obstruction by excavation, repair or any other means approved by the Engineer, at no additional cost to the City.

After the obstruction has been removed, the Contractor shall continue with the CCTV inspection. A reverse setup, if necessary, shall be performed by the Contractor at no additional cost to the City. Should the camera get stuck in the sewer, the Contractor shall be responsible for all costs involved in extracting it. Costs related to difficulties encountered during internal television inspection are incidental to the Contract and claims, therefore, will not be considered.

- g) Defects such as offset joints, cracks in the pipe, and inflow shall be pointed out, quantified verbally, and projected on CCTV video disc. The Contractor shall use the standard owner's video disc introduction, abbreviations, log sheet forms, and severity code with legend when recording the line segment information. The Contractor shall notify the Engineer of any additional damage found and obtain prior approval from the Engineer for additional point repairs.
- h) Original DVD shall be submitted to and shall become the property of the City. DVD's will be reviewed by the Engineer for focus, lighting, sound, clarity of view, and technical quality. Videos recorded while a camera has flipped over in the process of traveling and the viewing of laterals, obstructions or defects that are blocked by cables, skids or other equipment will not be accepted. Sharp focus, proper lighting, and clear distortion-free viewing during the camera operations shall be maintained. Failure to maintain these conditions will result in the rejection of the video disc by the Engineer. Video recordings, if unacceptable to the Engineer, shall be repeated at no additional cost to the City.
- i) The City reserves the right to re-televisé any reach of the pipeline following the cleaning, pipe installation and rehabilitation activities, but before Acceptance, to determine the existence and extent of any foreign material or obstructions such as cement grout, wood, rocks, sand, concrete, or pieces of pipe, and any structural deficiencies, or sags preventing the completion of the Work.
- j) Final CCTV. The Contractor shall clean the line with high pressure water jetting equipment and a sewer ball prior to performing mandrel, air test or both, or as specified by the Engineer. For the final video inspection, the City will require a dry pipe. During the post-video inspection, the camera shall stop at each lateral connection, focus on the bottom of the opening and then make one slow clockwise observation around the perimeter of the lateral which clearly shows the quality of the connection. If the Contractor fails to properly show and document any of the lateral openings, the Contractor will be required to re-televisé that section of pipeline at no additional cost to the City.
- k) The Contractor shall not be entitled to any additional contract time due to delays resulting from the need to correct any deficiencies, either repairable or non-repairable, in place, as determined by televised inspections.

306-1.4.8.6 DVD and Final Report Requirements. The Contractor shall provide all video with audio in digital file format on DVD's. Audio and written documentation shall accompany all DVD(s) submitted to the Engineer.

- a) DVD Requirements
 - i. One file shall be provided for each manhole to manhole pipe segment or for each manhole to manhole inspection video.
 - ii. The filename shall incorporate the unique facility identifier provided by the City and the date of the inspection. The facility identifier numbers will be manhole numbers, with adjacent manhole numbers identifying pipe sections. The facility identifier number(s) shall be compatible with the data input features of the reporting software i.e., number of available input digits, fields, or both.
 - iii. DVD recordings shall be in color and in MPEG2 format. The minimum video bit rate shall be 4.7 Mega bits per second (Mbps) and minimum audio bit rate shall be 128 Kilo bits per second (Kbps). Out-of-focus video recording or low quality and blurred pictures due to steam or smudged camera lens, or portions thereof, shall be cause for rejection of the video recording.

- iv. The camera source image capture shall provide a high resolution image with a minimum of 640x480 pixels capture. The video shall be at 30 frames per second.
- v. The video will be captured and compressed so as to reduce file size as much as possible while still meeting the needs of the City. The compression shall be in accordance with MPEG2 format. The video files shall be highly compressed, resulting in an anticipated average file size of maximum 10 MB per minute of video.
- vi. The compression shall not significantly degrade the still frame quality of the video or audio signal from the original source video, as judged in a side by side viewing under normal viewing conditions.
- vii. During post-installation CCTV inspections, the Contractor shall utilize one of the following video camera systems: a rotating-lens camera (articulating head) or a pan and tilt camera.
- viii. The Contractor shall use a dual recording system and submit post video inspection discs to the inspector, subsequent to recording.
- ix. The Contractor shall ensure visibility and lighting with minimum glare and without any dark or shadowy regions appearing on the final video disc.
- x. The Contractor shall pan and tilt the camera and pause for at least 15 seconds at each lateral connection to adequately show and document that the saddle has been installed properly for new installations and that the lateral opening has been reestablished for rehabilitation and lining in accordance with 500.1.1.7.a, "Miscellaneous."
- xi. The television camera shall produce a continuously-monitored high-quality picture, capable of discerning all major and minor structural defects in the pipeline. The post-installation CCTV inspection will document all defects which may affect the integrity or the strength of the pipeline, such as cracks, roughness, fins, or folds. The Contractor shall repair or replace all defects, at no additional cost to the City, which in the opinion of the Engineer may affect the hydraulic condition of the pipe liner.
- xii. Each DVD submittal shall include the following:

Visuals

- 1. Adequate view of the upstream and downstream manholes or storm drain access points. The direction of the survey upstream or downstream.
- 2. A pause at and zoom in on the lateral connections for at least 15 seconds for identification of the condition of the connection.
- 3. A pause at and zoom in on the identified defects sufficient for identification of the type of problem.
- 4. Identified fault conditions or defects, see Appendix for Standardized City Condition and Defect Codes.
- 5. Each pipe section shall be identified by FSN, manhole numbers and the street name. If shown on the Plans, station numbers and sheet numbers shall also be identified.
- 6. A continuous read-out of the camera distance from the starting manhole to the end point at all times.

7. Pipe size.
8. Pipe or liner material, see Appendix for Material Description and Code.

Audio

1. Date of CCTV inspection.
2. Confirmation of each section to be CCTV inspected i.e., narrative of manholes, storm access points or station numbers, or FSN's and direction upstream or downstream.
3. Description of pipe size lined on post and final videos, material liner type for post and final videos and pipe joint length.
4. Description and location of each defect.
5. Description and location of each service connection.
6. Include brief but informative comments on data of significance, including, but not limited to, the locations of unusual conditions, type and size of connection, collapsed section, the presence of scale and corrosion, and other discernible features.

Written Documentation

1. Date of CCTV inspection.
2. Printed labels on DVD number, location information, date of inspection, and other descriptive information.
3. Location, size, material, and length of pipe.
4. Direction of flow and measurement "From" manhole or storm drain access point or station number "To" manhole or storm drain access point or station number or FSN.
5. File numbers itemizing individual segments.
6. Sketch showing the street and cross streets where the CCTV inspection was made.
7. Description and location of each defect or deficiency and a list of all proposed repairs.
8. Description and location of each connection.
9. A menu which lists files for each pipe section to be inspected and the date of the inspection.

b. Final CCTV inspection reports

- i. The Contractor shall provide reports of final inspection results of pipeline televising and conditional assessments utilizing a MS Access database reporting software.
- ii. This information shall be in tabular form, and include but not be limited to the following information: pipeline run from upstream to downstream manhole, location of defects in feet from upstream manhole, description of the defect, and other pertinent information. The reports shall also show all service lateral connection locations. The inspection reports shall incorporate and utilize a standardized City's rating system to be provided for comprehensive evaluation of pipeline, manhole condition, or both, i.e., a standardized listing of facility condition and defect codes. Pipe condition and fault information tied to pipe location shall also be recorded in the Report.

- iii. The file naming convention for video files consists of 32 characters, including the extension. The structure includes the following: “(field book page start)-(manhole ID start)-(field book page end)-(manhole ID end)-(hhddmmyy).wmv” where the field book pages and manholes IDs are 4 characters in length and hhddmmyy signifies the hour, day, month and year of the inspection, respectively. An example filename may be “F18S-0045-F18S-0046-14150604.wmv”.
- iv. See Appendix for televising inspection pipe database structure, table formats and standardized city condition, defect codes and digital video filename. Final reports shall follow these requirements.

306-1.4.8.7 Tolerances.

- a) For underground sewer or storm drain conduit installations, the maximum operational tolerance for sag shall be 1/2”. When televised inspection is used to check for sag, a calibrated 1/4” diameter steel bar, mounted in front of the camera, shall be used to measure the depth of sag.
- b) For rehab work, tolerances shall be in accordance with 500-1.4.9, “DEFECT TOLERANCES”.
- c) If the Engineer determines that the deficiencies or sags are non-repairable in place, the affected portion(s) shall be reconstructed in accordance with 6-8, “COMPLETION, ACCEPTANCE, AND WARRANTY.”

306-1.4.8.8 Payment. The payment for cleaning and televising sewer mains or laterals and storm drains shall be included in the unit price Bid items for cleaning and televising sewer mains and storm drains, televising sewer mains for final acceptance, or lateral launch videos. If a Bid item has not been provided, the payment shall be included in the payment for the proposed pipe.

306-1.6 Basis of Payment for Open Trench Installations. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Second paragraph, DELETE in its entirety and SUBSTITUTE with the following:

The unit price bid for pipe and conduit in place shall be considered full compensation for all wyes, tees, bends, monolithic catch basin connections, and specials shown on the Plans; the removal or restoration of interfering portions of existing sewers, storm drains, and existing improvements as shown on Plans; the closing or removing of abandoned conduit and structures; the excavations of the trench; the control of ground and surface waters; the preparation of subgrade; placing, joining and testing pipe; backfilling the trench; permanent resurfacing; disposal of excess excavation; temporary resurfacing when not a Bid item; and all other work necessary to install the pipe or conduit, complete in place.

Third paragraph, after the word "backfill" ADD: "disposal of all excess excavation,"

ADD the following:

- a) The Unit Price bid for thrust and anchor blocks shall include the payment for the thrust blocks and anchor blocks for water main 16” and larger.
- b) Thrust blocks and anchor blocks for water mains 12” and smaller shall be included in the Bid item for water mains.
- c) Payment for subsurface investigations e.g., potholing for thrust blocks and anchor blocks for water mains 16” and larger shall be included in the Bid item for water main.

- d) Payment for meter assembly shall be included in the various Bid items unless a pay item has been provided for Meter Assembly. The concrete pad, fence, gate, associated piping, and coordination with City Forces shall be included in the payment for the meter assembly.
- e) Payment for valves, fire hydrant assembly and marker, fire service assembly, fire service connection, and backflow preventer shall be included in the unit price Bid items for Valves, Fire Hydrant Assembly and Marker, Fire Service Assembly and backflow preventer, Fire Service Connection, and Backflow Preventer.
- f) Removal of existing Fire Hydrant and all appurtenant work shall be included in the Bid item for Fire Hydrant and Assembly and Marker.
- g) Payment for underdrains shall be included in the unit Bid item for "Underdrains."
- h) The quantity of filter fabric to be paid for will be measured in square yards of the area covered, not including additional fabric for overlap. The quantity of permeable material to be paid will be measured by tons.

ADD: 306-13.2 Pipe Separations.

- a) Pipe installation shall be in compliance with the State's health standards for separation. Dimensions shall be measured from outside pipe wall to outside pipe wall.
 - 1. When a proposed water main is installed above an existing sewer main, no connection joints shall be within 8' outside the sewer main crossing on both sides.
 - 2. When a proposed water main is installed below an existing sewer main, no connection joints shall be within 10' of the sewer main crossing on both sides.
 - 3. When a proposed sewer main is installed above an existing water main, no connection joints shall be within 10' outside the water main crossing on both sides.
 - 4. When a proposed sewer main is installed below an existing water main, no connection joints shall be within 4' outside the water main crossing on both sides.
- b) The Contractor shall notify the Engineer immediately:
 - 1. When sewer and water pipes, whether existing or proposed, are found to be closer than 4' horizontally or 1' vertically.
 - 2. When 6" vertical separation between utilities other than sewer and water mains cannot be maintained.
 - 3. When a minimum 3' of cover over top of water main cannot be maintained.
 - 4. When a minimum 5' of cover on the top of water mains larger than 16" in diameter cannot be maintained.
 - 5. When a minimum 4' of cover over top of recycled water main cannot be maintained.
- c) If 1' vertical separation cannot be maintained between proposed and existing utilities, 6" – 11" sand cushion per 200-1.5, "Sand" and 1" neoprene pad shall be installed as shown on Plans. The neoprene pad shall be 1" thick and wide enough to extend a minimum of 6" horizontally beyond the outside pipe wall. Neoprene pads shall have hardness between 50-70 durometers, as manufactured by Hoffmeyer Company, Industrial Rubber Supply, or approved equal. The neoprene pad shall be installed immediately below or on top of the existing utility. The sand cushion shall be placed between the neoprene pad and the proposed pipe.

306-13.3 Utility Crossings. To the City Supplement, DELETE in its entirety.

ADD: PART 8 – ENVIRONMENTAL WORKS

SECTION 800 - REVEGETATION, MAINTENANCE, AND MONITORING

800-1.1 Terms and Responsibilities. For the purpose of these specifications the following definitions and descriptions of the responsibilities shall apply:

Project Biologist – To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

An independent third party consultant employed by the City, and is responsible for overseeing the protection of existing biological resources requirements and the entire revegetation program. The Project biologist shall not be the same as the Revegetation Contractor or Maintenance Contractor. Project Biologist shall review and become familiar with the Contract Documents and shall function under the direction of the Engineer. The Project Biologist shall be an individual or team of individuals with 4-year degree(s) in botany, ecology, landscape architecture. or a related field, and demonstrated experience in habitat restoration and shall be qualified to perform United States Fish and Wildlife Service protocol focused sensitive species surveys as outlined in the biological technical report, CEQA document, local, state and federal resource agency permits or a combination for the Project.

Revegetation Contractor - To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

The planting and plant establishment work shall be performed by a qualified Revegetation Contractor to implement the Revegetation Plan. Revegetation Contractor shall possess a landscape Contractor's and pesticide/herbicide license. The Revegetation Contractor shall demonstrate knowledge of native vegetation and invasive weed identification as a part of the Bid. The Revegetation Contractor shall implement the Revegetation Plan in accordance with recommendations provided by the Project Biologist and Engineer.

800-1.7.1 General. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

The City will retain a qualified Project Biologist to perform biological monitoring work for this contract. The Contractor shall coordinate its activities and Schedule with the activities and schedules of the Biologist Monitor.

800-1.8.5 Samples. To the City Supplement, REVISE subsection number to “**800-1.8.10 Samples.**”

800-1.8.6 Substitutions and Changes. To the City Supplement, REVISE subsection number to “**800-1.8.11 Substitutions and Changes.**”

800-2.1 General. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

800-2.1 General. When required in the Contract Documents, a licensed Revegetation Contractor shall be retained to perform landscape and revegetation work. The Contractor shall submit copies of the Revegetation Contractor's landscape contractor license and pesticide/herbicide license or a subcontractor holding a pesticide/herbicide license as noted in section 800-1.1 within 5 days of the Bid opening and show references for at least 3 successful native habitat revegetation projects of similar size and complexity in Southern California and provide a current reference for each. The submittals shall be sent to the City Project Manager.

If the proposed licensed Revegetation Contractor is not approved, the Contractor shall re-submit and obtain approval of an alternate licensed Revegetation Contractor at no additional cost to the City prior to the award of the Contract. Once approved, the licensed Revegetation Contractor shall attend the pre-construction meeting to present and coordinate the revegetation portion of the Project.

SECTION 801 – WATER POLLUTION CONTROL

801-2.9 Post-Construction Requirements. To the City Supplement second paragraph, ADD the following:

The decal-disc inlet markers shall be “das Duracast Curb Marker®” or approved equal.

801-9.3 BMP Requirements. To the City Supplement, ADD the following:

- c) WTAP shall be required when the Project exceeds the Maximum Disturbed Area Requirements unless the grading Work is performed in phases that do not exceed the limit shown on the Plans per phase.

SECTION 804 – SEWAGE SPILL PREVENTION

To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

804-1 GENERAL. The Contractor shall observe and comply with the City’s policy of zero spills. The Contractor shall be liable for all damages and fines associated with sewage spills caused by improper support or damage to the existing sewer facilities.

The Contractor shall designate a person responsible for the development and enforcement of the Sewage Spill Response Plan, and for ensuring sewer spills are minimized to the maximum extent possible. The Contractor shall provide a status of all bypass related work at biweekly progress meetings as requested by the City.

804-2 SEWAGE SPILL PREVENTION AND RESPONSE PLAN. Prior to the start of construction, the Contractor shall develop and submit to the Engineer, for review and approval, a written Sewage Spill Prevention and Response Plan. The plan shall include sewage spill response plan, spill containment and cleanup plan, staging area, and sewage bypass and pumping plan.

The Sewage Spill Prevention and Response Plan shall be developed to respond to any construction related sewage spill(s). The plan shall include:

- a) Identifying all nearby environmentally-sensitive areas such as waterways, channels, catch basins and entrances to existing underground storm drains.
- b) Making arrangements for an emergency response unit, stationed at or near the Site, comprised of emergency response equipment and trained personnel to be immediately dispatched in the event of a sewage spill(s). This includes field biologists, archaeologists, or both if in an environmentally-sensitive area such as a canyon.
- c) Developing an emergency notification procedure that includes an emergency response team with telephone numbers and arrangements for backup personnel and equipment. The emergency response unit shall be able to dispatch to the Site 24 hours a day 7 days a week including weekends and holidays. The Contractor shall designate primary and secondary representatives, their respective phone numbers, pager numbers, and mobile phone numbers. These Contractor’s representatives shall be accessible and available at all times to respond immediately to any sewer spill event.
- d) Identifying any property owners who may be affected e.g., the City Park and Recreation Department.

At the pre-construction meeting the Contractor will be provided with a list of the City representatives to contact in case of sewage spill(s). In case of a sewage spill(s), the Contractor shall immediately call the Sewage Spill Hotline number at (619) 527-5481 and shall act immediately without instructions from the City, to control the spill and take all appropriate steps to contain it in accordance with the Sewage Spill Prevention and Response Plan and 804-2.1, "Sewage Bypass and Pumping Plan." The Contractor shall immediately notify the City representatives of the spill and shall report Project name, location, Contractor name, Project Engineer, and Engineer names.

The Contractor shall, within 3 Working Days from the occurrence of the spill, submit to the Engineer a written report describing the following information related to the spill: the location; the nature and estimated volume; the date and time; the duration; the cause; the type of remedial and/or clean up measures taken (including erosion control measures) and the date and time of implementation; the corrective and/or preventive actions taken to avoid further spills; equipment used in spill response; and the environmentally-sensitive habitat such as a water body, if any, impacted and results of any necessary monitoring. The Contractor shall provide a list of who from the City was notified, date and time of notification, date and time the Contractor was notified of the spill, date and time the Contractor arrived on Site.

The Engineer may institute further corrective actions, as deemed necessary, to fully comply with existing laws, ordinances, codes, order or other pertinent regulations. In addition to any penalties provided by federal, state, and local laws, the Contractor shall be responsible for all costs incurred for the corrective actions including mitigation measures (habitat restoration, etc.) and obtaining after-the-fact permits if necessary, in environmentally sensitive areas. These permits include but are not limited to those from the City Planning Department Development Services, California Coastal Commission, U.S. Army Corps of Engineers and the California Department of Fish and Game.

It shall be the Contractor's responsibility to assure that all field forces, including Subcontractors, know and obey all safety and emergency procedures, including the Sewage Spill Prevention and Response Plan applicable to the work, to be maintained and followed at the Site. If in an environmentally sensitive area, such as canyon, stream, or lagoon, impacts shall be minimized. Crews shall be aware at the start of the job of any sensitive environmental habitats, breeding season restrictions, etc.

The Contractor shall prevent spills when working on sewer lines, such as when making temporary connection, when connecting new lines into the sewer system, ensuring no laterals are connected to mains being abandoned, ensuring diversions are appropriately installed, and diversions are completely removed when finished so there are no blockages. The Contractor shall not trap debris and discharge rock or debris downstream. Avoidance of streams is paramount unless authorized via permits.

The Contractor shall defend, indemnify, protect, and hold harmless the City, its agents, officers, and employees, from and against all claims asserted, or liability established for damages or injuries to any person or property resulting from any sewage spill caused or claimed to be caused by the Contractor's action or failure to take measures to prevent a spill. **The Contractor shall be responsible for payment of any fines assessed against the City for such sewage spills.** The Contractor's duty to indemnify and hold harmless shall not include any claims or liability arising from the established active or sole negligence or willful misconduct of the City, its agents, officers or employees.

The Contractor shall obtain and maintain an additional insurance coverage for Pollution Liability with its limits and requirements as set forth in 7-3.5.3, "Contractors Pollution Liability Insurance Endorsements." The limits and requirements for Pollution Liability shall be in an amount sufficient to cover potential losses from sudden and accidental pollution. Unless otherwise provided for in the Bid Proposal, all costs associated with the requirements for Sewage Spill Prevention and Response Plan, including additional insurance, shall be included in the prices for other related Bid items.

804-2.1 Sewage Bypass and Pumping Plan. The Contractor shall submit to the Engineer for approval, a Sewage Bypass and Pumping Plan at least 15 Working Days prior to implementation of flow diversion in compliance with the City’s policy of “ZERO SPILLS.” The Sewage Bypass and Pumping Plan shall indicate the sequence of diversion operations, all other operations the Contractor will establish to maintain wastewater service during the construction period, and a quality assurance and quality control plan for the diversion Work. The Sewage Bypass and Pumping Plan shall include an emergency response plan indicating the procedures, equipment, and activities that will be implemented in the event of an emergency shutdown or failure of the flow diversion equipment used for construction. The Contractor shall be responsible for implementation of the emergency plan in accordance with 804-2 “Sewage Spill Prevention and Response Plan”.

The Contractor’s Sewage Bypass and Pumping Plan shall be reviewed and approved by the Wastewater Collection Division of the City before flow can be diverted. No deviation from the approved Sewage Bypass and Pumping Plan will be allowed without prior approval from the Engineer.

The Contractor shall observe and comply with all Federal, State, and local laws, ordinances, codes, orders, and regulations which in any manner affect the conduct of the work, specifically as it relates to sewage spills. The Contractor shall be fully responsible for preventing sewage spill(s), containing any sewage spill(s), recovery and legal disposal of any spilled sewage, any fines, penalties, claims and liability arising from negligently causing a sewage spill(s), and any violation of any law, ordinance, code, order, or regulation as a result of the spill(s).

The Contractor shall exercise care not to damage existing public and private improvements, interrupt existing services or facility operations which may cause a sewage spill(s). Any reasonably anticipated utility or improvement which is damaged by the Contractor shall be immediately repaired at the expense of the Contractor. In the event that the Contractor damages an existing utility or interrupts an existing service, which causes a sewage spill(s), the Contractor shall immediately call the emergency number at (619) 515-3525.

The Contractor shall exercise care not to damage any sensitive habitats or historic resources unless authorized via the discretionary permit and Mitigation, Monitoring and Reporting Program approved by the City.

The Contractor shall provide all facilities, labor, power, and appurtenances necessary to divert wastewater flows as necessary to allow proper installation of the pipeline and/or manhole linings.

The Contractor shall submit as part of their Sewage Bypass and Pumping Plan their monitoring procedure and frequency and shall continuously monitor the flow levels downstream and upstream of the flow diversion to detect any possible failure that may cause a sewage backup and spill(s). The Contractor shall maintain a log of the monitoring and provide daily copies to the Engineer in a manner acceptable to the Engineer.

The Contractor shall inspect and maintain the diversion system daily, including the back-up system. The Contractor shall submit with their Sewage Bypass and Pumping Plan their maintenance procedures and frequency. The Contractor shall maintain a log of all inspection, maintenance and repair records, and provide copies to the Engineer upon request in a manner acceptable to the Engineer.

The Contractor shall size the flow diversion system to handle the peak flow and shall include a 100% backup in the flow diversion system. The Contractor shall provide temporary means to maintain and handle the sewage flow in the existing system as required to complete the necessary construction. The Contractor shall utilize the flow diversion system to mitigate any additional wet weather flows, perform the necessary maintenance and repairs on the flow diversion system, and exercise and ensure the operation of the backup system. Each pump, including the backup pumps, shall be a complete unit with its own suction and discharge piping. The Contractor shall operate the backup flow

diversion system for a minimum of 25% of the total diversion time on a weekly basis. The backup flow diversion system shall be fully installed, operational, and ready for immediate use. The diversion system shall be hydraulically tested with clean water prior to wastewater flow diversion. The Contractor shall demonstrate to the satisfaction of the Engineer that both the primary and backup flow diversion systems are fully functional and adequate, and shall certify the same, in writing, to the Engineer in a manner acceptable to the Engineer.

The Contractor shall provide one dedicated fuel tank for every single pump or generator, if fuel or generator driven pumps are used. The Contractor shall provide an emergency standby power generator, if electric power driven pumps are used. The Contractor shall provide a fuel level indicator outside each fuel tank. The Contractor shall continuously (while in use) monitor the fuel level in the tanks and ensure that the fuel level does not drop below a level equivalent of two hours of continuous flow diversion system operation. The Contractor shall take the necessary measures to ensure the fuel supply is protected against contamination. This includes but is not limited to fuel line water traps, fuel line filters, and protecting fuel stores from precipitation. The Contractor shall monitor all hoses and repair leaks immediately.

804-2.2 Payment. Full compensation for the Sewage Bypass and Pumping Plan, its implementation e.g., labor, facilities, equipments, power, appurtenances and incidentals, shall be included in Bid item 1.

SECTION 805 – WATER DISCHARGES

805-2.7 Payment. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Payment for dewatering, if encountered, will be made as follows:

- a) The Allowance Bid item for Permit and Discharge Fees shall cover the payment for monthly discharge fees as invoiced by Public Utilities Department and associated expenses e.g. water samples and lab testing to obtain the required permit from the City’s Public Utilities Department for such discharges.
- b) The Lump Sum payment for “Treatment System for Hazardous Contaminated Water” shall include Equipment and Set up for contaminated water containing hazardous substances. It Payment shall include Dewatering Plan, installing and operating proper equipment to treat the hazardous contaminated water not treatable by the dewatering system to bring the discharged water to the level that is in compliance with the permitting agencies’ requirements and water quality standards. Payment shall include but not limited to piping, wells, pumps, electrical system, maintenance, water holding tank, water meters, chemicals, filters and other operating expenses.
- c) The Lump Sum payment for “Dewatering System” shall include Equipment and Set up for dewatering and cleaning groundwater containing non-hazardous substances e.g. sand and silt. This includes Dewatering Plan, installing and operating proper equipment to treat and bring the discharged water to the level that is in compliance with the permitting agencies’ requirements and water quality standards. This payment shall include but not limited to piping, wells, pumps, electrical system, maintenance, water holding tank, water meters, operating expenses, 24 hour monitoring of the system to prevent the impacts of pump failure, vandalism, etc.
- d) For the payment for “Handling and Disposal of the Hazardous Contamination”, see 803-16, “Payment.”
- e) The payment for preparing “Community Health and Safety Plan” shall be included in the various Bid items unless a Bid Item has been provided.

SECTION 807 – RESOURCE DISCOVERIES

ADD: 807-1.1 Environmental Document. The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department (DSD) will prepare a CEQA document for this Contract. Appendix A is reserved for this CEQA document. The CEQA document will be issued via an addendum. The Contractor shall comply with all requirements of the CEQA document, as set forth in the Contract documents.

Unless a bid item has been provided, payment for compliance with this CEQA shall be included in the various bid items.

807-1.2 Archeological and Native American Monitoring Program. To the City Supplement, DELETE in its entirety and SUBSTITUTE within the following:

Unless specified otherwise in the Contract Documents, the Contractor shall retain a qualified archaeologist approved by the City's Environmental Analysis Section (EAS). In addition to being approved by EAS, and within 5 working days of the bid opening, the Contractor must provide a list of 3 successful local projects the archaeologist completed in the last 5 years, and provide a current reference for each. The City shall verify the information provided and only qualified monitors shall be accepted. The archeologist shall retain the appropriate Native American representative. Archeologist and the Native American representative shall attend the pre-construction meeting. The areas shown on the Plans subject to monitoring are approximate. The archaeologist shall confirm the sites and implement the required monitoring per Contract Appendices.

If a discovery is made, the Contractor's archaeological monitor shall make a determination as to whether excavation in the area must cease or can continue. The time the Contractor waits for this determination from their monitor cannot be claimed as delay time.

Unless included in the payment for the proposed item of Work e.g., utility main, the full compensation for archaeological and Native American monitoring program and report preparation, as prescribed in Contract Appendices, shall be included in Bid item 1.

If any significant archaeological sites are known to exist in the project area, they will be shown in the Archaeological Data Recovery Program as part of Appendix A. In the event of a significant discovery, foreseen or unforeseen, and if no bid item for Archaeological and Native American Mitigation and Curation is included in the Contract, the Contractor shall be entitled to additional compensation in accordance with 3-3, "Extra Work", for implementation of a Mitigation Program as set forth in Contract Appendices.

807-1.3 Paleontological Monitoring Program. To the City Supplement, DELETE in its entirety and SUBSTITUTE within the following:

Unless specified otherwise in the Contract Documents, the Contractor shall retain a qualified paleontologist approved by EAS. In addition to being by approved by EAS, and within 5 working days of the bid opening, the Contractor must provide a list of 3 successful local projects the archaeologist completed in the last 5 years, and provide a current reference for each. The City shall verify the information provided and only qualified monitors shall be accepted. The paleontologist shall attend the pre-construction meeting. The areas shown on the Plans subject to monitoring are approximate. The paleontologist shall confirm the sites and implement the required monitoring in Contract Appendices.

Unless included in the payment for the proposed item of Work e.g., utility main, the full compensation for paleontological monitoring program and report preparation, as prescribed in Contract Appendices, shall be included in Bid item 1.

If a discovery is made, the Contractor's paleontological monitor shall make a determination as to whether excavation in the area must cease or can continue. The time the Contractor waits for this determination from their monitor cannot be claimed as delay time.

In the event of a significant discovery, and if no bid item for Paleontological Mitigation and Excavation is included in the Contract, the Contractor shall be entitled to additional compensation in accordance with 3-3, "Extra Work," for implementation of a Mitigation Program as set forth in Contract Appendices.

807-1.4 Archaeological and Native American Mitigation and Curation. To the City Supplement, DELETE in its entirety and SUBSTITUTE within the following:

In the event of a significant Native American or archaeological discovery foreseen or unforeseen and after consultation with EAS staff, the Contractor shall implement a mitigation program as set forth in Contract Appendices. In accordance with the Mitigation and Monitoring Reporting Program, the mitigation program shall include but not be limited to, preparation and implementation of an Archaeological Data Recovery Program (ADRP), recovery, sorting, cleaning, cataloging/identifying/analyzing, curation (bagging, placement into archival boxes, delivery to an appropriate institution, and any fees required by the institution), and reporting, of artifact remains. The Archaeological Principal Investigator (PI) as defined in the MMRP shall make a recommendation if all or a portion, (i.e. representative sample) of the items discovered need to be curated.

Work for mitigation shall be considered Extra Work. The Contractor shall provide the Engineer with invoices for the Work performed, including the invoice from the archaeological monitor in the format shown in the attached Appendix, and be reimbursed from the amount allocated.

If there is an ADRP or known site that is indicated in the Contract Documents, the payment shall be considered Extra Work.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

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SECTION 01025 - 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. Final payment for WORK covered by Unit Prices will be made on the basis of the actual measured quantities accepted by the CONSTRUCTION MANAGER multiplied by the Unit Price of the Bid Schedule.
- D. 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. **Unit Price Items:** Unit Price Items are provided by the OWNER for additive or deductive WORK not presently identified in the Contract Documents. In the appropriate places on the Bid Schedule each Bidder shall quote Unit Prices for the items of WORK in the units stated when no unit price is provided on the Bid Schedule. Each unit price, whether additive or deductive, shall cover all costs and charges, including, without limitation, the costs of material, fabrication, delivery, installation or application, supervision, bond and insurance charges, overhead, profit, and taxes. Unit Prices shall be the exact amount per unit to be applied to the units of WORK actually provided or not provided for the purpose of modifying the Contract Price or establishing the payment due the CONTRACTOR, as applicable. Unit Prices provided by the OWNER shall be held good and in effect until the WORK is completed and accepted by the OWNER. CONTRACTOR proposed Unit Prices which are so unbalanced as to be detrimental to the OWNER'S interest may be rejected or cause rejection of the Bidder's entire bid, at the discretion of the OWNER.

- C. **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.
- D. **Retention:** Payment for all bid items is subject to the retention provisions of the General Conditions.
- E. **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.
- F. The OWNER reserves the right to vary the total contract price by 25% by varying the Unit Price quantities and authorized Allowance amounts within their respective individual limits.
- G. **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.
- H. Quantities for each item in the Bid Schedule will be used to analyze the bids and determine contract award.
- I. **Specified Items and Stipulated Prices:** The stipulated price for these items cannot be invoiced until the item is complete and accepted by the CONSTRUCTION MANAGER and the OWNER.

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. 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. The allowable variation in quantities is identified in each Unit Price Bid Item.
- B. **Contract-Required WORK (Lump Sum):**
 - 1. **Bid Item No. 01 – General Construction (Lump Sum):**

Payment for General Construction will be made at the lump sum price named in the Bid Schedule under Item No. 01, which price shall constitute full compensation for completion of all mobilization, demobilization, insurance, all requirements of the CA Environmental Quality Act (CEQA) Mitigated Negative Declaration (MND) document (as contained in Appendix A), supervision, planning, design, engineering fees associated with construction

activities for CONTRACTOR-required design efforts, furnishing and constructing all facilities, complete as defined within these Contract Documents, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

2. **Bid Item No. 02 – Sheeting, Shoring and Bracing (Lump Sum):**

Payment for all temporary sheeting, shoring and bracing will be made at the lump sum price named in the Bid Schedule under Item No. 02, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

The price shall constitute full compensation for all temporary sheeting, shoring and bracing required by the Contract Documents and/or site conditions. Sheeting, shoring and bracing shall include all planning, design, engineering fees (including designer inspection and certification of installation), furnishing and constructing, removal and proper disposal of such temporary sheeting, shoring and bracing, complete, as required under the provisions of any permits and in accordance with the requirements of CALOSHA (CA Division of Occupational Safety and Health Administration) and the Construction Safety Orders of the State of California, pursuant to the provisions of Section 6707 of the California Labor Code.

3. **Bid Item No. 03 – Final Approval of Operation & Maintenance Manuals (or Owner’s Manuals) and Master Record Documents (Stipulated Lump Sum):**

Payment for the contract-required Operation and Maintenance Manuals (or Owner’s Manuals) and Master Record Documents (TO INCLUDE BOTH DRAWINGS AND SPECIFICATIONS) will be made at the lump sum price named in the Bid Schedule under Item No. 03, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for preparation, submittal, required revisions, complete administration and full execution and the OWNER’s full acceptance of the Operations and Maintenance manuals (or Owner’s Manuals) and the Master Record Documents (to include drawings and specifications) and FINAL acceptance of ALL of them by the OWNER and complete as defined within these Contract Documents.

The stipulated lump sum price must be included in the bid at the stipulated amount, and CANNOT be invoiced until the specified item is complete as defined within these Contract Documents, submitted, and FULLY ACCEPTED by the OWNER. This specified item is a requirement of the contract.

4. **Bid Item No. 04 – Water Pollution Control Plan (WPCP) Program Development (Lump Sum):**

Payment for the contract-required Water Pollution Control Plan (WPCP) Program Development will be made at the lump sum price named in the Bid Schedule under Item No. 04 with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for preparation, submittal, revisions, and complete administration and full development of the WPCP and FINAL acceptance by the OWNER and complete as defined within these Contract Documents.

5. **Bid Item No. 05 – Water Pollution Control Plan (WPCP) Program Implementation (Lump Sum):**

Payment for the contract-required Water Pollution Control Plan (WPCP) Program Implementation will be made at the lump sum price named in the Bid Schedule under Item No. 05 with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for complete administration, full execution, implementation and maintenance of the OWNER-accepted WPCP and FINAL acceptance by the OWNER and complete as defined within these Contract Documents.

6. **Bid Item No. 06 – Bonds (Lump Sum):**

Payment for all Contract Document-required Bonds will be made at the lump sum price named in the Bid Schedule under Item No. 06 and complete as defined within these Contract Documents with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

C. **Allowance Bid Items for WORK not included in the original Contract Documents (including Addenda), but ultimately included in the Contractual Final Scope of Work**

1. **Bid Item No. 07 – Field Orders (Allowance):**

No measurement will be made for this item. Payment for WORK under bid item No. 07 will be made only to the extent that such WORK is specifically authorized in advance by the OWNER.

Determining the price for miscellaneous field orders will be done in accordance with the Contract Document provisions.

Prices for this WORK will be negotiated. An allowance for overhead and profit will be permitted in accordance with the provisions of this contract. This item is considered incidental to the Contract and may be adjusted, or deleted in its entirety, as determined by the OWNER.

PART 2 - PRODUCTS

2.1 GENERAL PROGRESS PAYMENT REQUIREMENTS

- A. Payment for WORK performed shall be in accordance with the final, OWNER-approved Cost-Loaded CPM. The CONSTRUCTION MANAGER 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 CONSTRUCTION MANAGER in accordance with Specification Section 01680, Paragraph 1.9C.

- 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 CONSTRUCTION MANAGER 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 CONSTRUCTION MANAGER 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 OWNER's form provided by the CONSTRUCTION MANAGER 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.
- C. The Application for Payment is submitted according to the format and instructions provided by the OWNER and covering the WORK completed through the last day of the previous month or through the date established by the CONSTRUCTION MANAGER.

PART 3 - EXECUTION

3.1 MONTHLY REVIEWS/APPLICATION FOR PAYMENT

- A. Monthly review meetings between the CONTRACTOR and the CONSTRUCTION MANAGER will be held within seven (7) calendar days prior to the payment application date designated by the CONSTRUCTION MANAGER. Prior to the monthly review meeting, the CONTRACTOR will submit the Master Record Documents as identified in Section 01050 1.3A.2, an updated schedule and a signed application for payment showing a Summary of Earned Values for the reporting and payment period so that the CONSTRUCTION MANAGER 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 CONSTRUCTION MANAGER will sign the payment request and forward it to the OWNER. The CONSTRUCTION MANAGER will determine payment amounts if agreement with the CONTRACTOR is not reached.

**** END OF SECTION ****

SECTION 01039 - COORDINATION AND MEETINGS

PART 1 - GENERAL

1.1 GENERAL

- A. In addition to coordination requirements, this section includes information on the pre-construction meeting, the site mobilization meeting, progress meetings, pre-installation meetings, means and methods meetings, and risk management meetings, if required.

1.2 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to assure an efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate completion and clean up of work of separate sections in preparation for Substantial Completion and for portions of work designated for OWNER'S partial utilization.
- E. After OWNER occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of OWNER'S activities.
- F. Coordinate with other contractors working onsite to avoid impacting their operations, and to insure that facility interfaces are properly joined.

1.3 PRE-CONSTRUCTION MEETING

- A. Prior to the commencement of work at the site, a preconstruction conference will be held at a mutually agreed time and place. The CONTRACTOR's Project Manager, its superintendent, and subcontractors as the CONTRACTOR deems appropriate shall attend the preconstruction conference. Other attendees will be:
 - 1. CONSTRUCTION MANAGER
 - 2. Representatives of the OWNER.
 - 3. Others, as requested by the CONTRACTOR, OWNER, or CONSTRUCTION MANAGER.

- B. Unless previously submitted to the CONSTRUCTION MANAGER, the CONTRACTOR shall bring to the conference information requested with the notification of the time and place of the preconstruction conference.
- C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the CONTRACTOR prior to the meeting date. However, the CONTRACTOR should be prepared to discuss all of the items listed below.
 - 1. Status of CONTRACTOR's insurance and bonds.
 - 2. CONTRACTOR's tentative schedules.
 - 3. Transmittal, review, and distribution of CONTRACTOR's submittals.
 - 4. Processing applications for payment.
 - 5. Maintaining Record Documents.
 - 6. Critical work sequencing.
 - 7. Field decisions and Change Orders.
 - 8. Use of project site, office and storage areas, security, housekeeping, and OWNER's needs.
 - 9. Major equipment deliveries and priorities.
 - 10. CONTRACTOR's assignments for safety and first aid.
- D. The CONSTRUCTION MANAGER will preside at the preconstruction conference and will arrange for recording and distributing the minutes in written form to all persons in attendance.

1.4 SITE MOBILIZATION MEETINGS

- A. The CONSTRUCTION MANAGER will schedule a meeting at the Project sites prior to CONTRACTOR occupancy.
- B. Attendance Required: OWNER, CONSTRUCTION MANAGER, CONTRACTOR, Superintendent, and major Subcontractors/Vendors.
- C. Agenda:
 - 1. Use of premises by OWNER and CONTRACTOR.
 - 2. OWNER'S requirements and partial occupancy if applicable.
 - 3. Construction facilities and controls provided by OWNER.
 - 4. Temporary utilities provided by OWNER.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Procedures for testing.
 - 9. Procedures for maintaining record documents.
 - 10. Requirements for start-up of equipment.

11. Inspection and acceptance of equipment put into service during construction period.

D. The CONSTRUCTION MANAGER will record minutes and distribute copies to all participants.

1.5 CONSTRUCTION PROGRESS MEETINGS

A. The CONSTRUCTION MANAGER shall schedule and hold regular progress meetings (at least bi-weekly) and at other times as required by progress of the WORK. The CONTRACTOR shall attend, and may also bring representatives of its suppliers, manufacturers, and subcontractors.

B. The CONSTRUCTION MANAGER shall preside at the meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings will be to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the CONTRACTOR is required to present any issues which may impact his work, with a view to resolve these issues expeditiously.

1.6 PRE-INSTALLATION MEETING

A. When required in individual specification sections, The CONSTRUCTION MANAGER will convene a pre-installation meeting at the work site prior to commencing work of the section.

B. Attendance will be required of parties directly affecting, or affected by, work of the specific section. Failure of the CONTRACTOR, subcontractor, or Supplier to attend may result in a charge to the CONTRACTOR for costs incurred by the OWNER, CONSTRUCTION MANAGER, and/or DESIGN CONSULTANT in attending the meeting.

C. The CONSTRUCTION MANAGER will prepare an agenda and preside at the meeting:

1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

D. The CONSTRUCTION MANAGER will record the minutes and distribute copies to the OWNER, CONTRACTOR, and other participants.

1.7 MEANS & METHODS MEETINGS

A. Within 14 calendar days of the Notice to Proceed (NTP), the CONTRACTOR shall develop and present to the CONSTRUCTION MANAGER and the OWNER an oral presentation describing and setting forth in detail the planned means and methods for performing the WORK. This presentation shall include supporting graphics and visual aids as necessary or as requested by the CONSTRUCTION MANAGER or the OWNER.

B. From time to time the CONTRACTOR shall, as necessary to justify changes in the CONTRACTOR's CPM schedule, or as requested, present to the CONSTRUCTION MANAGER and the OWNER a revised oral presentation.

1.8. RISK MANAGEMENT MEETINGS.

- A. The CONTRACTOR shall participate in Risk Management and Analyses meetings, as requested by the CONSTRUCTION MANAGER or the OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

** END OF SECTION **

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DEFINITION

- A. "Cutting-and-Patching" is defined to include the cutting and patching of nominally completed and previously existing concrete, steel, wood, and miscellaneous metal structures; piping; and pavement in order to accommodate the coordination of the WORK, or the installation of other facilities or structures or to uncover other facilities and structures for access or inspection, or to obtain samples for testing, or for similar purposes.

1.2 REQUIREMENTS OF STRUCTURAL WORK

- A. Structural work shall not be cut or patched in a manner that may result in a reduction of load-carrying capacity or load/deflection ratio.
- B. Prior to cutting-and-patching the following categories of work, the CONTRACTOR shall obtain the CONSTRUCTION MANAGER'S approval to proceed:
 - 1. Structural steel
 - 2. Miscellaneous structural metals, including equipment supports, stair systems and similar categories of work
 - 3. Structural concrete
 - 4. Foundation construction
 - 5. Timber and primary wood framing
 - 6. Bearing and retaining walls
 - 7. Structural decking
 - 8. Exterior curtain wall construction
 - 9. Pressurized piping, vessels and equipment

1.3 OPERATIONAL AND SAFETY LIMITATIONS

- A. The CONTRACTOR shall not cut or patch operational elements and safety-related components in a manner that may result in a reduction of capacities to perform in the manner intended or result in decreased operational life, increased maintenance, or decreased safety.
- B. Prior to cutting-and-patching the following categories of work, the CONTRACTOR shall obtain the CONSTRUCTION MANAGER'S approval to proceed:
 - 1. Sheeting, shoring and cross bracing
 - 2. Operating systems and equipment
 - 3. Water, moisture, vapor, air, smoke barriers, membranes and flashings

4. Noise and vibration control elements and systems
5. Control, communication, conveying and a electrical wiring systems
6. Fire protection systems

1.4 VISUAL REQUIREMENTS

- A. The CONTRACTOR shall not cut or patch work which is exposed on the exterior or exposed in occupied spaces, in a manner that may result in a reduction of visual qualities or resulting in substantial evidence of the cut-and-patch work, both as judged solely by the CONSTRUCTION MANAGER. The CONTRACTOR shall remove and replace work judged by the CONSTRUCTION MANAGER to have been cut or patched in a visually unsatisfactory manner.

1.5 APPROVALS

- A. Where prior approval of cutting-and-patching is required, the CONTRACTOR shall submit the request well in advance of time work will be performed. The request should include a description of why cutting-and-patching cannot reasonably be avoided, how it will be performed, how structural elements (if any) will be reinforced, products to be used, firms and tradesmen to perform the work, approximate dates of the work, and anticipated results in terms of structural, operational, and visual variations from the original WORK.
- B. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
- C. Where cutting-and-patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
- D. Approval by the CONSTRUCTION MANAGER to proceed with the cutting-and-patching does not waive the CONSTRUCTION MANAGER'S right to later require complete removal and replacement of a part of the WORK found to be not in accordance with the Contract Documents or industry standards.

PART 2 - PRODUCTS

2.1 MATERIALS USED IN CUTTING-AND-PATCHING

- A. The CONTRACTOR shall use material identical with the original materials where feasible. If identical materials are not available, the CONTRACTOR shall provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and visual effects where applicable.
- B. Materials shall comply with the requirements of the technical specifications wherever applicable.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, the CONTRACTOR shall examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. The

CONTRACTOR shall take corrective action before proceeding, if unsafe or unsatisfactory conditions, as determined by the CONSTRUCTION MANAGER, are encountered.

- B. Before proceeding, the CONTRACTOR shall meet at the site with all subcontractors involved in cutting and patching, the CONSTRUCTION MANAGER, and any contractors or subcontractors. Areas of potential interference and conflict shall other effected be reviewed and procedures to resolve potential conflicts shall be determined.

3.2 PREPARATION

- A. Provide temporary support of work to be cut.
- B. Protect existing work during cutting-and-patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting-and-patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork that must remain in service. Do not remove or relocate until provisions have been made to bypass them.
- E. Take precaution necessary to prevent fires and to prevent the false activation of fire alarms.

3.3 PERFORMANCE

- A. Employ skilled workmen to perform cutting-and-patching. Proceed with cutting-and-patching at the earliest feasible time and complete without delay.
- B. Cut existing work to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- C. Cut existing work using methods least likely to damage elements to be retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations. Review as-built or record drawings if available.
- D. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- E. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
- F. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
- G. Comply with requirements of applicable Sections of Division 02 where cutting and patching requires excavating and backfilling.
- H. Bypass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.

- I. Patch with durable seams that are as invisible as possible. Comply with tolerances as specified in these Contract Documents.
- J. Where feasible, inspect and test patch areas to demonstrate integrity of the installation.
- K. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that will minimize evidence of patching and refinishing.
- L. Where removal of walls or partitions extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
- M. At penetration of fire rated walls, ceilings, or floors, completely seal voids with suitable fire rated material to full thickness of the penetrated element.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting-and-patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

** END OF SECTION **

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 QUALITY CONTROL

- A. The CONTRACTOR is required to:
1. Employ a professional engineer or land surveyor registered in the State of California and acceptable to the OWNER. Use qualified personnel to assist surveyor.
 2. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an insurance certificate.
 3. Employ a professional engineer of the discipline required for specific service on the project, registered (current) in the State of California.

1.2 SURVEY REFERENCE POINTS

- A. The CONSTRUCTION MANAGER will establish basic survey reference points. These reference points will not be further than fifteen hundred (1500) feet apart.
- B. The CONTRACTOR shall protect survey reference points prior to starting site work and shall preserve basic survey permanent reference points during construction. Promptly report to the CONSTRUCTION MANAGER the loss or destruction of any basic survey reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to, and approval from, the CONSTRUCTION MANAGER.

1.3 PROJECT MASTER RECORD DOCUMENTS

- A. The CONTRACTOR is required to:
1. Maintain a complete and accurate log of control and survey work as it progresses.
 2. The CONTRACTOR shall keep and maintain, at the job site, one record set of CONTRACT SPECIFICATIONS AND DRAWINGS. Please note that in the previous sentence, SPECIFICATIONS were called out in addition to the DRAWINGS. The CONTRACTOR shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Documents, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Documents. Record Documents shall be supplemented by any detailed sketches or photographs as necessary or directed to indicate, fully, the WORK as actually constructed. These Master Record Documents of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by Requests for Information, Addenda, Field Orders, approved Submittals, properly verified test reports, and Change Orders shall be maintained up-to-date during the progress of the WORK, and shall be made available for review and comment by the CONSTRUCTION MANAGER at the monthly review meeting (reference 01025, 3.1.A)

3. On the RECORD SPECIFICATIONS, legibly mark and record at each Product Section a description of the actual Products installed, including the following:
 - Manufacturer's name, address and telephone number and product model and serial number.
 - Product substitutions or alternates utilized.
 - Changes made by Addenda, Requests for Information, Clarifications, Field Orders, or Change Orders.
 4. Legibly mark RECORD DRAWINGS AND SHOP DRAWINGS to record actual construction including:
 - Measured depths of foundations in relation to finish floor datum.
 - Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the WORK.
 - Field changes of dimension and detail.
 - Details not on original or incorrectly depicted on Contract Drawings.
 5. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the Record Documents shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
 6. Make Record Documents (INCLUDING BOTH DRAWINGS AND SPECIFICATIONS) accessible to the CONSTRUCTION MANAGER at all times during the construction period.
- B. The CONSTRUCTION MANAGER shall review the CONTRACTOR'S updated Record Documents on a monthly basis as a prerequisite for recommending approval of the CONTRACTOR'S monthly progress payment. Failure of the CONTRACTOR to maintain updated Record Documents shall result in delaying the CONTRACTOR'S monthly progress payment until such Record Documents are properly updated.
- C. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of Master Record Documents (INCLUDING BOTH DRAWINGS AND SPECIFICATIONS) to the CONSTRUCTION MANAGER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of Master Record Documents shall consist of corrected specifications showing any revisions and corrected full sized drawings showing the reported location of the WORK. Said up-to-date Master Record Documents shall be in the form of a set of full sized prints and specifications with legibly plotted information overlaid in red. The information submitted by the CONTRACTOR in the Master Record Documents will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Master Record Documents as a result.
- D. Final payment or Release of Retention will not be acted upon until the CONTRACTOR-prepared Master Record Documents have been delivered to the CONSTRUCTION MANAGER AND FULLY APPROVED BY THE OWNER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
- B. Verify horizontal and vertical position of reference points by field traverse to at least two other reference points prior to each use of reference point.
- C. Promptly notify the CONSTRUCTION MANAGER of any discrepancies discovered prior to proceeding with the work.

3.2 SURVEY REQUIREMENTS

- A. The CONTRACTOR shall provide field engineering services. Utilize recognized engineering survey practices.
- B. The CONTRACTOR shall establish elevations, lines and levels. Locate and lay out by instrumentation:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and equipment centerline and elevations.
 - 4. Periodically verify layouts.
- C. Where the dimensions and locations of existing structures are of critical importance in the installation or connection of any part of the WORK, the CONTRACTOR shall verify such dimensions and locations in the field before the fabrication or installation of any material or equipment which is dependent on the correctness of such information.

3.3 REQUESTS FOR AUTHORIZATION TO PROCEED WITH EXCAVATION

- A. All excavation for earthwork, underground utility installation, foundation construction or temporary facilities, shall not begin until the CONTRACTOR has received authorization to proceed with the excavation from the CONSTRUCTION MANAGER.
- B. The purpose of the excavation authorization procedure is as follows:
 - 1. Notifies the Safety Manager of the need for monitoring the excavation and to assure that all safety plans and/or trench shoring plans have been reviewed.
 - 2. Advises the Safety Manager of the name of the Competent Person in charge of the excavation.
 - 3. Allows the CONSTRUCTION MANAGER to notify the CONTRACTOR of special conditions or procedures required during the excavation.

4. Notifies the CONSTRUCTION MANAGER of any work that must be coordinated by the CONTRACTOR with other contractors/agencies on-site or adjacent to the work site.
- C. The CONTRACTOR shall notify the CONSTRUCTION MANAGER of intention to excavate by transmitting "REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION", Exhibit 1, at least five (5) calendar days prior to the date proposed for the start of excavation. The CONTRACTOR shall not submit the request until all required safety/shoring plans have been reviewed and the notifications required have been completed.
 - D. The CONTRACTOR shall number the requests consecutively as directed by the CONSTRUCTION MANAGER. When the excavation is authorized a copy of the authorization shall be posted near the excavation and protected from rain or damage. The Competent Person responsible for the excavation shall have a copy of the authorization available at all times that work is underway in the excavation.
 - E. Authorization to proceed with the excavation shall not relieve the CONTRACTOR of any responsibilities for conducting the work in a safe manner and meeting all the requirements of Construction Safety Orders for Excavations. Nothing in this section shall change the requirements of the General Conditions, Part 4.4, Underground Utilities or Part 6.18, Safety.

EXHIBIT 1

REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION (SEE FOLLOWING PAGE)

REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION

CONTRACTOR: DATE: _____ REQUEST NO. _____

DATES OF EXCAVATION: _____ FROM: _____ TO: _____
(MAXIMUM FOUR (4) WEEKS. IF EXCAVATION MUST CONTINUE A NEW AUTHORIZATION MUST BE OBTAINED.)

DESCRIPTION OF EXCAVATION: _____

SKETCH OF EXCAVATION LOCATION: (INDICATE PLANT NORTH AND COORDINATES)

NAME OF COMPETENT PERSON IN CHARGE OF EXCAVATION: _____
EXCAVATION GREATER THAN 4 FT DEEP: ___ YES ___ NO, MAXIMUM DEPTH: __ FEET
SPECIAL CONDITIONS:

CAL OSHA PERMIT RECEIVED: _____ CALL USA NOTIFIED: _____

SAFETY PLAN/TRENCH SHORING PLAN SUBMITTED _____

U.G. FACILITY OWNERS NOTIFIED: _____ (DATE _____ OF
APPROVAL/NOTIFICATION TO BE ENTERED)

SIGNATURE: _____
CONTRACTOR'S AUTHORIZED REPRESENTATIVE _____ DATE _____

CONSTRUCTION MANAGER AUTHORIZATION TO PROCEED

CONTRACTOR IS AUTHORIZED TO PROCEED WITH THE WORK DESCRIBED ABOVE.
CM ASSUMES NO RESPONSIBILITY FOR THE EXECUTION OF THE WORK.

SPECIAL CONDITIONS OR PROCEDURES TO BE OBSERVED FOR THIS EXCAVATION:

AS-BUILT DRAWINGS ARE REQUIRED FOR THE INSTALLATION OF ALL TEMPORARY
OR PERMANENT UNDERGROUND PIPELINES, DUCT BANKS AND CABLES.

SIGNATURE: _____
CONSTRUCTION MANAGER _____ DATE _____

**** END OF SECTION ****

SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

PART 1 - GENERAL

1.1_ GENERAL

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CBM	Certified Ballast Manufacturers
CEMA	Conveyors Equipment Manufacturer's Association

CGA	Compressed Gas Association
CLPCA	California Lathing and Plastering Contractors Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FPL	Forest Products Laboratory
HI	Hydronics Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IOS	International Organization for Standardization
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission Association
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NRCA	National Roofing Contractors Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.

WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.1 GENERAL

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

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" or "International Building Code" or "CA Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO) or the International Building Code of the International Code Council (ICC). Similarly, references to "Mechanical Code" or "Uniform or International Mechanical Code", "Plumbing Code" or "Uniform or International Plumbing Code", "Fire Code" or "Uniform or International Fire Code," shall mean Uniform or International Mechanical Code, Uniform or International Plumbing Code and Uniform or International Fire Code of the International Conference of the Building Officials (ICBO) or the International Code Council (ICC). "Electric Code" or "National Electric Code" (NEC) shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the order of precedence as listed in the Whitebook shall govern. In those cases where a conflict cannot be resolved by utilizing the order of precedence, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the CONSTRUCTION MANAGER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR'S bid shall reflect the most stringent Contract Document requirements.
- D. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- E. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction, 2009 edition, including the 2010 Whitebook (Document PITS090110-1).
- F. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- G. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- H. **Applicable Safety Standards:** References herein to "Cal-OSHA" shall mean **State of California, Department of Industrial Relations, Construction Safety Orders**, as amended to date, and all changes and amendments thereto.

1.3 QUALITY ASSURANCE

- A. Conform to reference standard by date of issue current on date for receiving bids.
- B. Should the specified reference standards conflict with the Contract Documents, refer to paragraph 1.2 (c) of this Section.

1.4 SCHEDULE OF REFERENCES

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, N.W. Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219

ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AFBMA	Antifriction Bearing Manufacturers Association 1101 Connecticut Avenue N.W. Suite 700 Washington, DC 20036
AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209
AGC	Associated General CONTRACTOR'S of America 1957 E Street, N.W. Washington, DC 20006
AGMA	American Gear Manufacturers Association 1500 King Street, Suite 201 Alexandria, VA 22314
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AIA	American Institute of Architects 1735 New York Avenue, N.W. Washington, DC 20006
AISC	American Institute of Steel Construction 400 North Michigan Avenue Eighth Floor Chicago, IL 60611
ANSI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
AITC	American Institute of Timber Construction 333 W. Hampden Avenue Englewood, CO 80110
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APA	American Plywood Association Box 11700 Tacoma, WA 98411
API	American Petroleum Institute 1220 L. Street, N.W. Washington, DC 20005

ARI	Air-Conditioning and Refrigeration Institute 1501 Wilson Boulevard Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 E. 47th Street New York, NY 10017
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPA	American Sod Producers Association 4415 West Harrison Street Hillside, IL 60162
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 2310 South Walter Reed Drive Arlington, VA 22206
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society 550 LeJeune Road, N.W. Miami, FL 33135
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 22091
CDA	Copper Development Association 57th Floor, Chrysler Building 405 Lexington Avenue New York, NY 10174
CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036

CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22101
EJCDC	Engineers' Joint Contract Documents Committee American Consulting Engineers Council 1015 15th Street, N.W. Washington, DC 20005
EJMA	Expansion Joint Manufacturers Association 25 North Broadway Tarrytown, NY 10591
FGMA	Flat Glass Marketing Association 3310 Harrison White Lakes Professional Building Topeka, KS 66611
FM	Factory Mutual System 1151 Boston-Providence Turnpike P.O. Box 688 Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WRSIS) Washington Navy Yard, Building 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
JIC	Joint Industrial Council c/o National Machine Tool Builders Association 7901 Westpark Drive McLean, VA 22102
IBR	Institute of Boiler and Radiator Manufacturers aka Hydronics Institute P. O. Box 218 35 Russo Place Berkeley Heights, NJ 07922
ICBO	International Conference of Building Officials 5360 S. Workman Mill Road Whittier, CA 90601

IEEE	Institute of Electrical and Electronics Engineers 345 East 47th Street New York, NY 10017
IMIAC	International Masonry Industry All-Weather Council International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MBMA	Metal Building Manufacturer's Association 1230 Keith Building Cleveland, OH 44115
MFMA	Maple Flooring Manufacturers Association 60 Rivere Drive Northbrook, IL 60062
MIL	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NCMA	National Concrete Masonry Association P.O. Box 781 Herndon, VA 22070
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse road Vienna, VA 22180
NEC	National Electric Code 1 Battery March Park P.O. Box 9146 Quincy, MA 02169
NEMA	National Electrical Manufacturers' Association 2101 'L' Street, N.W. Washington, DC 20037
NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
NFPA	National Forest Products Association

1619 Massachusetts Avenue, N.W.
Washington, DC 20036

NSWMA	National Solid Wastes Management Association 1730 Rhode Island Avenue, N.W. Washington, DC 20036
NTMA	National Woodwork Manufacturers Association 205 W. Touhy Avenue Park Ridge, IL 60068
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 201 North Wells Street Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, DC 20203
RIS	Redwood Inspection Service One Lombard Street San Francisco, CA 94111
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau 515 116th Avenue Bellevue, WA 98004
SDI	Steel Deck Institute P.O. Box 9506 Canton, OH 44711
SDI	Steel Door Institute 712 Lakewood Center North 14600 Detroit Avenue Cleveland, OH 44107
SIGMA	Sealed Insulating Glass Manufacturers Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joist Institute 1205 48th Avenue North Suite A Myrtle Beach, SC 29577
SMACNA	Sheet Metal and Air Conditioning CONTRACTOR'S National Association 8224 Old Court House Road Vienna, VA 22180

SSPC Steel Structures Painting Council
4400 Fifth Avenue
Pittsburgh, PA 15213

TCA Tile Council of America, Inc.
Box 326
Princeton, NJ 08540

UL Underwriters' Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

WCLIB West Coast Lumber Inspection Bureau
6980 S.W. Varns Road
Box 23145
Portland, OR 97223

WWPA Western Wood Products Association
1500 Yeon Building
Portland, OR 97204

** END OF SECTION **

SECTION 01300 - CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

- A. Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the CONSTRUCTION MANAGER.
- B. Within seven (7) calendar days after the date of commencement as stated in the Notice to Proceed (NTP), the CONTRACTOR shall submit the following items to the CONSTRUCTION MANAGER for review:
 - 1. A preliminary schedule of Shop Drawings, Samples, and submittals listed in the Bid.
 - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
- C. At the preconstruction conference, the CONTRACTOR shall submit the following items to the CONSTRUCTION MANAGER for review:
 - 1. A 60-day plan of operation in accordance with Greenbook/Whitebook.
 - 2. A project overview bar chart in accordance with Greenbook/Whitebook.
 - 3. A preliminary schedule of values in accordance with Greenbook/Whitebook.

1.2 SHOP DRAWINGS

- A. Wherever called for in the Contract Documents, or where required by the CONSTRUCTION MANAGER, the CONTRACTOR shall furnish to the CONSTRUCTION MANAGER for review, 6 copies, plus the number the CONTRACTOR wants returned, not to exceed 12 copies, plus one reproducible copy, of each shop drawing submittal. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.
- B. All shop drawing submittals shall be accompanied by the CONSTRUCTION MANAGER's standard submittal transmittal form. The form may be obtained from the CONSTRUCTION MANAGER. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the CONSTRUCTION MANAGER.
- D. Except as may otherwise be indicated herein, the CONSTRUCTION MANAGER will return prints of each submittal to the CONTRACTOR with its comments noted thereon, within 15 calendar days following their receipt by the CONSTRUCTION MANAGER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the

CONSTRUCTION MANAGER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the CONSTRUCTION MANAGER's review beyond the second submittal. The CONSTRUCTION MANAGER'S maximum review period for each submittal, including all resubmittals, will be 15 days per submittal. In other words, for a submittal that requires two resubmittals before it is complete, the maximum review period for that submittal could be 45 days.

- E. If three (3) copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.
 - F. If three (3) copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required.
 - G. If a submittal is returned to the CONTRACTOR marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the CONSTRUCTION MANAGER.
 - H. If a submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the CONSTRUCTION MANAGER.
 - I. Fabrication of an item shall be commenced only after the CONSTRUCTION MANAGER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
 - J. All CONTRACTOR shop drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the CONSTRUCTION MANAGER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the CONSTRUCTION MANAGER of any CONTRACTOR submittals will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the CONSTRUCTION MANAGER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
 - K. The CONSTRUCTION MANAGER's review of CONTRACTOR shop drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.
- 1.3 CONTRACTOR'S SCHEDULE
- A. The CONTRACTOR's construction schedules and reports shall be prepared and submitted to the CONSTRUCTION MANAGER in accordance with the provisions of Section 01311.

1.4 SAMPLES

- A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than three (3) samples of each such item or material to the CONSTRUCTION MANAGER for acceptance at no additional cost to the OWNER.
- B. Samples, as required herein, shall be submitted for acceptance a minimum of 21 days prior to ordering such material for delivery to the jobsite, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name for identification and submitted to the CONSTRUCTION MANAGER for acceptance. Upon receiving acceptance of the CONSTRUCTION MANAGER, one set of the samples will be stamped and dated by the CONSTRUCTION MANAGER and returned to the CONTRACTOR, and one set of samples will be retained by the CONSTRUCTION MANAGER, and one set of samples shall remain at the job site until completion of the WORK.
- D. Unless indicated otherwise, all colors and textures of specified items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products, or equipment lines and their selection will require an increase in contract time or price, the CONTRACTOR will clearly indicate same on the transmittal page of the submittal.

1.5 OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS)

- A. The CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner in the OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS). The OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be written so that it can be used and understood by the OWNER'S operation and maintenance staff. Each individual force main shall have its own independent and unique OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS). Therefore, there may be as many as twelve (12) separate, independent, and unique OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS).
- B. Each OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS) shall be subdivided first by specification section number; second, by equipment item; and last, by "part." "Parts" shall conform to the following (as applicable):
 - 1. Part 1 - Equipment Summary
 - a. Summary: A summary table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.
 - b. Form: The CONSTRUCTION MANAGER will supply an Equipment Summary Form for each item of mechanical, electrical and instrumentation equipment in the WORK. The CONTRACTOR shall fill in the relevant information on the form and include it in Part 1.
 - 2. Part 2 - Operational Procedures
 - a. Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:

Installation
Adjustment
Startup
Location of controls, special tools or other equipment required or related instrumentation needed for operation
Operation Procedures
Load Changes
Calibration
Shutdown
Troubleshooting
Disassembly
Reassembly
Realignment
Testing to determine performance efficiency
Tabulation of proper settings for all pressure relief valves, low and high pressure switches and other protection devices
List of all electrical relay settings including alarm and contact settings

3. Part 3 - Preventive Maintenance Procedures

- a. Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component and by leaving the equipment in place.
- b. Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade and type, and temperature ranges shall be covered.

4. Part 4 - Parts List

- a. Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.
- b. Drawings: Cross-sectional or exploded view drawings shall accompany the parts list.

5. Part 5 - Wiring Diagrams

- a. Diagrams: Part 5 shall include complete internal and connection wiring diagrams for electrical equipment items.

6. Part 6 - Shop Drawings

- a. Drawings: This part shall include approved shop or fabrication drawings, complete with dimensions.

7. Part 7- Safety

- a. Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.

8. Part 8 - Documentation

- a. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.
- C. For each force main, the CONTRACTOR shall furnish to the CONSTRUCTION MANAGER seven (7) identical OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS). Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents indicating all equipment in the manuals shall be prepared.
- D. OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be submitted in final form to the CONSTRUCTION MANAGER not later than the 75 percent of construction completion date. All discrepancies found by the CONSTRUCTION MANAGER in the OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be corrected by the CONTRACTOR within 15 calendar days from the date of written notification by the CONSTRUCTION MANAGER.
- E. Incomplete or unacceptable OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) at the 75 percent construction completion point shall constitute sufficient justification to withhold the amount stipulated in paragraph "OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS) Submittals" of Section 01700, from any monies due the CONTRACTOR.

1.6 INSTRUCTION OF OWNER'S PERSONNEL

A. **General:**

1. Training is not generally a part of the contract, unless it is specifically called out in the technical specifications. If the OWNER determines that certain training is desired on a particular component or a portion of the contract not required of the technical specifications, a field order or change order will be executed in order to facilitate such training for the wastewater collections staff.

1.7 ELECTRONIC DOCUMENT SUBMITTAL REQUIREMENTS

A. **General**

1. All final submittals are required in both paper and electronic format. Four (4) copies of each final submittal shall be provided on compact disk media (CD-ROM).
2. Where preliminary submittals are required in electronic format, three (3) copies of the preliminary submittal shall be provided on CD-ROM for review.
3. CD-ROM disks shall be on high-quality CD-R media. CDs shall have printed paper labels with the project name, CIP Number, CONTRACTOR, and content. CD-RW (CD-rewritable) disks are not acceptable. CDs shall be provided with a case and a case insert label displaying the same information shown on the CD label.
4. The CD-ROM data format shall comply with ISO 9660 (2010) with Joliet extensions.
5. Deviation from this standard will be accepted only if advance approval is given by the CONSTRUCTION MANAGER.

B. **Documents:** Electronic submittals for the following types of documents are required as a minimum. Additional requirements are identified in the equipment specifications.

1. Design

- (a) Design Specifications
- (b) Design Drawings and record drawings

2. Operations and Maintenance

- (a) Facility design O&M manuals
 - (1) Volume I - process information
 - (2) Volume II - standard operating procedures (SOP)
 - (3) Volume III - all maintenance information for the facility.
 - (a) Manufacturer O&M manuals
 - (b) Facility Loop and Wiring Diagrams

3. Environmental Documents

4. Research & Development

C. **Format**

1. Construction drawings and record drawings developed under the Contract shall be in Bentley Microstation (DGN V8 version) format. All drawings shall conform to the CADD and Drafting standards set forth in the CWP Guidelines, Volume III.

2. Other than construction drawings and record drawings, documents shall be in Adobe Acrobat PDF format, using the Acrobat version as specified by the CONSTRUCTION MANAGER. Documents that are submitted in Acrobat Image Only format will not be accepted.

3. Electronic Conversion: Vendor and CONTRACTOR shop drawings developed under the Contract shall be in Bentley Microstation (DGN) format. Documents in electronic format (WordPerfect, Microsoft Word, Excel, etc.) shall be converted to standard PDF format using the Acrobat printer driver or other direct conversion software. The Acrobat PDF sub-format for electronically converted documents shall be the Acrobat Standard PDF file format which includes both image and text information.

4. Documents not available in electronic format shall be scanned at 300 dpi, bitonal (black and white) and converted into Adobe Acrobat (PDF). Image enhancement software shall be used during scanning. The Acrobat PDF sub-format for scanned documents shall be the Original Image with Hidden Text format.

5. All PDF documents shall be reviewed, and corrected if necessary, for orientation and legibility.

6. Individual document files shall not exceed 3 megabytes in size. Large documents shall be broken down by subsections to facilitate this requirement

D. **Document Organization and Indexing**

1. Electronic submittals shall be logically organized. File names shall be in UPPERCASE only, use a maximum of 64 characters, contain no spaces, and clearly indicate the file contents.

2. Supplier's submittals that include O&M documentation for more than one equipment type shall be divided into separate documents for each equipment type.
3. Each document's Table of Contents shall contain PDF bookmarks which actively link to the referenced sections within the document.
4. A master PDF index file shall be included, with a master Table of Contents, and active internal links to individual document files. The master PDF index file shall be clearly identifiable. External PDF link file names shall be in uppercase only.
5. A table shall be provided and submitted in spreadsheet format which includes the information about each document file. The contents of the table shall be submitted and approved by the CONSTRUCTION MANAGER. An example of information to be provided is as follows: (This is an example only)

(a) Document file name

- (1) Document title and description
- (2) Hard Copy Catalog No. (used by facility document coordinator)
- (3) Document Type: (see above)
- (4) Facility Name
- (5) Specification Number
- (6) Process Name
- (7) Unit Process Number
- (8) Manufacturer's Name (if applicable)
- (1) Supplier's Name (if applicable)
- (2) EMPAC asset number (if applicable)
- (3) Asset Description (if applicable)
 - (a) Keyword
 - (b) Qualifier

1.8 SPARE PARTS LIST

- A. The CONTRACTOR shall furnish to the CONSTRUCTION MANAGER five (5) identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the OWNER in inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the OWNER in ordering. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

1.9 RECORD DRAWINGS (one component of the Project Master Record Documents as identified in specification section number 01050)

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were

not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK.

Copies of the record drawings shall be submitted on the 20th working day of every month after the month in which the notice to proceed is given as well as on completion of WORK. Failure to submit complete record drawings on or before the 20th working day will enact the liquidated damages clause for interim record drawings submittals described in Article 3 of the Agreement.

- B. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
- C. Record drawings shall be accessible to the CONSTRUCTION MANAGER at all times during the construction period.
- D. Final payment will not be acted upon until the CONTRACTOR-prepared record drawings have been delivered to the CONSTRUCTION MANAGER. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information overlaid in red.
- E. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of record drawings to the CONSTRUCTION MANAGER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected drawings showing the reported location of the WORK. The information submitted by the CONTRACTOR in the Record Drawings will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Record Drawings as a result.
- F. Please also refer to specification section 01050 – FIELD ENGINEERING for Project Master Record Document requirements. Please note that the specifications are the other component of the Project Master Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01309 - PRE-AWARD COST-LOADED SCHEDULE

PART 1 - GENERAL

1.1 REQUIREMENTS OVERVIEW

- A. The CONTRACTOR'S planning, scheduling and execution of the contract work shall be presented to the OWNER by submission of the progress schedule information and data specified in this Section.
- B. The Pre-Award Cost-Loaded Schedule shall be the basis of the construction schedule.
- C. The WORK under this contract will be planned, scheduled, executed, and reported by the CONTRACTOR using a cost-loaded CPM (Critical Path Method) schedule within a Work Breakdown Structure specified by the CONSTRUCTION MANAGER. The CONTRACTOR will adhere to established technical standards for CPM using a computerized precedence diagram method. The CONTRACTOR is required to provide schedule data using a hard copy and disk format specified by the CONSTRUCTION MANAGER.
- D. The CONTRACTOR is responsible for coordinating its own schedules (including subcontractors) as well as construction activities of others as directed by the CONSTRUCTION MANAGER. The CONSTRUCTION MANAGER will maintain the overall Project Construction Schedule, of which the CONTRACTOR'S Construction Schedule will be a part. The CONTRACTOR should refer to the Project Construction Schedule to ensure that project site coordination and work by others at the site properly depicts the CONTRACTOR'S planning.
- E. All submittals discussed in this section shall be prepared and handled in accordance with Section 01300 - Contractor Submittals.

1.2 SOFTWARE/INTERFACE REQUIREMENTS

- A. The CONTRACTOR shall use CPM scheduling software to produce the contract schedules and reports as specified herein. This software shall run on IBM PC compatible equipment, be commercially available for lease or purchase, and be capable of processing and plotting schedule data as specified in this Section. The CONTRACTOR shall provide all schedules on a Compact Disc (CD). The schedule files may be in either Primavera Project Planner (P6) format or an ASCII format specified by the CONSTRUCTION MANAGER.

1.3 QUALITY ASSURANCE

- A. In preparing all contract schedules, it is the responsibility of the CONTRACTOR to work with each subcontractor and supplier to obtain information pertinent to the planning and updating of their respective activities and schedules.

1.4 USE OF FLOAT

- A. Total Float is the number of days by which a part of the WORK in the Construction Schedule may be delayed from its early dates without necessarily extending the Contract Time. Contract Float is the number of days between the CONTRACTOR'S anticipated date for early completion of the WORK, or specified part, and the corresponding Contract Time. Total float and contract float belong to the project and are not for the exclusive benefit of any party. They shall be available to the OWNER, the CONSTRUCTION MANAGER, their consultants, or the CONTRACTOR, to accommodate changes in the WORK, or to mitigate the effect of events which may delay performance or completion. The CONSTRUCTION MANAGER will monitor and optimize the use of float for the benefit of the Program.

1.5 EARLY COMPLETION

- A. An early completion schedule is one which anticipates completion of all or specified part of the work ahead of the corresponding Contract Time. Since Contract float belongs to the project, the CONTRACTOR shall not be entitled to any extension in Contract Time, or recovery for any delay incurred because of extensions in an early completion date, until all contract float is used or consumed and performance or completion of the WORK extends beyond the corresponding Contract Time. The CONTRACTOR shall adjust or remove any float suppression techniques, e.g., preferential sequencing (crew movements, equipment use, form reuse, etc.), extended durations, imposed dates, scheduling of WORK not required for a Contract Time as required WORK, and others, as a prerequisite to a request for an increase in Contract Price or Contract Time. Use of restraint dates should be minimized and require approval by the CONSTRUCTION MANAGER.

1.6 NON-COMPLIANCE

- A. The OWNER reserves the right to have the CONSTRUCTION MANAGER assist the CONTRACTOR in the preparation of schedule submittals which are overdue by more than 10 days. The CONSTRUCTION MANAGER'S assistance with schedule preparation shall not relieve the CONTRACTOR of his responsibilities for determination of the methods, techniques, and sequences for the performance of the WORK.
- B. These remedies for the CONTRACTOR'S failure, neglect or refusal to comply with the requirements of this Section are in addition to, and not in limitation of, those provided under other sections of the Contract.

PART 2 - PRODUCTS

2.1 GENERAL CRITERIA

- A. The Pre-Award Cost-Loaded Schedule is prepared by the CONTRACTOR and reflects the CONTRACTOR'S plans for and status of the WORK.
- B. The Pre-Award Cost-Loaded Schedule shall show the breakdown of work into activities and relationships only to the extent required to effectively manage the WORK. The Pre-Award Cost-Loaded Schedule shall show the division of the WORK into activities and specify the progression from the Notice To Proceed to the end of the Contract Time. Each activity shown on the Pre-Award Cost-Loaded Schedule will have a respective budget value, a portion of the Contract Price, identified in Section 01025. The Pre-Award Cost-Loaded Schedule shall include appropriate time allowances and constraints for submittals, items of interface with work performed by others, and specified construction, start-up and performance tests.
- C. The scope of the WORK shall be broken down into significant milestones and activities that include the work of all Specification Sections involved and identify each major trade subcontractor and supplier. Site-related activities shall not reflect a combining of work located in separate structures, work corresponding to different divisions of the specifications, or work performed by different subcontractors. Mobilization activities shall also be identified. Work being performed by MBE/WBE firms shall be identified by a distinguishable coding.
- D. The CONTRACTOR'S Pre-Award Cost-Loaded Schedule shall include all procurement related activities which lead to delivery of permanent materials to the site in a timely manner. The procurement activities shall indicate significant events in the procurement process such as issuance of purchase orders and subcontracts, submittal of shop drawings, review and approval of shop drawings, release for fabrication, release for shipment, etc., as appropriate.

- E. The CONTRACTOR shall schedule those requisite duties and responsibilities of the OWNER, the CONSTRUCTION MANAGER and others (performing work for the OWNER) indicated in or required by the Contract Documents within the Contract Time. The Pre-Award Cost-Loaded Schedule shall incorporate activities and sequences based on the information given in the Contract Documents, and if not given, as indicated by the CONSTRUCTION MANAGER in writing.
- F. The Pre-Award Cost-Loaded Schedule shall identify the point in time when the CONTRACTOR is entitled to payment for the work pertaining to each activity.
- G. The Pre-Award Cost-Loaded Schedule shall be in a precedence diagram format, shall be plotted on a time-scaled calendar, and shall expressly identify the Contract Time, milestones, the critical path(s), and all activities. Activities shall be shown on their early dates, with their total float noted beside them. Connections between activities whether on the same sheet or on different sheets shall identify both the predecessor and successor work. Activity data shall include description of the work, activity costs (budget), activity duration, and special codes.

2.2 COST LOADING

- A. The Pre-Award Cost-Loaded Schedule shall be cost-loaded by the CONTRACTOR. Each schedule activity will be assigned a budget value in accordance with contract requirements and activity descriptions. The sum of all budget values assigned shall equal the Contract total.
- B. If the WORK includes items covered by unit prices and/or allowances, the Pre-Award Cost-Loaded Schedule shall include these items in the cost-loading. The Schedule shall incorporate these activities in a manner that is based on the CONTRACTOR'S best estimate of the sequences contemplated by the unit prices and/or allowances.

2.3 SCHEDULE SUBMITTAL

- A. The CONTRACTOR shall produce a Pre-Award Cost-Loaded Schedule Submittal which will be an accurate representation of the proposed means and methods for accomplishing the WORK. This schedule will show all logical relationships and constraints between activities.
- B. The Pre-Award Cost-Loaded Schedule submittal shall consist of the time-scaled CPM logic diagrams, activity reports, cost reports, and a floppy disk with CPM software files duplicating the CONTRACTOR'S files in a P6 or a CONSTRUCTION MANAGER-specified ASCII format. The CPM reports shall be sorted by 1) activity number in order of ascending activity number; 2) by total float in order of ascending total float values (and by ascending early start dates, then ascending activity numbers, within the same total float values); 3) early start dates, in chronological order (and by ascending activity numbers within the same early start dates); and other sorts as requested by the CONSTRUCTION MANAGER.

2.4 CONTRACTOR'S PRE-AWARD COST-LOADED SCHEDULE

- A. When the Pre-Award Cost-Loaded Schedule is reviewed and accepted it becomes the basis for establishment of phased funding values, and is referred to as the CONTRACTOR'S Phased Funding Schedule. From then on, all activities and their relationships may not be changed, added, or deleted without the consent of both the CONSTRUCTION MANAGER and the CONTRACTOR. All changes must be coordinated and approved by the CONSTRUCTION MANAGER. Contract Time (including all contracted milestones) cannot be changed without a formal Change Order approved by the OWNER.

2.5 COST REPORTS

- A. Cost Reports shall include monthly and cumulative totals for reportable items of work as specified by the CONSTRUCTION MANAGER. The reports shall be in formats acceptable to the CONSTRUCTION MANAGER.

2.6 ACTIVITY REPORTS

- A. Activity Reports shall include activity number, description, total duration, early start and finish dates, late start and finish dates, and total float. Durations shall be stated in working days. The Contract Time shall restrain the late finish dates; milestones representing commencement of work conditions shall be shown as restraining early start dates. A report shall also be provided showing each relationship type (start to finish, lag time, etc.) between each activity and each of its preceding and succeeding activities.

PART 3 - EXECUTION

3.1 SCHEDULE DEVELOPMENT

- A. The CONTRACTOR shall provide six (6) copies of the Pre-Award Cost-Loaded Schedule Submittal due within the time specified in the contract. This submittal shall reflect the entire scope of the Contract WORK as bid.
- B. The CONTRACTOR'S Pre-Award Cost-Loaded Schedule shall bear the CONTRACTOR'S stamp of approval signed by the CONTRACTOR. The CONTRACTOR'S stamp of approval shall constitute a representation to the OWNER and CONSTRUCTION MANAGER that the CONTRACTOR has determined or verified all data on that CONTRACTOR'S Pre-Award Cost-Loaded Schedule or assumes full responsibility for doing so, and that the CONTRACTOR has reviewed and coordinated the sequences in that CONTRACTOR'S Pre-Award Cost-Loaded Schedule with the requirements of the WORK.
- C. The CONSTRUCTION MANAGER'S review and comments will be for conformance with the Contract Time and those sequences of work indicated in or required by the Contract Documents, to record early and late dates for milestones, and for conformance with the requirements of this Section and other information given in the Contract Documents which may have a bearing on the schedule. The CONSTRUCTION MANAGER'S review will also be for reasonableness and consistency in the cost-loading of the schedule activities. The CONSTRUCTION MANAGER'S review shall not extend to the CONTRACTOR'S means, methods, or techniques, the correctness of which shall remain the sole responsibility of the CONTRACTOR.
- D. If a re-submittal is required, the CONTRACTOR shall make appropriate adjustments or corrections, and shall deliver to the CONSTRUCTION MANAGER SIX (6) stamped and signed copies of the resubmitted CONTRACTOR'S Pre-Award Cost-Loaded Schedule, directing specific attention, in writing, to adjustments or corrections made other than those made in response to the CONSTRUCTION MANAGER'S comments on the previous submittal.
- E. All schedules shall be in accordance with the Contract Time requirements of the contract. The CONSTRUCTION MANAGER'S review of a schedule will not relieve the CONTRACTOR from responsibility for complying with the Contract Time requirements, adhering to those sequences of work indicated in or required by the contract documents, or from completing any omitted work within the Contract Time.

**** END OF SECTION ****

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 DEFINITION

- A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 PROJECT QUALITY CONTROL PLAN

- A. The CONTRACTOR is responsible for producing WORK to meet the quality required by the Contract Documents and to perform the quality control efforts necessary to ensure those requirements are met. The CONSTRUCTION MANAGER's inspection of any WORK will not relieve the CONTRACTOR of the primary responsibility for such efforts.
- B. The CONTRACTOR shall submit to the CONSTRUCTION MANAGER a Quality Control Plan for review and approval within 14 days of the Notice to Proceed. The submittal must be approved before construction WORK begins. The Quality Control Plan will include:
 - 1. A description of the workings and structure of the CONTRACTOR's Quality Control Plan that will be implemented to assure quality WORK will be done.
 - 2. A contract specific Inspection Plan that lists and describes the inspections that the CONTRACTOR will conduct, their frequency, acceptance criteria, and who will conduct each inspection. The Inspection Plan shall include the WORK to be performed by subcontractors, fabricators, and suppliers.
 - 3. Identification of the individuals within the CONTRACTOR's organization who are responsible for quality assurance including their role and authority.

After completion of the CONSTRUCTION MANAGER's review of the CONTRACTOR's Quality Control Plan, the CONTRACTOR and CONSTRUCTION MANAGER will meet to discuss and define quality standards and expectations and to coordinate the CONSTRUCTION MANAGER's inspection efforts with the CONTRACTOR's planned efforts.

- C. The CONTRACTOR's attention is directed to the Check Out Plan required by Specification Section 01680. At the CONTRACTOR's option, the Physical Checkout and Inspection portion of the Check Out Plan may be addressed in the Project Quality Control Plan as long as all elements of the Check Out Plan required by Specification Section 01680 are addressed in the Project Quality Control Plan.
- D. The CONTRACTOR will be obligated to accommodate procedural changes to contract required quality control issues requested by the CONSTRUCTION MANAGER.

1.3 FACTORY INSPECTION AND TESTS

- A. The CONTRACTOR shall be responsible for inspection and testing of materials, products, or equipment at the place of manufacture at its own expense when required by the General Conditions, Special Provisions, Regulatory Permits, Codes, or as noted in the plans or specifications. Where specified in the plans and/or technical specifications, the OWNER/CONSTRUCTION MANAGER will perform inspection and witness tests on

materials, products, or equipment at the place of manufacture. The CONTRACTOR shall bear all costs for inspection and for witnessing factory tests by the OWNER'S/CONSTRUCTION MANAGER'S representatives as nominated by the OWNER for the number of days indicated for such inspections and observations. These costs shall include travel expenses, and expenses for lodging, meals, and car rental if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. If air travel is involved, it shall include economy-class tickets. Costs paid by the CONTRACTOR for inspection and for witnessing factory tests shall not include the salaries or salary-related expenses of the inspectors.

- B. Where the Plans and/or Technical Specifications indicate that factory inspection and witnessing of testing by the OWNER/CONSTRUCTION MANAGER is optional or discretionary, the OWNER will pay for travel and related costs associated with such inspection and witnessing of tests by the OWNER'S/CONSTRUCTION MANAGER'S representatives.
- C. The presence of the OWNER'S/CONSTRUCTION MANAGER'S representatives at the place of manufacture shall not relieve the CONTRACTOR of the responsibility for furnishing materials, products, and equipment which comply with all requirements of the Contract Documents. The CONTRACTOR is obligated to meet the requirements of the Contract Documents, and any act or omission on the part of the OWNER/CONSTRUCTION MANAGER shall not relieve the CONTRACTOR of the obligation to fulfill the requirements of its Contract.
- D. In cases, where the OWNER/CONSTRUCTION MANAGER is indicated to perform inspection and witness tests, the CONTRACTOR shall provide the CONSTRUCTION MANAGER, as a minimum, an advance notice of twenty-one (21) calendar days prior to the start of any testing at the place of manufacture. This notice period may be modified depending on the requirements of each specification section in the technical specifications of the Contract Documents.
- E. When tests fail to meet the specified requirements, retesting because of non-conformance to specified requirements shall be performed by the same testing laboratory as directed by the OWNER/CONSTRUCTION MANAGER. The CONTRACTOR shall bear all costs for such retesting, including costs for additional trips for factory inspection and testing by OWNER'S/CONSTRUCTION MANAGER'S inspectors.
- F. For samples and tests required by the CONTRACTOR for its own quality assurance program and needs, whether or not specified in the Contract Documents, costs shall be included in the Contract Price.
- G. All tests required by the specifications, regulatory permits, or referenced codes and standards shall be the responsibility of the CONTRACTOR, unless specifically noted otherwise.

1.4 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the material, product, or equipment considered; however, the OWNER will use any generally-accepted system of sampling and testing which will insure that the quality of the workmanship is in full agreement with the Contract Documents.

- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the CONSTRUCTION MANAGER will make independent investigations and tests; and failure of any portion of the WORK to meet any of the requirements of the Contract Documents shall be reasonable cause for the CONSTRUCTION MANAGER to require the removal or correction and reconstruction of any such work in accordance with the Contract Documents.

1.5 INSPECTION AND TESTING LABORATORY SERVICE

- A. If required, the OWNER will provide and pay for the services of an independent testing laboratory to perform routine testing of earth work and concrete at the site, (i.e. soil density; concrete strength, slump, and air content) and perform random tests of other areas previously completed and inspected by CONTRACTOR.
- B. The OWNER's testing laboratory will perform other inspections, testings, and other services specified in the Contract Documents, to be performed by the OWNER, or as required by the CONSTRUCTION MANAGER. The cost of these services will be paid for by the OWNER.
- C. Reports will be submitted by the OWNER's testing laboratory to the CONSTRUCTION MANAGER in duplicate, indicating observations and results of tests, and indicating compliance or non-compliance with Contract Documents.
- D. The CONTRACTOR shall cooperate with the CONSTRUCTION MANAGER and OWNER's testing laboratory by furnishing samples of materials, concrete design mix, equipment, tools, storage and other assistance as requested.
- E. The CONTRACTOR shall notify the CONSTRUCTION MANAGER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.
- F. Retesting required because of non-conformance to specified requirements shall be performed by the same testing laboratory as directed by the CONSTRUCTION MANAGER. The CONTRACTOR shall bear all costs from such retesting at no additional cost to the OWNER.
- G. For samples and tests required for the CONTRACTOR's use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be included in the Contract Price.
- H. All tests required by the specifications or referenced codes and standards are the responsibility of the CONTRACTOR, unless specifically noted otherwise.

1.6 SPECIAL INSPECTION

- A. The Uniform Building Code/International Building Code/CA Building Code requires that special inspections be performed on certain structural elements of the project. The CONSTRUCTION MANAGER will perform all on-site special inspections required by the Uniform Building Code/International Building Code/CA Building Code. The cost of these services when provided during normal WORK hours will be paid for by the OWNER.

- B. When building components are fabricated off site, the CONTRACTOR must utilize a fabricator approved by the City of San Diego Development Services Department. If the CONTRACTOR elects to utilize a fabricator that is not approved by the City of San Diego Development Services Department, the CONTRACTOR shall provide a special inspector to perform continuous special inspection in the fabricator's shop. The CONTRACTOR shall be responsible for all costs associated with performing special inspection in the fabricator's shop.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **Inspection:** The CONTRACTOR shall inspect materials or equipment upon arrival on the job site and immediately prior to installation. The CONTRACTOR shall reject damaged and defective items. This inspection shall include a review of Contract requirements; a check to assure that all materials and/or equipment have been tested, submitted, and approved; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of materials and equipment to assure that they conform to reviewed shop drawings or submittal data. This inspection shall also include instruction as necessary to assure that workmen know the requirements of the Contract as they pertain to the feature, an examination of the quality of workmanship, as well as a review of control testing for compliance with the Contract requirements.
- B. **Measurements:** The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. **Special Procedures:** Methods and facilities shall be provided to assure conformance with requirements for special process specifications such as welding, heat treating and nondestructive testing of materials. Certifications for personnel, procedures, and equipment shall be maintained as required to meet the requirement of the Contract Documents and all applicable codes.
- D. **Manufacturer's Instructions:** Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

3.2 MANUFACTURER'S FIELD INSTALLATION SERVICES AND REPORTS

- A. When specified in individual specification sections, the CONTRACTOR shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, (test, adjust, and balance of equipment) and to provide instructions when necessary.
- B. The CONTRACTOR shall report to the CONSTRUCTION MANAGER in writing any observations and site decisions or instructions given by the manufacturers' representative to the CONTRACTOR that are supplemental or contrary to manufacturers' written instructions.
- B. The CONTRACTOR shall submit manufacturer representative's reports (in duplicate) within seven (7) calendar days of each field visit, to the CONSTRUCTION MANAGER for review. If duration of field visit is greater than one week, submit weekly reports. The final report shall certify that equipment or system has been satisfactorily installed and is functioning correctly.

** END OF SECTION **

SECTION 01505 - MOBILIZATION

PART 1 - GENERAL

1.1 GENERAL

- A. Mobilization shall include the obtaining of all permits; moving onto the sites of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items, if required:
1. Moving on to the site of all CONTRACTOR's plant and equipment required for first month operations.
 2. Installing temporary construction power, wiring, and lighting facilities.
 3. Developing construction water supply.
 4. Providing field office trailers for the CONTRACTOR, if so desired, complete with all furnishings and utility services.
 5. Providing all on-site communication facilities, including telephones, cordless phone antenna, and radio pagers.
 6. Providing on-site sanitary facilities and potable water facilities.
 7. Arranging for and erection of CONTRACTOR's work and storage yard.
 8. Constructing and implementing security features and requirements.
 9. Obtaining all required permits.
 10. Having all OSHA-required notices and establishment of safety programs.
 11. Having the CONTRACTOR's superintendent at the job site full-time.
 12. Submitting initial submittals.

1.2 PAYMENT FOR MOBILIZATION

- A. The CONTRACTOR's attention is directed to the condition that no payment for mobilization, or any part thereof will be approved for payment under the Contract until all mobilization items listed above have been completed as specified.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

** END OF SECTION **

SECTION 01510 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. **Types:** Typically, the types of utility services required for general temporary use at the project sites include the following:

- Water service (potable for certain uses)
- Storm sewer
- Sanitary sewer
- Electric power service
- Telephone service

1.2 JOB CONDITIONS

- A. **Scheduled Uses:** The CONTRACTOR shall, in conjunction with establishment of job progress schedule, establish a schedule for implementation and termination of service for each temporary utility or facility; at earliest feasible time, and when acceptable to OWNER AND CONSTRUCTION MANAGER, change over from use of temporary utility service to permanent service, if required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The CONTRACTOR shall provide either new or used materials and equipment, which are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry, by compliance with appropriate standards, as being suitable for intended use in each case. Where a portion of temporary utility is provided for CONTRACTOR by utility company, the CONTRACTOR shall provide remainder with matching and compatible materials and equipment and comply with recommendations of the utility company.

PART 3 - EXECUTION

3.1 INSTALLATION OF TEMPORARY UTILITY SERVICES

- A. **General:** Wherever feasible, the CONTRACTOR shall engage the utility company to install temporary service to project, or as a minimum, to make connection to existing utility service; locate services where they will not interfere with total project construction WORK, including installation of permanent utility services; and maintain temporary services as installed for required period of use; and relocate, modify or extend as necessary from time to time during that period as required to accommodate total project construction WORK.
- B. **Approval of Electrical Connections:** All temporary connections for electricity shall be subject to the approval of the CONSTRUCTION MANAGER and the power company representative, and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the WORK.
- C. **Separation of Circuits:** Unless otherwise permitted by the CONSTRUCTION MANAGER, circuits separate from lighting circuits shall be used for all power purposes.

- D. **Construction Wiring:** All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Administrative Code; and Subpart K of the OSHA Safety and Health Standards for Construction.

3.2 INSTALLATION OF POWER DISTRIBUTION SYSTEM

- A. **Power:** The CONTRACTOR shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.
- B. **Temporary Power Distribution:** The CONTRACTOR shall provide a weatherproof, grounded, temporary power distribution system sufficient to accommodate performance of entire WORK of project, including, but not necessarily limited to, temporary electrical heating where indicated, operation of test equipment and test operation of building equipment and systems which cannot be delayed until permanent power connections are operable, temporary operation of other temporary facilities, including permanent equipment and systems which must be placed in operation prior to use of permanent power connections (pumps, HVAC equipment, elevators, and similar equipment), and power for temporary operation of existing facilities (if any) at the site during change-over to new permanent power system. Provide circuits of adequate size and proper power characteristics for each use; run circuit wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations, and result in least interference with performance of the WORK; provide rigid steel conduit or equivalent raceways for wiring which must be exposed on grade, floors, decks, or other recognized exposures to damage or abuse.

3.3 INSTALLATION OF LIGHTING

- A. **Construction Lighting:** All WORK conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper WORK and to afford adequate facilities for inspection and safe working conditions.
- B. **Temporary Lighting:** The CONTRACTOR shall provide a general, weatherproof, grounded temporary lighting system in every area of construction work, as soon as overhead floor/roof deck structure has been installed; and provide sufficient illumination for safe work and traffic conditions; and run circuit wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations on grade, floors, decks, or other recognized areas of possible damage or abuse.

3.4 WATER SUPPLY

- A. **General:** The CONTRACTOR shall coordinate with the Public Utilities Department (PUD) for obtaining water service connection and shall allow a three-month notice to the Water Department. The CONTRACTOR shall provide all facilities necessary to convey the water from the source to the points of use in accordance with the requirements of the Contract Documents.

The water capacity charge and the wet tap fees shall be paid by the OWNER. The CONTRACTOR shall pay the fee for water meter and all other charges for water use.

- B. The CONTRACTOR shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the water supply system. Water used for domestic purposes shall be free of contamination and shall conform to the requirements of the State and local authorities for

potable water. The CONTRACTOR shall be solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.

- C. **Water Connections:** The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR shall pay all permit and water charges.

3.5 INSTALLATION OF SANITARY FACILITIES

- A. **Toilet Facilities:** Fixed or portable chemical toilets shall be provided wherever needed for the use of CONTRACTOR's employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.
- B. **Sanitary and Other Organic Wastes:** The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the CONSTRUCTION MANAGER and in accordance with all laws and regulations pertaining thereto.

3.6 INSTALLATION OF FIRE PROTECTION

- A. **Fire Protection:** The construction plant and all other parts of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Article 34, Section 1805, b of Cal-OSHA, and Subpart F of the OSHA Standards for Construction.

3.7 OPERATIONS AND TERMINATIONS

- A. **Inspections:** Prior to placing temporary utility services into use, the CONTRACTOR shall inspect and test each service and arrange for governing authorities' required inspection and tests, and obtain required certifications and permits for use thereof.
- B. **Protection:** The CONTRACTOR shall maintain distinct markers for underground lines, and protect from damage during excavating operations.
- C. **Termination and Removal:** When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, the CONTRACTOR shall promptly remove installation unless requested by CONSTRUCTION MANAGER to retain it for a longer period. The CONTRACTOR shall complete and restore WORK which may have been delayed or affected by installation and use of temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

- D. **Removal of Water Connections:** Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the CONSTRUCTION MANAGER and to the agency owning the affected utility.

**** END OF SECTION ****

SECTION 01521 – CONSTRUCTION SECURITY

PART 1 - GENERAL

1.1 SECURITY PROGRAM

A. The CONTRACTOR shall:

1. Protect the WORK including all field office trailers and their contents from theft, vandalism, and unauthorized entry.
2. Initiate a site security system and program, at the time of mobilization onto the work-site, which provides adequate security for site stored and installed material, product, and equipment. The CONSTRUCTION MANAGER will approve the security system. Considerations for the security program shall include, but not be limited to, the following:
 - Submit security reports monthly to CONSTRUCTION MANAGER.
 - Provide a 6-foot high, dark green-screened (full height) perimeter fence with locked-gate for access, if required.
 - Provide perimeter lighting, if required, spaced at an interval of 20 feet illuminated all night at 50 foot-candle, minimum.
 - Provide high-security, locked box containers in the fenced area for material storage, or off-site approved, bonded storage area.
 - Ensure that structures designed with security locks must be capable of being secured with temporary or permanent high-security locks prior to installation.
3. Maintain the security program throughout the Contract duration.
4. Be responsible at all times for security of the storage compound and lay-down areas, and for all Contractor plant, material, equipment, and tools, as well as, for those belonging to subcontractors.
5. Provide the CONSTRUCTION MANAGER with a list of 24-hour emergency telephone numbers.
6. Submit to the CONSTRUCTION MANAGER an up-dated progressive inventory of materials, equipment, and tools when received on-site.

1.2 ENTRY CONTROL

A. The CONTRACTOR shall:

1. Restrict entry of unauthorized personnel and vehicles onto the project or work site.
2. Maintain copies of vehicle insurance cards or other proof of insurance on-site for vehicles permitted on-site.
3. Require vehicle passes when vehicles are on-site.
4. Allow entry only to authorized persons with proper identification.

5. Maintain an Employee/Visitor Log, and make the log available to the CONSTRUCTION MANAGER on request. The log shall be submitted to the CONSTRUCTION MANAGER monthly, or as necessary.
 6. Give jobsite security orientation training to all affected employees including subcontractor employees. Employee participation in the security orientation shall be acknowledged by their respective individual signatures affixed to an orientation roster.
- B. The CONSTRUCTION MANAGER has the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any project security rules.

1.3 RESTRICTIONS

- A. The CONTRACTOR shall not allow cameras on site, or photographs to be taken except with prior approval of the OWNER.

1.4 PROJECT SITE SECURITY SERVICES

- A. The CONTRACTOR shall:

1. Provide project site security to control entry to the project sites.
2. Monitor the passage of personnel, vehicles, materials, and equipment entering and leaving the project site. License plates of vehicles permitted to enter the project site shall be recorded.
3. Patrol the project sites to observe and report unauthorized entry or activities.

B. **Requirements**

At the request of the CONSTRUCTION MANAGER, the CONTRACTOR shall perform duties as follows:

1. Direct emergency vehicles or equipment to a pre-designated on-site location.
2. Verify vehicle passes and personnel badges.
3. Direct personnel, vehicles, materials, and equipment to the proper area.
4. Direct traffic as requested by the CONSTRUCTION MANAGER including off-site traffic as may be required.
5. Monitor security for equipment and/or material temporarily stored along the access road or in the parking area.
6. Maintain an Employee/Visitor Log and direct visitors to the proper offices of the CONSTRUCTION MANAGER or CONTRACTOR for authorization to enter the site.
7. Maintain records of insurance files for all vehicles permitted on-site.
8. Maintain security report files.
9. Notify on a daily basis the CONSTRUCTION MANAGER of security violations, and enter all facts regarding the incident in a Security Log. The Security Log shall be transmitted to the CONSTRUCTION MANAGER.

10. Upon approval by the OWNER, the CONTRACTOR shall assist the CONSTRUCTION MANAGER to remove personnel denied access to the site for violation of site regulations.
11. Enforce parking area regulations and site speed limit, and obtain the name/vehicle license number of violators and report violators to the CONSTRUCTION MANAGER.
12. Inspect area lighting on a daily basis and report deficiencies to the CONSTRUCTION MANAGER.
13. Call the CONSTRUCTION MANAGER to report a fire, hazardous material spill, or medical emergency. Report the emergency to the fire department as directed by the CONSTRUCTION MANAGER.
14. Notify the CONSTRUCTION MANAGER of all unusual activities/occurrences.

PART 2 - PRODUCTS

2.1 CONTRACTOR SECURITY PLAN

- A. Prior to the performance of any work the CONTRACTOR shall submit to the CONSTRUCTION MANAGER for review and comment two copies of security plan commensurate with the needs of the project, and signed by an officer of the CONTRACTOR. Adequacy of the security plan is the responsibility of the CONTRACTOR. The CONSTRUCTION MANAGER will not review the CONTRACTOR security plan for adequacy.

The security plan shall:

1. Include employee site security orientation program.
2. Include security measures to protect CONTRACTOR employees and other persons from injury, prevent material damages, or avoid financial losses.
3. Cover security procedures related to CONTRACTOR tools and equipment that shall be mobilized for the WORK.

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01600 - PRODUCTS, MATERIALS, EQUIPMENT AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. The word "Products," as used herein, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

1.2 QUALITY ASSURANCE

- A. **Source Limitations:** To the greatest extent possible for each unit of work, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

- A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss. Materials delivered onsite without an approved submittal for verification shall be rejected and payment withheld.

1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment [including those provided by OWNER,] by methods to prevent soiling and damage.
- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.
- E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.6 MAINTENANCE OF STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.
- B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.
- C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continually.
- D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
- E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to acceptance by the OWNER in accordance with the Contract Documents.

1.7 INVESTIGATION OF FAILED PRODUCTS

- A. Prior to disposal of failed products, materials, or equipment, the CONTRACTOR shall inform and report the causes of failure during or after construction to the CONSTRUCTION MANAGER.

1.8 **PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEMS**

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier and/or Manufacturer, the naming of the item is intended to establish the type, function, and quality required. Unless expressly prohibited, materials or equipment of other suppliers and/or manufacturers MAY BE

accepted if SUFFICIENT information is submitted by the CONTRACTOR to the CONSTRUCTION MANAGER for the OWNER's EXCLUSIVE review to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the CONTRACTOR.
2. The OWNER will be the sole judge as to the type, function, and quality of any such substitute and the OWNER's decision shall be final.
3. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense additional data about the proposed substitute.
4. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense a special performance guarantee, or other surety, with respect to any substitute.
5. Acceptance by the OWNER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute.
6. The CONTRACTOR shall be responsible for resultant changes including design and construction changes and any and all additional costs resulting from the changes which the accepted substitution requires in the CONTRACTOR'S WORK, the WORK of its subcontractors, vendors, and of other contractors, and shall effect such changes without cost to the OWNER.

B. The procedure for review by the OWNER will include the following:

1. If the CONTRACTOR wishes to provide a substitute item, the CONTRACTOR shall make written application to the CONSTRUCTION MANAGER on the "Substitution Request Form." This form will be provided by the OWNER.
2. The "Substitution Request Form(s)" shall be submitted within the stipulated period PRIOR to the award of the Contract. Please also note article 1.8 D of specification section number 01600.
3. Wherever a proposed substitute item has not been submitted within said period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the OWNER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
4. The CONTRACTOR shall CERTIFY that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.
5. The OWNER will evaluate each proposed substitute within a reasonable period of time.
6. As applicable, no shop drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without the OWNER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
7. The CONSTRUCTION MANAGER will record the time required by the OWNER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the

CONTRACTOR in the Contract Documents occasioned thereby. Whether or not the OWNER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the OWNER and ENGINEER for evaluating each proposed substitute.

- C. The CONTRACTOR's application using the "Substitution Request Forms" shall contain the following statements and information which shall be considered by the OWNER in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of substantial completion on time.
 2. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
 3. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.
 4. All variations of the proposed substitute from the items originally specified will be identified.
 5. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
 6. Itemized, detailed estimate of ALL costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change. Please make sure to consider article 1.8A, 1 through 6, shown above.
- D. **The OWNER, nor ENGINEER, will NOT allow, NOR permit, NOR entertain, NOR consider ANY AND ALL Post-Award Substitution Requests, nor Post-Award Substitutions, whatsoever.**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01660 - EQUIPMENT TESTING AND PLANT STARTUP

PART 1 - GENERAL

1.1 GENERAL

- A. Equipment testing and plant/pump station/force main startup are requisite to satisfactory completion of the contract and, therefore, shall be completed within the contract time.

1.2 EQUIPMENT TESTING

- D. The CONTRACTOR shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24 inches in size, injectors, tanks, batch-type disc meters, and rotameters, and any other minor items of equipment specifically exempted by the CONSTRUCTION MANAGER in writing), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the CONSTRUCTION MANAGER and OWNER.
- B. The CONTRACTOR shall require that each manufacturer's representative furnish to the CONSTRUCTION MANAGER a written report addressed to the OWNER certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions.
- C. The CONTRACTOR shall be responsible for scheduling all operations testing. The CONTRACTOR is advised that the CONSTRUCTION MANAGER and the OWNER's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the OWNER's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the OWNER at least two (2) weeks in advance and shall be provided while the respective manufacturer's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. Prior to scheduling any operations testing, the CONTRACTOR shall have previously furnished the Owner's Manuals required under Section 01300.
- D. The CONTRACTOR shall notify the CONSTRUCTION MANAGER at least three (3) days in advance of each equipment test.
- E. The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

1.3 PLANT/STATION START-UP

- A. The startup of a plant/station is a highly complex operation requiring the combined technical expertise of the CONTRACTOR, manufacturers, subcontractors, the CONSTRUCTION MANAGER, and the OWNER. The CONTRACTOR shall provide the effective coordination of all parties necessary for the successful plant startup. The CONTRACTOR shall also submit a resume of the Startup Expert/professional. The CONSTRUCTION MANAGER/OWNER will approve the Startup Expert/professional.

- B. It is not the intent of the CONSTRUCTION MANAGER to instruct the CONTRACTOR in the startup of the plant; however, the CONSTRUCTION MANAGER will be available prior to and during startup to provide technical support to the CONTRACTOR.
- C. The CONTRACTOR shall be required to start up the plant, operate it, and pass a ten (10)-day test prior to acceptance. All equipment must properly run continuously 24 hours per day for the test period at rates indicated by the CONSTRUCTION MANAGER. If any item malfunctions during the test, the item shall be repaired and the test restarted at day zero with no credit given for the operating time before the aforementioned malfunction.
- D. At about 50 to 70 percent completion of each station, the CONTRACTOR shall submit to the CONSTRUCTION MANAGER for review and approval, a detailed schedule of operations which will be necessary to effect a successful initial operation and sustained period of operation for the duration of the required startup period.
- E. The CONTRACTOR shall provide operating personnel for the duration of the startup. Additionally, the CONTRACTOR shall provide its own alternative plan for providing, at its own expense, all water, power, chemicals, and other consumables required for successful completion of the test, in the event that public utilities, facilities, and/or resources become not readily available for hookup or tapping.
- F. The startup shall not be commenced until all required leakage tests and equipment tests have been completed to the satisfaction of the CONSTRUCTION MANAGER/OWNER.
- G. All defects in materials or workmanship which appear during this test period shall be immediately corrected by the CONTRACTOR. Time lost for equipment repairs, wiring corrections, control point settings, or other reasons which actually interrupt the startup may, at the discretion of the CONSTRUCTION MANAGER, be justifiable cause for extending the startup test duration.
- H. During the startup, the CONTRACTOR shall provide the services of authorized representatives of the manufacturers, in addition to those services required under operations testing, as necessary, to correct faulty equipment operation.
- I. During the startup, the CONTRACTOR shall keep records of the operations, in accordance with the instructions of the CONSTRUCTION MANAGER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01680 - PHYSICAL CHECKOUT, SHOP, FIELD, AND FUNCTIONAL TESTING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. The physical inspection and testing requirements in this Section are in addition to those requirements defined in Divisions 02 through 16 of the Technical Specifications. These activities shall be performed prior to substantial completion.
- B. Provide the following checkout and testing activities:
 - 1. Shop Testing of equipment as specified in Divisions 02 through 16, and as specified herein.
 - 2. Physical checkout and inspection of equipment and materials to verify conformance of the installed equipment and materials to the Contract Document.
 - 3. Field Testing of equipment as specified in Divisions 02 through 16, and as specified herein.
 - 4. System Loop Checks as specified in Divisions 02 through 16, and as specified herein.
 - 5. Functional Testing of equipment as specified in Divisions 02 through 16, and as specified herein.
- C. Provide a Checkout Plan covering the entire checkout and testing process in conformance with the Contract Documents, and as specified herein.

1.2 DEFINITIONS:

- A. Shop Testing is defined as testing that is done by the Supplier either at the place of manufacture, the place of assembly, or at another location where the required testing apparatus is located, for the purpose of proving that the products meet the requirements of the pertinent technical specification(s). The administrative procedures for shop testing are specified in subsection 1.5 of this Section, while the technical requirements are included in the pertinent technical specification(s). The minimum acceptable test criteria are specified in subsection 1.4 of this Section.
- B. Physical Checkout is defined as the process of physically inspecting products after they have been installed to determine if the products have been properly and completely installed, comply with the approved shop drawings and are ready for Field and/or Functional Testing. The requirements for Physical Checkout (if applicable) are contained in the pertinent technical specifications and in subsection 1.8 of this Section.
- C. Field Testing is defined as testing that is performed by the CONTRACTOR, and/or Subcontractors, with Supplier assistance, on products after they have been installed, and after the performance of physical checkout, for the purpose of proving that the tested products meet the requirements of the pertinent technical specifications. Field testing is required regardless of whether or not shop testing was performed on the same piece of equipment or material. The administrative requirements for field testing are specified in subsection 1.9 of this Section, while the technical requirements are contained in the pertinent technical specification(s). The minimum acceptable test criteria are specified in subsection 1.4 of this Section.
- D. System Loop Checks - (Applies to equipment or systems controlled by the Distributed Control System) are defined as tests performed jointly by the CONTRACTOR and the Control Systems Provider providing control systems (COMNET), to verify the control wiring

(both hardwired and datalink) between the Distributed Control System and instruments or equipment which it monitors or controls throughout the plant. Loop checks are to be performed to insure the Distributed Control System can properly control or monitor each instrument or piece of equipment and that the systems are ready for functional testing. The requirements and procedures for Loop Checks are contained in the pertinent specifications and subsection 1.10 of this section.

Loop Checks are defined as tests performed to verify the control wiring (both hardwired and datalink) between local control panels (LCPs) and/or the distributed control system (DCS) and instruments or equipment which they control. The CONTRACTOR performs loop checks from local control panels to all instruments or equipment which they control. Additionally the CONTRACTOR shall perform loop checks jointly with the Control Systems Provider (CSP) CONTRACTOR, for instruments or equipment controlled by the distributed control system. The test verifies proper operational control or monitoring of the instrument or equipment. Loop checks are to be performed to insure the LCP and/or the DCS can properly control or monitor each instrument or piece of equipment and that the systems are ready for functional testing. The requirements and procedures for System Loop Checks are contained in the pertinent specifications and subsection 1.10 of this section.

- E. Functional Testing is defined as testing performed by the CONTRACTOR on a "system" normally comprised of two or more pieces of equipment, after the equipment has been installed, and after Physical Checkout and Field Testing have been completed, for the purpose of proving that the system meets requirements as specified and as indicated. The administrative requirements for Functional Testing are specified in subsection 1.11 of this Section, while the technical requirements are specified in the technical specifications.
- F. The Supplier's Representative or Manufacturer's Representative is defined as a person, or persons provided by the Supplier or Manufacturer, who is qualified by having the training and experience, to provide technical and/or process-related advice, and/or assistance, relating to the installation or utilization of the products provided by that same Supplier. The Supplier's Representative or Manufacturer's Representative shall be a Professional Engineer registered in the State of California in the discipline most appropriate for the product provided or approved by the OWNER.
- G. The Testing, Checkout, and Start-Up Coordinator is defined as the person provided by the CONTRACTOR to coordinate and oversee the total spectrum of testing and inspection activities required by the Contract Documents. The Testing and Checkout and Start-Up Coordinator shall be a Professional Engineer registered in the State of California in the discipline most appropriate for the equipment to be tested and checked out or approved by the OWNER.

1.3 ROLES AND RESPONSIBILITIES:

- A. The CONTRACTOR shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the testing specified herein and interim connections. In addition the CONTRACTOR shall arrange for and provide the participation or assistance of survey crews, engineers, quality control technicians, Suppliers' and/or Manufacturer's representative(s), and required utility, regulator, or governmental agency representatives.
- B. The CONTRACTOR shall provide the services of the Supplier's and/or Manufacturer's representative(s) as follows:
 - 1. Shop Testing as specified in the specifications in Divisions 02 through 16, and as specified herein.

2. Assistance during installation as specified in the specifications in Divisions 02 through 16.
 3. Field Testing as specified in the specifications in Divisions 02 through 16, and as specified herein.
 4. Functional Testing as specified in the specifications in Divisions 02 through 16, and as specified herein.
- C. The Supplier's and/or Manufacturer's representative's activities required by this Section are in addition to the requirements for vendor training and other services specified elsewhere in the Contract Documents. Timing for the performance of these services shall be defined in the Checkout Plan, specified herein.
- D. The CONSTRUCTION MANAGER and/or OWNER may review and comment on the CONTRACTOR's deliverables, participate in the physical inspection activities, witness the shop and field testing, witness loop checks, witness functional testing, and provide verification of conformance to the specifications.
- E. The CONTRACTOR shall be responsible for incorporating these procedures into the CPM schedule. No additional time or compensation will be approved relating to delays associated with these requirements.

1.4 MINIMUM SHOP AND FIELD TESTING REQUIREMENTS

In addition to procedures referenced for shop and field testing contained in a technical specification, the following shall be required. Should these requirements conflict with the Supplier's recommendations in any way; the more stringent requirements will prevail.

- A. Measurement of wearing ring clearances for all pumps requiring assembly, so equipped:
1. Provide a minimum of two measurements of clearances taken opposed to each other by 90°.
 2. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck rings found to be out of round or out of specified tolerance.
- B. Measurement of Impeller Bore for all pumps requiring assembly:
1. Provide a minimum of two measurements of the Impeller Bore opposed to each other by 90°.
 2. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck impellers found to be out of round or out of specified tolerance.
- C. Measurement of shaft run out for all rotating equipment requiring assembly:
1. Remove bearings from the shaft. Support shaft on pedestal rollers or in a lathe.
 2. Check each shoulder on the shaft.
 3. Take a minimum of two measurements of each shoulder, opposed to each other by 90°.
 4. All measurements and clearances shall be within Supplier's specifications for new installations. Replace and recheck shafts found to be out of round or out of specified tolerance.

D. Vibration Measurement:

1. Conduct a torsional and vibration analysis of equipment in accordance with the requirements of Section 11000 and the applicable equipment specifications.

E. Belt Drives:

1. All belts shall ride within the sheave and not slip to the bottom of the groove(s).
2. Belt tension shall be in accordance with Supplier's recommendations.
3. Pulley alignment shall be within Supplier's recommendations.

F. Gear Drives and Reducers:

1. Check gears for lash at no less than three points around the gear.
2. Rotate gears a full 360° while checking alignment.

G. Coupling/Shaft Alignment:

1. Perform all final alignments and checks with a dial indicator or a laser device. Feeler gauges and straight edges are not acceptable.
2. Eliminate soft foot conditions prior to aligning.
3. When checking for final soft foot, any displacement in excess of 0.002" must be corrected.
4. When checking for pipe strain, any displacement in excess of 0.002" must be corrected.
5. Alignments will not be regarded as final until the grout is set and all piping has been attached. Demonstrate that alignment is not changed by attachment of piping.
6. Shim the driving element, never the driven element.
7. Take bracket sag corrections into account when using a dial indicator. Bracket sag shall be determined on a rigid pipe.
8. Mount a dial indicator to the driven element so that it can be rotated. Rotate both elements while aligning.
9. When aligning three coupled elements, align gear reduction elements with the driven element first, then align the driver to the gear reduction element.
10. Check all four alignments; i.e., angular alignment in the vertical and horizontal planes, and parallel alignment in the vertical and horizontal planes.
11. The minimum acceptable alignment accuracy for flexible couplings is ± 0.005 ", or the Supplier's specifications, whichever is more stringent.
12. The dial indicator must be perpendicular to the alignment surface.

13. Number hold down nuts prior to tightening. Loosen in reverse order. Tighten in ascending order.
14. Use only clean, deburred shims. Clean the machine base and feet from rust or burrs prior to alignment.

H. Measurement of Noise (dB)

1. Eliminate noise sources generated by adjacent construction activity prior to testing.
2. Establish a background noise level prior to testing.
3. Perform noise level testing whenever a maximum noise level is indicated. A noise test will also be required for any equipment likely to exceed OSHA standards for one hour exposure without hearing protection.

I. Hydrostatic Testing:

1. AWWA C600 standards latest edition are the minimum acceptable standards for all hydrostatic testing.
2. Visually inspect all welds prior to testing, for cracks, undercut on surface greater than 1/32" deep, lack of fusion on surface, reinforcement greater than specified in Table 127.4.2 located in ANSI B31.1 Power Piping, and incomplete penetration (when accessible). Repair or rework as directed by the CONSTRUCTION MANAGER.
3. At no time during hydrostatic testing shall any part of the piping system be subjected to a stress greater than 90% of its yield strength at test temperature.
4. After at least 10 minutes of full hydrostatic test pressures, make an examination for leakage of all joints, connections, and all regions of high stress, such as around openings and thickness transition sections.
5. Unless otherwise specified, the minimum required hydrostatic test pressure shall be 1.5 times the design pressure as specified and as indicated.
6. Unless otherwise specified, the minimum pressure holding time shall be 10 minutes plus the time required to inspect for leakage.
7. Maximum pressure shall not exceed the maximum rated pressure for any component in the system being tested.

J. Electrical Equipment

1. The testing standards for electrical components are those contained in the pertinent technical specification(s).
2. Functional and field testing shall follow the Physical Checkout and are contained in the pertinent technical specification(s).

1.5 SHOP TESTING

- A. When required by the Technical Specifications, perform shop testing prior to delivery of the equipment or material. Unless otherwise noted, provide 45 days written notice indicating the

time and place of testing. The CONTRACTOR shall submit the following for approval thirty days prior to this notice:

1. Description of the equipment and the applicable specification sections
 2. **Description of the test:** Specifically outlining how tests will conform to the requirements in the Technical Specifications.
 3. **Testing Devices That Will Be Used in the Tests:** Description must state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.
 4. **Personnel Used to Perform the Tests:** Resumes, qualifications, and experience shall be submitted. Personnel performing tests shall be Professional Engineers registered in the discipline most appropriate for the testing that will be performed.
 5. **Schedule for testing:** Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or test failure.
 6. **Test forms:** Submit all forms used to record and report on Shop Test data, for approval, prior to the test. No testing shall be conducted until these forms are approved. Forms shall provide the following information: description of test, equipment used, personnel present, equipment specification numbers, and measurements made. Forms shall have a place for signature by the person responsible for conducting the test, and an officer of the company verifying that the tests performed are true, accurate, have met the required criteria, and that the equipment will operate as indicated and as specified.
- B. Shop test procedures will be reviewed and returned by the CONSTRUCTION MANAGER within 15 days of receipt. Incorporate minor comments related to the procedures, equipment, or personnel prior to testing. Major comments by the CONSTRUCTION MANAGER will require a resubmission of the shop test procedure and proposed test date. The CONTRACTOR will be notified, in writing by the CONSTRUCTION MANAGER, if a formal resubmission is required with the transmittal of the review comments.
- C. Travel, lodging, rental car, meals, and other travel-related expenses for the CONSTRUCTION MANAGER, OWNER personnel, and their representatives, prior to, during, and after the testing, will be paid for by the CONTRACTOR.
- D. Submit 6 (six) copies of the following within seven (7) days after completion of the tests for approval:
1. Completed test forms, for each device tested, on forms as approved prior to the test.
 2. Completed certification, the content of which was approved prior to the tests.
 3. A written summary of test; a report of the results and a summary of the entire procedure.
 4. A schedule for retesting, if necessary. The CONTRACTOR shall perform any retesting required to fulfill the intent of the Technical Specification test requirements at no additional cost to the OWNER. Additional travel required by the CONSTRUCTION MANAGER and the OWNER personnel and their representatives to witness retesting shall be paid by the CONTRACTOR. Reimbursement for travel expenses required for retesting will be applied as a debit against the CONTRACTOR'S subsequent Application for Payment. Allowable travel cost will be in accordance with the travel expenses reimbursements permitted by City regulations.

1.6 WITNESSING OF TESTS

Unless otherwise noted, provide a minimum of 45 days written notice to the CONSTRUCTION MANAGER so that the CONSTRUCTION MANAGER, the OWNER, or its representatives, may have the opportunity to witness the Shop tests, Field tests, Loop checks, and Functional tests. The CONSTRUCTION MANAGER and the OWNER may witness the performance of any or all tests, at their option. The CONSTRUCTION MANAGER's or OWNER's witnessing of tests does not relieve the CONTRACTOR of its obligation to comply with the requirements of the Contract Documents.

1.7 CHECKOUT PLAN

- A. The CONTRACTOR shall submit a Checkout Plan based upon the requirements defined herein, and the Technical Specifications to the CONSTRUCTION MANAGER. Six (6) copies and 1 (one) copy on electronic media (MS Word) of the preliminary Checkout Plan shall be submitted for review at least 21 calendar days prior to the proposed date of the first test. The plan shall define:
1. The equipment and applicable specification section(s) for the equipment
 2. The logical and systematic performance of physical inspections, shop tests, field tests, loop checks, and functional tests including:
 - a. A chronological schedule of all testing, checking, and inspection activities.
 - b. A checklist of all inspection, checking, and testing activities broken down by location, discipline, system, and device or item.
 - c. All blank forms proposed by the CONTRACTOR for verification or recording for all testing.
 - d. An index which cross references the forms to their intended application(s).
 - e. A list of all shop tests, and supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for re-testing, in the event it is required.
 3. Participants in the testing.
 4. Special test equipment.
 5. Sources of the test media (water, power, air.)
 6. The proposed method of delivery of the media to the equipment to be tested.
 7. Temporary or interim connections for the sequencing of multiple units.
 8. Ultimate proper disposal of the test media.
- B. The plan will be reviewed by the CONSTRUCTION MANAGER, modified or revised within 90 days as necessary by the CONTRACTOR, then approved by the CONSTRUCTION MANAGER. The CONTRACTOR shall continue to update the Checkout Plan, working in conjunction with the CONSTRUCTION MANAGER prior to the start of the scheduled

equipment checkout and functional testing activities. Each specific element of the plan must receive written approval by the CONSTRUCTION MANAGER at least two weeks prior to the actual commencement of testing.

- C. The CONTRACTOR shall designate, in the Checkout Plan, a coordinator for Testing, Checkout, and Start-Up to coordinate and manage the activities defined in the checkout plan, as approved by the CONSTRUCTION MANAGER.

1.8 PHYSICAL CHECKOUT AND INSPECTIONS

- A. Physical Checkout and inspections provide verification of conformance to the requirements of the Technical Specifications and Contract Drawings for physical presence; dimensions; and location, for proper materials, parts, and items; and for integrity of materials, equipment and systems to determine their condition and readiness for field and/or functional testing. Inspection includes the following elements, as applicable
 1. Exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, gates, and signage.
 2. Building structural integrity, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC systems.
 3. Concrete structures for structural integrity, finish, tolerance, durability, appearance, embedded and inserted items, painting and surface applications.
 4. Steel structures for member alignment, connection bolts torque, connection welds integrity, painting, fire proofing and surface applications.
 5. Mechanical systems and items for installation, alignment and securing, adjustments of packing and seals, lubrication, drive connection and alignment, motor rotation, belt/chain tension, painting or surface applications, and tagging for identification.
 6. Piping systems for material, size, components, direction, alignment of joints and bolting/welding, valves, packing and seals, screens, filters and strainers, painting, identification labeling and color coding, hangers, anchors, supports, and expansion provisions.
 7. Electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit identification, terminal installation and identification, major switches, circuit breakers and components, and labeling for system identification.
 8. Communication systems including telephone, fire/smoke alarm, security, page/party, and closed circuit TV; similar to electrical above.
 9. Computer systems by station, function, and network interface.
- B. Inspection will verify that tanks, pipes, conduits, vessels, equipment, systems, buildings, areas and other items provided under the Contract are clean and free from debris or materials which may interfere with subsequent testing requirements or routine operations. Correct unsatisfactory conditions prior to testing or acceptance.
- C. Upon completion of the inspection, submit to the CONSTRUCTION MANAGER six (6) copies of each completed inspection form, signed by an authorized representative of the CONTRACTOR who participated in the inspection. The CONSTRUCTION MANAGER will review and approve the contents of the forms. Should a re-inspection be required, it shall be performed at no additional cost to the OWNER.

1.9 FIELD TESTING OF EQUIPMENT

- A. **CONTRACTOR Personnel:** The CONTRACTOR shall provide the services of an experienced and authorized Supplier's or Manufacturer's representative for each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24-inches in size, injectors, tanks, batch-type disc meters, and rotometers, and any other minor items of equipment specifically exempted in writing by the CONSTRUCTION MANAGER and DESIGNER), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the Supplier's or Manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the CONSTRUCTION MANAGER. The CONTRACTOR shall notify the CONSTRUCTION MANAGER of the visit of the Supplier's or Manufacturer's representative at least 48 hours in advance of arrival at the work site.
- B. **CONTRACTOR's Report:** The CONTRACTOR shall deliver to the CONSTRUCTION MANAGER a written report prepared by the Supplier's or Manufacturer's representative, addressed to the OWNER, certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions. The Supplier's or Manufacturer's representative shall also provide written authorization that the equipment can be operated. This report shall be submitted within 7 days of the Supplier's or Manufacturer's representative visit to the site.
- C. **Scheduling Tests:** The CONTRACTOR shall be responsible for scheduling all field testing. The CONTRACTOR is advised that the CONSTRUCTION MANAGER and the OWNER's operating personnel will witness field testing and that the Supplier's or Manufacturer's representative shall be required to instruct the OWNER's operating personnel in the correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the OWNER at least 2 weeks in advance, and shall be provided while the equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. One hundred and twenty (120) days prior to scheduling any field testing, the CONTRACTOR shall have previously received approval of the Owner's Manuals required under Section 01300. No field testing will be permitted if this requirement is not met. Any associated delays to the completion of the contract resulting from delayed testing due to incomplete or unapproved OWNER's manuals will be the responsibility of the CONTRACTOR.
- D. **Test Support:** The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, temporary and interim connections, and services required for conducting the tests and shall properly dispose of all material, media, and lubricants upon completion of the test.
- E. **Notice Requirement:** Field testing shall be in addition to, and not in lieu of, shop testing. Field testing will be performed as a part of the overall physical and functional testing process defined herein and in accordance with the approved Checkout Plan. However, as a minimum the following specific instructions shall also apply. The CONTRACTOR shall provide 60 (sixty) calendar days written notice indicating the date and time for testing each piece of equipment, or a series of equipment pieces.
1. All equipment installed by the CONTRACTOR shall undergo an operational check by the CONTRACTOR to verify that the equipment is functioning (electrically, mechanically and structurally) as it has been designed.

2. Each device shall be operated through its full range of motion and each instrument shall be checked against its full span.
 3. At a minimum, this check shall include turning the equipment on and running it through one full cycle. This cycle shall include all operating possibilities. Signals or interlocks from other pieces of equipment may be simulated upon prior approval of the CONSTRUCTION MANAGER.
- F. **Review of Procedures:** Field test procedures will be reviewed and returned by the CONSTRUCTION MANAGER within 30 (thirty) days of receipt. Incorporate minor comments to the procedures, equipment, or personnel prior to testing. Major comments by the CONSTRUCTION MANAGER will require a resubmission of the field test procedure and proposed test date. The CONTRACTOR will be notified, in writing, by the CONSTRUCTION MANAGER if a formal resubmission is required with the transmittal of the review comments.
- G. **Additional Notice Requirements:** Provide 7 (seven) days written notice to the CONSTRUCTION MANAGER prior to the actual start of any testing. This will include a statement by the CONTRACTOR that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.
- H. **Test Report Requirements:** At conclusion of the test the CONTRACTOR will deliver draft test report data, and then submit, within 7 (seven) days after completion of the tests, 6 (six) copies of the following to the CONSTRUCTION MANAGER for approval:
1. Completed test forms, for each device tested, on forms provided by the CONTRACTOR prior to the tests.
 2. Completed certification documentation, the content of which was approved prior to the tests.
 3. A written summary of the test; a report of the results and a summary of the entire procedure.
 4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the intent of the technical specification test requirements at no additional cost to the OWNER.

1.10 SYSTEM LOOP CHECKS

- A. Loop checks are performed jointly by the CONTRACTOR and the Control Systems Provider after field testing. The CONTRACTOR will have primary responsibility and will provide personnel to insure that the installed equipment and/or instruments are properly installed and operating during loop checks. The Control Systems Provider will provide personnel to operate the Distributed Control System (DCS). The CONTRACTOR will provide communication equipment as required for the Control Systems Provider and CONSTRUCTION MANAGER personnel to insure coordinated communication between the field and the Control Room.
- B. The CONTRACTOR will provide 30 (thirty) days written notice indicating the date and time when loop checks will start. Submit with this notice a loop check package which includes the following to the CONSTRUCTION MANAGER for approval:

1. Testing devices that will be used in the tests: Description must state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.
 2. Schedule for Testing: Schedule shall include frequency of measurement, personnel present, and contingency plans for equipment and/or system failure.
 3. Test forms: Provide test forms for recording and reporting on the test data.
 4. Provide material and equipment required for the test.
 5. Utility requirements: Utilities will be supplied by the CONTRACTOR for loop checks, as required.
 6. Operational requirements: Include precautions which will be taking to protect equipment and personnel during testing.
- C. The CONSTRUCTION MANAGER and the OWNER may witness the performance of these tests, at their option.
- D. Approval of the loop check package will be made within two weeks of the test date. Incorporate minor comments on the procedures and equipment prior to testing. Major comments by the CONSTRUCTION MANAGER will require a resubmission of the loop check package and test date.
- E. The CONTRACTOR shall provide seven days written notice to the CONSTRUCTION MANAGER prior to the actual start of any testing.
- F. The CONTRACTOR shall submit within one week after completion of the tests, the following to the CONSTRUCTION MANAGER for approval:
1. Completed test forms, for each loop tested on forms provided by the CONTRACTOR and approved prior to the test.
 2. Written summary of testing, reporting on the results and summarizing the entire procedure.
 3. A schedule for retesting, if necessary, including changes to procedures, testing devices, or personnel. Any retesting required to fulfill the intent of these requirements, due to negligence, poor workmanship, or products that fail to meet the Contract requirements, shall be at no additional cost to the OWNER.

1.11 FUNCTIONAL TESTING

- A. When listed in the APPENDIX of this particular Section, specific functional tests shall be performed by the CONTRACTOR who supplied the equipment being tested in addition to the requirement for shop, field, and other tests called for in the Technical Specifications. If more than one CONTRACTOR supplied the equipment being tested, each CONTRACTOR will provide a representative for the functional test team, and the team leader will be the representative from the CONTRACTOR with the major piece of equipment being tested. If no clear distinction exists under this criteria, then the CONTRACTOR with the largest dollar value of equipment incorporated into the system being tested shall be the team leader. Functional tests will be performed with fluid or gaseous substances that are generally non-septic, non-corrosive, non-toxic, and non-inflammable.

- B. The CONTRACTOR shall provide 45 days written notice in accordance with Section 1.6, indicating the date and time during which the specified functional test is proposed. Submit with this notice a contract specific functional test plan which follows the generic functional test plan included in the contract, and which includes the following to the CONSTRUCTION MANAGER for approval:
1. Description of the system's equipment, piping, valves, instruments and other components, and the applicable specification sections.
 2. Test procedures to be provided by Engineer.
 3. Testing devices that will be used in the tests: Description must state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.
 4. Personnel used to perform the tests: Submit resumes and qualifications. As a minimum, personnel must have three (3) years experience with the operation of the equipment and/or system to be tested and have participated in five similar tests during this period of experience.
 5. Schedule for Testing: Schedule shall include frequency of measurements, personnel present, and contingency plans for equipment and/or system test failure.
 6. Test forms: Provide test forms for recording and reporting on the test data.
 7. Material and equipment required for the test.
 8. Utility requirements: Utility requirements will be identified and supplied by the CONTRACTOR for functional testing purposes. Provide labor for the reuse of the test water.
 9. Operational requirements: Include valve positions, set-ups, and gate positions that are required to run the tests in the written request so that the CM can anticipate and plan for the testing. Provide all temporary piping, connections or other temporary requirements related to performance of the functional tests.
 10. The CONTRACTOR shall develop a Function Test Schedule which allows no less than 120 days to complete the Functional Test Program.
- C. The CONTRACTOR will be obligated for installation and cost associated and cost associated with all temporary materials and systems required to facilitate functional testing.
- D. The CONSTRUCTION MANAGER, and the OWNER will direct specific actions when conflicts surface and will witness the performance of these tests.
- E. Approval of the functional test package by the CONSTRUCTION MANAGER will be made within two weeks of the test date. Incorporate minor comments on the procedures, equipment, and personnel prior to testing. Major comments by the CONSTRUCTION MANAGER will require a resubmission of the functional test package and test date.
- F. Provide seven days written notice to the CONSTRUCTION MANAGER prior to the actual start of any testing. This will include a statement by the CONTRACTOR that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.

- G. Submit within 7 (seven) days after completion of the tests, 6 (six) copies of the following to the CONSTRUCTION MANAGER for approval:
1. Completed test forms, for each device, or system tested, on forms approved prior to the test.
 2. Completed certification, the content of which was approved prior to the tests.
 3. A written summary of the test; a report of the results and a summary of the entire procedure.
 4. A schedule for retesting, if necessary, including changes to procedures, testing devices, or personnel. Any retesting required for failures due to negligence, poor workmanship, or due to using products that do not meet the Contract requirements shall be at no additional cost to the OWNER.

1.12 CORRECTIONS TO THE WORK

Correct any items of work failing to meet the specified requirements, at no additional cost to the OWNER. Correct the nonconforming items by re-work, modification, or replacement, at the option of the CONSTRUCTION MANAGER. This includes the provision of all required labor, materials, and requirements for retesting as specified herein, to verify that the items conform to Contract Documents.

1.13 SAFETY

Conduct all specified test procedures in compliance with all applicable safety standards and regulations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 FINAL CLEANUP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

1.2 CLOSE-OUT TIMETABLE

- A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the CONSTRUCTION MANAGER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUAL) SUBMITTAL

- A. The CONTRACTOR's attention is directed to the condition that one percent of the contract price will be deducted from any monies due the CONTRACTOR as progress payments, if at the 75 percent construction completion point, the approved OWNER'S MANUAL complying with Section 01300 has not been submitted. The aforementioned amount will be retained by the OWNER as the agreed, estimated value of the approved OWNER'S MANUALS. Any such retention of money for failure to submit the approved OWNER'S MANUALS on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the CONTRACTOR.

1.4 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the CONSTRUCTION MANAGER for transmittal to the OWNER:
 - 1. Written guarantees, where required.
 - 2. Operations and Maintenance manuals and instructions.
 - 3. New permanent cylinders and key blanks for all locks.
 - 4. Maintenance stock items; spare parts; special tools.
 - 5. Completed Record Drawings and ALL Master Record Documents, to include the specifications.
 - 6. Bonds for roofing, maintenance, etc., as required.
 - 7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.

8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.5 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in the Greenbook, Whitebook, and the supplementary special provisions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and his surety shall be liable to the OWNER for the cost thereof.

1.6 BOND

- A. The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and the Greenbook, Whitebook, and the supplementary special provisions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 01999 - REFERENCE FORMS

The forms listed below and included in this section are referenced from other sections of the Contract Documents. All properly and completed forms are required under this contract, including in particular, the Unit Responsibility Certification Form. Submit to construction manager within 7 calendar days of completion.

<u>Form No.</u>	<u>Title</u>
01300A	Submittal Transmittal Form
01660A	Equipment Test Report Form
01730A	Operation and Maintenance Transmittal Form
01730B	Equipment Record Form
01730C	Equipment Record Form
11000A	Manufacturer's Installation Certification Form
11000B	Manufacturer's Instruction Certification Form
11000C	Unit Responsibility Certification Form
11060A	Motor Data Form
16000A	Wire and Cable Resistance Test Data Form
16000B	Installed Motor Test Data Form
16000C	Motor Control Center Test Form
16000D	Neutral Grounding Resistor Test
16000E	Loop Wiring and Insulation Resistance Test Data Form
16000F	Panel Indicator Calibration Test Data Form
16000G	Signal Trip Calibration Test Data Form
16000H	Field Switch Calibration Test Data Form
16000I	Transmitter Calibration Test Data Form
16000J	Miscellaneous Instrument Calibration Test Data Form
16000K	Individual Loop Test Data Form
16000L	Loop Commissioning Test Data Form

SUBMITTAL TRANSMITTAL

Submittal Description: _____ Submittal No.:¹ _____

Spec Section: _____

	Routing	Sent	Received
OWNER:	Contractor/CM		
PROJECT:	CM/Engineer		
	Engineer/CM		
CONTRACTOR:	CM/Contractor		

We are sending you Attached Under separate cover via
 Submittals for review and comment
 Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action ^a	Reviewer initials	Review comments attached

^a**NOTE: NET = No exceptions taken; MCN = Make corrections noted; A&R = Amend and resubmit; R = Rejected; AAN = Approved as Noted**
 Attach additional sheets if necessary

Contractor

Certify either A or B:

- A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, specified (no exceptions).
- B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

<u>No.</u>	<u>Deviation</u>

Certified by: _____

Contractor's Signature

¹See paragraph 01300-4.0A, Transmittal Procedure.

NOTE: This example equipment test report is provided for the benefit of the Contractor and is not specific to any piece of equipment to be installed as a part of this project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

CITY OF SAMPLE

**EXAMPLE WATER TREATMENT PLANT
STAGE IV EXPANSION PROJECT**

ABC Construction Company, Inc., General Contractor
XYZ Engineering, Inc., Construction Manager

EQUIPMENT TEST REPORT

Equipment Name: Sludge Pump 2
 Equipment Number: P25202
 Specification Ref: 11390
 Location: East Sedimentation Basin Gallery

	Contractor		Construction Manager	
	Verified	Date	Verified	Date

PREOPERATIONAL CHECKLIST

Mechanical

Lubrication	_____	_____	_____	_____
Alignment	_____	_____	_____	_____
Anchor bolts	_____	_____	_____	_____
Seal water system operational	_____	_____	_____	_____
Equipment rotates freely	_____	_____	_____	_____
Safety guards	_____	_____	_____	_____
Valves operational	_____	_____	_____	_____
Hopper purge systems operational	_____	_____	_____	_____
Sedimentation tank/hopper clean	_____	_____	_____	_____
O&M manual information complete	_____	_____	_____	_____

	Contractor		Construction Manager	
	Verified	Date	Verified	Date
<u>Electrical</u> (circuit ring-out and high pot tests)				
Circuits:				
Power to MCC 5	_____	_____	_____	_____
Control to HOA	_____	_____	_____	_____
Indicators at MCC:				
Red (running)	_____	_____	_____	_____
Green (power)	_____	_____	_____	_____
Amber (auto)	_____	_____	_____	_____
Indicators at local control panel				
Wiring labels complete	_____	_____	_____	_____
Nameplates:				
MCC	_____	_____	_____	_____
Control station	_____	_____	_____	_____
Control panel	_____	_____	_____	_____
Equipment bumped for rotation	_____	_____	_____	_____
<u>Piping Systems</u>				
Cleaned and flushed:				
Suction	_____	_____	_____	_____
Discharge	_____	_____	_____	_____
Pressure tests	_____	_____	_____	_____
Temporary piping screens in place	_____	_____	_____	_____
<u>Instrumentation and Controls</u>				
Flow meter FE2502F calibration	_____	_____	_____	_____
Calibration Report No. _____				
Flow recorder FR2502G calibrated against transmitter	_____	_____	_____	_____
VFD speed indicator calibrated against independent reference	_____	_____	_____	_____
Discharge overpressure shutdown switch calibration	_____	_____	_____	_____
Simulate discharge overpressure Shutdown	_____	_____	_____	_____

	Contractor		Construction Manager	
	Verified	Date	Verified	Date
FUNCTIONAL TESTS				
<u>Mechanical</u>				
Motor operation temperature satisfactory	_____	_____	_____	_____
Pump operating temperature satisfactory	_____	_____	_____	_____
Unusual noise, etc.?	_____	_____	_____	_____
Pump operation: 75 gpm/50 psig	_____	_____	_____	_____
Measurement:	Flow	_____	_____	_____
	Pressure	_____	Test Gauge#	_____
Alignment hot	_____	_____	_____	_____
Dowelled in	_____	_____	_____	_____
Remarks:	_____			

<u>Electrical</u>				
Local switch function:				
Runs in <i>HAND</i>	_____	_____	_____	_____
No control power in <i>OFF</i>	_____	_____	_____	_____
Timer control in <i>AUTO</i>	_____	_____	_____	_____
Overpressure protection switch PS2502C functional in both <i>HAND</i> and <i>AUTO</i>	_____	_____	_____	_____
Overpressure protection switch PS2502C set at 75 psig	_____	_____	_____	_____
PLC 2500 set at 24-hour cycle, 25 min <i>ON</i>	_____	_____	_____	_____

OPERATIONAL TEST				
Forty-eight hour continuous test. Pump cycles as specified, indicators functional, controls functional, pump maintains capacity, overpressure protection remains functional, hour meter functional.				
	_____	_____	_____	_____

RECOMMENDED FOR BENEFICIAL OCCUPANCY

Construction Manager _____ Date _____

ACCEPTED FOR BENEFICIAL OCCUPANCY

Owner's Representative _____ Date _____

01730-A. OPERATION AND MAINTENANCE TRANSMITTAL FORM:

Date: _____ Submittal No:² _____
 To: _____ Contract No: _____
 _____ Spec. Section: _____
 _____ Submittal Description: _____
 _____ From: _____
 Attention: _____

Checklist	Contractor		Construction Manager	
	Satisfactory	N/A	Accept	Deficient
1. Table of contents				
2. Equipment record forms				
3. Manufacturer information				
4. Vendor information				
5. Safety precautions				
6. Operator prestart				
7. Start-up, shutdown, and postshutdown procedures				
8. Normal operations				
9. Emergency operations				
10. Operator service requirements				
11. Environmental conditions				
12. Lubrication data				
13. Preventive maintenance plan and schedule				
14. Troubleshooting guides and diagnostic techniques				
15. Wiring diagrams and control diagrams				
16. Maintenance and repair procedures				

17. Removal and replacement instructions				
18. Spare parts and supply list				
19. Corrective maintenance man-hours				
20. Parts identification				
21. Warranty information				
22. Personnel training requirements				
23. Testing equipment and special tool information				

Remarks:

Contractor's Signature

²See paragraph 01300-4.0A, Transmittal Procedure.

01730-B. EQUIPMENT RECORD FORM:

MAINTENANCE REQUIREMENTS	D	W	M	Q	S	A	Hours

01730-C. EQUIPMENT RECORD FORM:

EQUIP DESCRIP		EQUIP LOC	
EQUIP NO.	SHOP DWG NO.	DATE INST	COST
MFGR		MFGR CONTACT	
MFGR ADDRESS			PHONE
VENDOR		VENDOR CONTACT	
VENDOR ADDRESS			PHONE

MAINTENANCE REQUIREMENTS	D	W	M	Q	S	A	Hours

11000-A. MANUFACTURER'S INSTALLATION CERTIFICATION FORM:

Contract No.: _____ Specification Section: _____

Equipment Name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the project manual, has been provided in accordance with the manufacturer's recommendations, and that the trial operation of the equipment item has been satisfactory.

Comments: _____

Date

Manufacturer

Signature of Authorized Representative

Date

Contractor

Signature of Authorized Representative

11000-B. MANUFACTURER'S INSTRUCTION CERTIFICATION FORM:

Contract No.: _____ Specification Section: _____

Equipment Name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer certifies that a service engineer has instructed the wastewater treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Startup procedure reviewed _____
Shutdown procedure reviewed _____
Normal operation procedure reviewed _____

Others: _____

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency) _____
Described special tools required _____
Described normal items to be reviewed for wear _____
Described preventive maintenance instructions _____
Described greasing frequency _____

Others: _____

Date _____ Manufacturer _____

Date _____ Signature of Authorized Representative _____

Date _____ Signature of Owner's Representative _____

Date _____ Signature of Contractor's Representative _____

(Job Title)

**CERTIFICATE OF UNIT RESPONSIBILITY
for Specification Section _____**

(Section title)

In accordance with paragraph 11000-1.02 C of the contract documents, the undersigned manufacturer accepts unit responsibility for all components of equipment furnished under specification Section _____. We hereby certify that these components are compatible and comprise a functional unit suitable for the specified performance and design requirements.

Notary Public

Name of Corporation

Commission expiration date

Address

Seal:
Duly Authorized Official

By: _____

Legal Title of Official

Date: _____

11060-A. MOTOR DATA FORM:

Equipment Name _____ Equipment No.(s) _____

Site Location _____

Nameplate Markings

Mfr _____ Mfr Model _____ Frame _____ HP _____

Volts _____ Phase _____ RPM _____ Service Factor _____

FLA _____ LRA _____ Freq _____ Amb temp rating _____ degrees C

Time rating _____ Design letter _____
(NEMA MG1-10.35) (NEMA MG1.16)

KVA code letter _____ Insulation Class _____

The following information is required for explosion Bproof motors only:

A. Approved by UL for installation in Class _____, Div _____

B. UL frame temperature code _____; Group _____ Atmosphere
(NEC Tables 5002 and 5002(b))

The following information is required for all motors 2 horsepower and larger:

A. Guaranteed minimum efficiency _____
(paragraph 11060-2.4G)

B. Nameplate or nominal efficiency _____

Data Not Necessarily Marked on Nameplate

Type of enclosure _____ Enclosure material _____

Temp rise _____ degrees C (NEMA MG112.41,42)

Space heater included? _____ Yes _____ No; if Yes, _____ watts _____ volts

Type of motor winding overtemperature protection, if specified; _____

Use the space below to provide additional information on other motor modifications, if specified:

16000-A. WIRE AND CABLE RESISTANCE TEST DATA FORM:

Wire or Cable No.: _____ Temperature, °F _____

Location of Test megohms Insulation
resistance,

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

16000-B. INSTALLED MOTOR TEST FORM:

Motor Equipment Number _____ Date of test _____

Equipment Driven _____

MCC Location _____

Ambient temp _____°F

Resistance:

Insulation resistance phase-to-ground megohms:

Phase A _____, Phase B _____, Phase C _____

Current at Full Load:

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Phase _____ Current, amps _____

Thermal Overload Device: Manufacturer/catalog # _____ Amperes _____

Circuit breaker (MCP) setting: _____

Motor Nameplate Markings:

Mfr _____ Mfr type _____ Frame _____ HP _____

Volts _____ Phase _____ RPM _____ **Service factor

Amps _____ Freq _____ Ambient temp rating _____°C

Time rating _____ **Design letter _____
(NEMA 110.35) (NEMA MG1.16)

Code letter _____ Insulation class _____

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED

Contractor's Representative

ate _____

WITNESSED

Owner's Representative

Date _____

16000-C. MOTOR CONTROL CENTER TEST FORM:

Equipment No. _____ Ambient room temperature _____

Location _____

A. MECHANICAL CHECK:

All bolted connections either bus to bus or cable to bus shall be torqued to the manufacturer's recommendations.

B. ELECTRICAL TESTS:

1. Measure insulation resistance of each bus section phase to phase and phase to ground for 1 minute using a megohmmeter at 1000 volts.

Test Results (megohms)

<u>Phase</u>		<u>Phase</u>	
AGRD	_____	AB	_____
BGRD	_____	BC	_____
CGRD	_____	CA	_____

2. Set the circuit breaker in the starter unit to comply with the requirements of NEC, Article 43052 and Table 430152.
3. Motor overload heater elements shall be sized and installed based on the actual nameplate full load amperes of the motor connected to the starter.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

16000-D. LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM:

Loop No. _____

List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

Wire No.	Panel Tie	Field TB	Continuity Resistance ^a		Insulation Resistance ^b			
			Cond./ Cond.	Cond./ Shield	Shield/ Gnd.	Shield/ Cond.	Cond./ Gnd.	Shield/ Shield
A			-	(A/SH)				
B			(A/B)	-				
C	(A/C)	-						
D			(A/D)	-				
etc.								

- a. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of ± 2 ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.
- b. Insulation Test. Connect one end of a 500 volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-E. PANEL INDICATOR CALIBRATION TEST DATA FORM:

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____

Scale: _____ Range: _____

PV Scale Calibration

<u>% of Range</u>	<u>Expected Input</u>	<u>Actual Reading</u>	<u>Reading</u>	<u>% Deviation</u>
0				
50				
100				

% Deviation Allowed: _____

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-F. SIGNAL TRIP CALIBRATION TEST DATA FORM:

Tag No. and Description: _____

Make and Model No.: _____ Serial No. _____

Input: _____

Scale: _____ Range _____

Set Point(s): _____

After setting set point(s), run signal input through entire range and calculate deadband.

<u>Set Point</u>	<u>Incr. Input Trip Point</u>	<u>Decr. Input Trip Point</u>	<u>Calc. Deadband</u>	<u>Required Deadband</u>
------------------	-----------------------------------	-----------------------------------	---------------------------	------------------------------

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-G. FIELD SWITCH CALIBRATION TEST DATA FORM:

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____

Scale: _____ Range: _____

Set Point(s): _____

Simulate process variable (flow, pressure, temperature, etc.) and set desired set point(s). Run through entire range of switch and calculate deadband.

<u>Set Point</u>	<u>Incr. Input Trip Point</u>	<u>Decr. Input Trip Point</u>	<u>Calc. Deadband</u>	<u>Required Deadband</u>
------------------	-----------------------------------	-----------------------------------	---------------------------	------------------------------

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-H. TRANSMITTER CALIBRATION TEST DATA FORM:

Tag No. and Description: _____

Make and Model No.: _____ Serial No.: _____

Input: _____

Scale: _____ Range: _____

Set Point(s): _____

Simulate process variable (flow, pressure, temperature, etc.) and measure output with appropriate meter.

<u>% of Range Deviation</u>	<u>Input</u>	<u>Expected Output</u>	<u>Actual Output</u>	<u>%</u>
0				
50				
100				

% Deviation Allowed: _____

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-I. MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM:

(For instruments not covered by any of the preceding test forms, the Contractor shall create a form containing all necessary information and calibration procedures.)

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-J. INDIVIDUAL LOOP TEST DATA FORM:

Loop No. _____

Description: (Give complete description of loop's function using tag numbers where appropriate.)

P&ID No.: (Attach copy of P&ID.)

- a. Wiring tested:
(Attach test form 17000A)
- b. Instrumentation tubing/piping tested:
(Attach test form 17000B)
- c. Instruments calibrated:
(Attach test forms 17000C through I)
- d. List step-by-step procedures for testing loop parameters. Test loop with instruments, including transmitters and control valves, connected and functioning. If it is not possible to produce a real process variable, then a simulated signal may be used with the Construction Manager's approval.

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

16000-K. LOOP COMMISSIONING TEST DATA FORM:

Loop No. _____

- a. Loop tested:
(Attach test form 17000J)
- b. Controlled or connected equipment tests confirmed:
- c. Give complete description of loop's interface with process.
- d. With associated equipment and process in operation, provide annotated chart trace of loop response to changes in set points for verification of performance. This chart should demonstrate 1/4amplitude damping as output adjusts to set point change. Show set points, starting and finishing times on chart, as well as any other pertinent data.

Connect 2pen recorder to process variable (PV) and to controller output. Use 1 inch/second chart speed.

Pen 1 - PV - Connections:

Pen 2 - Output - Connections:

CERTIFIED: _____ Date _____
Contractor's Representative

WITNESSED: _____ Date _____
Owner's Representative

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes furnishing materials, equipment and labor necessary to perform and complete demolition of items described in the Contract Drawings and associated appurtenances.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01045 Cutting and Patching
 - 2. Section 01530 Protection of Existing Facilities
 - 3. Section 01560 Temporary Environmental Controls
 - 4. Section 01700 Project Closeout
 - 5. Section 02200 Earthwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 – Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.5 SUBMITTALS

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Demolition Schedule: The CONTRACTOR shall submit a complete coordination schedule for demolition work including shut-off and continuation of utility services prior to start of the WORK. The schedule shall indicate proposed methods and operations of facility demolition, and provide a detailed sequence of demolition and removal work to ensure uninterrupted operation of occupied areas.

1.6 ASBESTOS REMOVAL

- A. The OWNER is responsible for the removal and disposal of any asbestos found in structures scheduled for demolition, prior to commencement of demolition work by the CONTRACTOR.

- B. If, during demolition work, any additional asbestos materials are being discovered, the CONTRACTOR shall stop the work immediately and notify the CONSTRUCTION MANAGER for further instructions. Work interruptions caused thereby are subject to the provisions in 6-1.5 "Change of Contract Time" of the Whitebook.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

2.1 GENERAL

- A. Structures shall be demolished and removed in compliance with SSPWC subsection 306-5 and the requirements indicated herein.

2.2 POLLUTION CONTROL

- A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used for dust suppression in compliance with Section 01560 – Temporary Environmental Controls.
- B. Water shall not be used when it creates hazardous or objectionable conditions such as flooding, erosion, sedimentation, or pollution.

2.3 PROTECTION

- A. Safe passage of persons around the area of demolition shall be provided. Operations shall be conducted to prevent injury to people and damage to adjacent buildings, structures, and other facilities in compliance with Section 01530 – Protection of Existing Facilities.
- B. Interior and exterior shoring, bracing, or supports shall be provided to prevent movement, settlement or collapse of structures to be demolished.
- C. Existing landscaping materials, structures, and appurtenances which are not to be demolished shall be protected and maintained as necessary and in accordance with Section 01530 – Protection of Existing Facilities.
- D. Unless otherwise indicated, the CONTRACTOR shall protect and maintain all utilities in the proximity of the facilities to be demolished.
- E. The CONTRACTOR shall protect the nearby existing equipment such as control panels and others from dust caused by demolition activities by covering, drop-curtains and other similar methods.

2.4 STRUCTURE DEMOLITION

- A. Building structures and appurtenances shall be demolished, as shown and required to complete work, in compliance with governing regulations.
- B. Small structures may be removed intact when approved by authorities having jurisdiction.
- C. Demolition shall proceed in a systematic manner, from top of structure to ground.
- D. Concrete and masonry shall be demolished in small sections. Use bracing and shoring to prevent collapse.

- E. Demolition equipment shall be dispersed throughout structure and demolished materials removed to prevent excessive loads on supporting walls, floors or framing.

2.5 BELOW-GRADE DEMOLITION

- A. Footings, foundation walls, below-grade construction and concrete slabs on grade shall be demolished and removed to a depth which will not interfere with new construction, but not less than 12 inches below existing ground surface or future ground surface, whichever is lower. All floors of basements, vaults, and other underground structures shall be broken up.
- B. Below-grade areas and voids resulting from demolition of structures shall be completely filled to a minimum compaction of 95%.
- C. All fill and compaction shall be in accordance with Section 02200 - Earthwork.
- D. After fill and compaction, surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures, or as indicated.

2.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Demolition and removal of debris shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the OWNER. Alternate routes shall be provided around closed or obstructed traffic ways.
- B. Site debris, rubbish, and other materials resulting from demolition operations shall be removed and disposed of in compliance all laws and regulations. Burning of removed materials from demolished structures shall not be permitted.

2.7 PATCHING AND REPAIRING

- A. The CONTRACTOR shall provide patching, replacing, repairing, and refinishing of damaged areas involved in demolition as necessary to match the existing adjacent surfaces and in compliance with Section 01045.
- B. The CONTRACTOR shall repair all damages caused to adjacent facilities by demolition at no additional cost to the OWNER.
- C. After patching and repairing has been completed, the CONTRACTOR shall carefully remove splatterings of mortar from adjoining work (plumbing fixtures, trim, tile, and finished metal surfaces) and repair any damage caused by such cleaning operations.

2.8 CLEANING

- A. During and upon completion of work, the CONTRACTOR shall promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a clean condition in accordance with Section 01700 – Project Closeout.
- B. Clean adjacent structures and facilities of dust, dirt, and debris caused by demolition and return adjacent areas to condition existing prior to start of work.
- C. The CONTRACTOR shall clean and sweep the affected portions of roads, streets, sidewalks and passageways daily.

** END OF SECTION **

SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes site preparation, clearing and grubbing.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01530 Protection of Existing Facilities
 - 2. Section 01550 Site Access and Storage
 - 3. Section 02050 Demolition
 - 4. Section 02140 Dewatering
 - 5. Section 02200 Earthwork
 - 6. Section 02270 Erosion Control
 - 7. Section 16421 Utility Service Entrance

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 – Reference Standards.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

- A. Existing Conditions: The site shall be examined and the CONSTRUCTION MANAGER notified of any conditions which affect the WORK of this Section.
- B. Utility Interference: Where existing utilities interfere with the WORK of this Section, the CONSTRUCTION MANAGER shall be notified of interferences.

3.2 CLEARING AND GRUBBING

- A. Clearing and grubbing shall comply with SSPWC Subsection 300-1 and the following:
 - 1. The site shall be cleared of grass and weeds to a depth of at least 6 inches and debris and obstructions including brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger than 6 inches in any dimension, broken or old concrete and pavement.

2. The site shall be grubbed to a depth necessary to remove objectionable material including stumps and roots.
- 3.3 SALVAGE AND DISPOSAL
- A. Salvage: Topsoil shall be salvaged and stored at a location which will not interfere with the WORK.
 - B. Disposal: Waste material shall be disposed of in accordance with SSPWC Subsection 300-1.3.

** END OF SECTION **

SECTION 02140 - DEWATERING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes site dewatering necessary to lower and control groundwater levels and hydrostatic pressures to permit excavation and construction to be performed properly under dry conditions.
- B. Dewatering operations shall be adequate to assure the integrity of the finished project. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.
- C. The CONTRACTOR shall bear the sole responsibility for the design, installation, and operation of the dewatering system to comply with the requirements of this section. The CONTRACTOR shall be required to install additional dewatering equipment as may be required throughout the duration of the project to maintain specified groundwater levels.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 1. Section 02200 Earthwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 – Reference Standards.

1.4 SCHEDULE AND PLAN

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 1. The CONTRACTOR shall make an independent investigation of the soil and groundwater conditions at each site. The results of the CONTRACTOR's independent investigation shall include the results of any and all exploratory borings, laboratory tests, and analyses. The CONTRACTOR's independent investigation shall be in report form.
 2. Prior to commencement of excavation, a detailed plan and schedule, with description, for dewatering of excavations, piezometers, estimated dewatering rates, volume and equipment requirements shall be submitted with the dewatering plan. The plan shall be signed and sealed by a California registered Civil Engineer, Geotechnical Engineer, Engineering Geologist or Hydrogeologist with experience of at least one dewatering operation of similar magnitude and complexity in a recently completed construction project. The qualification of the dewatering system designer shall be submitted to

CONSTRUCTION MANAGER for approval. The CONTRACTOR shall make an independent investigation of the soil conditions to be dewatered. The dewatering plan shall be prepared specifically to accommodate soil materials and groundwater conditions of the site.

3. Demonstration of proposed system and verification that adequate personnel, materials and equipment are readily available, including standby equipment.
4. A copy of the executed industrial waste permit approved by City of San Diego Public Utilities Department (PUD).

1.5 CONTROL AND OBSERVATION

- A. Adequate control shall be maintained to ensure that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavation or damage to structures does not occur.
- B. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed daily to detect any settlement which may develop.
- C. A daily report shall be maintained recording the following:
 1. Groundwater elevations of ground water and piezometric water levels in observation wells (if any).
 2. Change in elevation of reference points as stated in subsection 1.5 to detect settlement in adjacent structures. CONSTRUCTION MANAGER may suspend work if any settlement exceeds 0.05 feet.
- D. After dewatering is discontinued, a weekly report shall be maintained for two months recording:
 1. Change in elevation of reference points as stated in subsection 1.5 to detect settlement in adjacent structures.

1.6 INSPECTION

- A. During or after trench excavation, when CONTRACTOR observes sufficient groundwater to be present that may prevent proper installation of pipe bedding, pipelines, backfill and compaction, then CONTRACTOR shall call for inspection of conditions by the CONSTRUCTION MANAGER. The CONSTRUCTION MANAGER shall inspect the conditions and determine if unacceptable conditions are present for pipe installation.
- B. If unacceptable trench conditions are found by the CONSTRUCTION MANAGER, then the CONTRACTOR will be authorized to mobilize and start dewatering operations of the pipeline trench.
- C. Damp soils or low volumes of groundwater in the bottom of trenches are not sufficient cause for trench dewatering.

1.7 MEASUREMENT AND PAYMENT

- A. Separate payments shall be made as specified in the contract for providing all dewatering equipment and apparatus, for mobilization/demobilization of dewatering equipment, and for all dewatering operations.
- B. The CONTRACTOR shall also be responsible for all costs associated with the discharge of dewatering effluent into the sanitary sewer system of the City.
- C. Storm water run-off flowing into the excavation site shall be minimized to the maximum extent possible. All water entering the excavation site shall be subject to all dewatering requirements specified in this document.
- D. Protection of adjacent structures from adverse effects of dewatering shall be the responsibility of the CONTRACTOR.

1.8 PERMITS

- A. The CONTRACTOR shall obtain an Industrial Waste Discharge Permit from PUD for discharging effluent from dewatering operations into the City sanitary sewer system.
- B. The CONTRACTOR shall be responsible for all costs associated with obtaining all proper permits and for maintaining permit compliance, including all costs associated with permit violations.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Dewatering, where indicated, includes deep wells, well points, piezometers, sump pumps, temporary pipelines for water disposal, and rock or gravel placement, and other means including standby pumping equipment maintained on the jobsite continuously.

2.2 FOUNDATION ROCK

- A. Foundation rock shall be included in the dewatering system to replace weakened soil within the excavation. Rock shall be 1-1/2 inch maximum crushed stone placed in minimum 12-inch layers and completely wrapped in filter fabric. Foundation rock shall be used in addition to bedding material shown on the plans and shall be used at the CONTRACTOR'S discretion, or as directed by the CONSTRUCTION MANAGER. Foundation rock shall be considered to be part of the dewatering system.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. All water encountered in the trench shall be disposed by the CONTRACTOR in such a manner as will not damage public or private property or create a nuisance or health nuisance. The CONTRACTOR shall furnish, install, and operate pumps, pipes, appliances, and equipment of sufficient capability to keep trench excavation free from water until the trench is backfilled, unless otherwise authorized by the CONSTRUCTION MANAGER. No dewatering from inside the trench will be permitted while the pipeline is being installed, unless it is approved by the CONSTRUCTION MANAGER.

- B. Dewatering shall be performed in compliance with Subsection 306-3.3 of SSPWC and as specified herein.
- C. An independent assessment of the subsurface conditions shall be performed prior to submitting a dewatering plan. The assessment shall be signed and sealed by a California registered Geotechnical Engineer, Engineering Geologist or Hydrogeologist. The plan shall include, but not be limited to:
 - 1. Additional exploratory borings.
 - 2. Laboratory testing.
 - 3. Pump testing.

All boreholes and wells advanced by the CONTRACTOR shall be logged and submitted for review.

- D. An adequate system shall be designed, installed and maintained to lower and control the ground water to permit excavation, construction of structures, and placement of fill materials to be performed under dry conditions. The system shall include two piezometers at each structure and one piezometer at the midpoint of each pipeline reach. The piezometers shall be properly installed to accurately reflect the groundwater depth adjacent to the excavation.
- E. Sufficient dewatering equipment shall be installed to pre-drain the water-bearing strata below the bottom of foundations, sewers and other excavations.
- F. The hydrostatic head in water-bearing strata below foundations, drains, sewers and other excavations shall be reduced to ensure that the water level and piezometric water levels are below the excavation surface at all times. The piezometric water level shall be maintained a minimum of 3 feet below the excavation surface. No excavation shall be made without proof of required lowered groundwater levels.
- G. The system shall be placed into operation prior to excavation below ground water level to lower the ground water level and shall be operated continuously 24 hours a day, 7 days a week until drains, sewers and structures have been constructed and fill materials have been placed and dewatering is no longer required. Groundwater will need to remain depressed until adequate loading from proposed structures and uplift resistance to buoyant forces can be provided. All dewatering wells, well points and piezometers shall be installed under the supervision of a California registered Geotechnical Engineer, Engineer Geologist, or Hydrogeologist. The registered professional shall submit a written certificate that the system has been installed according to the dewatering plan.
- H. The site shall be graded to facilitate drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and then be pumped or drained by gravity away from the excavation and disposed of in compliance with the CWP Guidelines, and local, State and Federal regulations.
- I. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- J. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with foundation rock completely wrapped in filter fabric at no additional cost to the OWNER.

- K. Flotation of structures and facilities shall be prevented by maintaining a positive and continuous removal of water. The dewatering system shall be in continuous operation until all structure and pipelines are properly backfilled.
- L. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- M. An Industrial Waste Discharge Permit shall be obtained from PUD to discharge dewatering effluent into the sanitary sewer system.

If the laboratory results of the independent assessment of subsurface conditions show contamination levels above what is acceptable, a treatment system shall be provided under the bid allowances in the Bid Schedule.

- N. The release of groundwater to its original level shall be performed in such a manner as not to disturb natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

**** END OF SECTION ****

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the WORK.
- B. Fill material is defined as material used to raise the level of a portion of the site to the line and grade indicated. Backfill material is defined as material used to refill an excavation.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02050 Demolition
 - 2. Section 02100 Site Preparation
 - 3. Section 02140 Dewatering

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 – Reference Standards.

1.4 REGULATORY REQUIREMENTS

- A. The WORK of this Section shall comply with current versions, with revisions, of the following:
 - 1. Construction Safety Orders, Division of Industrial Safety, State of California.
 - 2. California Department of Transportation Traffic Manual.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. The CONTRACTOR shall comply with the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The CONTRACTOR, prior to beginning any trench or structure excavation 5 feet deep or over shall submit to the OWNER and shall be in possession of the OWNER's written acceptance of the CONTRACTOR's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system established in the Construction Safety Orders of the State of California, such alternative system plans shall be prepared by a civil or structural engineer licensed in the State of California.

2. Copy of the excavation permit issued by the California Department of Industrial Safety.
3. Samples of imported material. Samples shall be submitted in accordance with SSPWC, Subsection 306-1.3.5.
4. Such other samples of materials as the CONSTRUCTION MANAGER may require.

1.6 SOIL TESTING

- A. General: All soils testing shall be done in accordance with SSPWC, Section 211, and by a testing laboratory of the OWNER's choice at the OWNER's expense.
- B. Compaction Tests: Where soil material is required to be compacted to a percentage of maximum density, the maximum density shall be determined in accordance with the requirements of SSPWC, Subsection 211-2. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and shall be at the CONTRACTOR's expense.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

- A. General: Fill and backfill material shall consist of select material obtained from the excavation, imported material, granular bedding material, or unclassified material. The CONTRACTOR shall import at his expense materials in excess of the approved material obtained from excavation as required to complete the fill, backfill, and grading WORK as indicated.
- B. Select Material: Select material shall consist of primarily granular material encountered in the excavation which is free of vegetation, organic matter, debris, rocks larger than 4 inches in diameter and other unsuitable material, and shall have an expansion index less than 30 (less than 20 for footings and floor slabs) as determined by IBC Standard No. 29-2, plasticity index of 10 or less, a liquid limit of 30 or less and shall be approved as select material by the CONSTRUCTION MANAGER.
- C. Imported Material: Imported material shall conform to the same specifications as select material defined above. In addition, the imported materials shall have a minimum sand equivalent of 15 as determined by California Test Method No. 217. Imported material placed in areas to be planted shall be able to support normal plant growth. Obtain approval by the CONSTRUCTION MANAGER prior to transporting imported material.
- D. Bedding Material: Bedding material, defined as that material supporting, surrounding and extending to 1 foot above the top of a pipe, shall be in accordance with SSPWC, Subsection 306-1.2.1.
- E. Unclassified Material: Unclassified material shall conform to SSPWC, Subsection 300-4.

2.2 ROCK PRODUCTS

- A. Rock products, consisting of crushed rock, rock dust, gravel, sand, and stone for riprap shall be clean, hard, sound, durable, uniform in quality and free of disintegrated material, organic matter, oil alkali, or other deleterious substance, and shall, unless otherwise specified, conform to the requirements of SSPWC, Subsection 200-1.

2.3 UNTREATED BASE MATERIALS

- A. Untreated base materials shall conform to the requirements of SSPWC, Subsection 200-2.
- B. Materials for use as untreated base or subbase shall be:
 - 1. Crushed Aggregate Base

2.4 TOPSOIL

- A. Topsoil shall be designated as Class A (imported), Class B (selected), or Class C (unclassified), and shall conform to the requirements of SSPWC, Subsection 212-1.1. The CONSTRUCTION MANAGER shall determine the suitability of topsoil prior to use.

PART 3 - EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall perform earthwork as necessary to complete the WORK as shown on the Contract Drawings and specified herein. The CONTRACTOR shall take the necessary precautionary measures to prevent dust or other nuisances which might be created by reason of his activities. The necessary precautionary measures shall conform to the requirements of SSPWC, Subsection 7-8. The requirements specified in Subsection 7-8 shall be extended to include paved surfaces.
- B. All types of earthwork, including trench, structural and general excavation, fill, backfill and compaction, shall conform to applicable requirements of the SSPWC. Section 300, and to the requirements specified herein.

3.2 SITE PREPARATION

- A. Areas to be excavated, filled, graded, and to be occupied by permanent construction or embankments shall be prepared by clearing and grubbing. Clearing and grubbing shall conform to the applicable requirements of SSPWC, Subsection 300-1.

3.3 EXCAVATION

- A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. Unless otherwise directed, the removal of said materials shall conform to the lines and grades shown. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water as required by Section 02140 - Dewatering. Excavations shall be sloped or otherwise supported in a safe manner in accordance with the rules, orders, and regulations of the Division of Industrial Safety of the State of California.
- B. Unclassified Excavation: Unclassified excavation shall consist of all excavation, including roadways, unless separately designated.
 - 1. Unsuitable material shall be excavated and disposed of in accordance with the requirements of SSPWC, Subsection 300-2.2.

2. Wet material, if unsatisfactory for the specified use on the project solely because of high moisture content, may be processed to reduce the moisture content, or may be required to be removed and replaced with suitable material in accordance with the requirements of SSPWC, Subsection 300-2.2.2.
 3. The removal and disposal of slide and slipout material shall be in accordance with SSPWC, Subsection 300-2.4.
 4. Excavation slopes shall be finished in conformance with the lines and grades shown, and in accordance with SSPWC, Subsection 300-2.5.
 5. Surplus material shall be disposed of off-site, and in accordance with SSPWC, Subsection 300-2.6.
- C. Structure Excavation: Structure excavation shall consist of the removal of material for the construction of foundations for bridges, retaining walls, headwalls, culverts, buildings, or other structures, and shall be in accordance with SSPWC, Subsection 300-3.
1. Cofferdams for foundation construction shall be constructed in accordance with SSPWC, Subsection 300-3.2.
 2. The treatment of foundation material shall be in accordance with SSPWC, Subsection 300-3.3.
- D. Underground Conduit Excavation:
1. General: Excavation for underground conduits shall be in accordance with SSPWC, Subsection 306-1.1 and the requirements contained herein. Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the pipe shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches.
 2. Bracing Excavations: The manner of bracing excavations shall be as set forth in the rules, orders and regulations of the Division of Industrial Safety of the State of California, and in accordance with the requirements of SSPWC, Subsection 306-1.1.6.
 3. Trench Bottom: Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required.
 4. Open Trench: The maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights conforming to requirements set forth in the California Department of Transportation Traffic Manual shall be provided and maintained.

5. Trench Over-Excavation: Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth required, and then backfilled to the grade of the bottom of the pipe.
 6. Where pipelines are to be installed in embankment fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.
- E. Over-Excavation Ordered by CONSTRUCTION MANAGER:
1. Trenches shall be over-excavated beyond the depth shown when required by the CONSTRUCTION MANAGER. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR at no additional cost to the OWNER when the over-excavation ordered by the CONSTRUCTION MANAGER is less than 6 inches below the limits shown. When the over-excavation ordered by the CONSTRUCTION MANAGER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance.
- F. Over-Excavation not Ordered or Indicated:
1. Any over-excavation carried below the grade ordered or indicated shall be backfilled to the required grade with the specified material and compacted. Such work shall be performed by the CONTRACTOR at no additional cost to OWNER.
- G. Excavation in Lawn Areas:
1. Where excavation occurs in lawn areas, the sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if removed sod has remained stockpiled for more than 72 hours.
 2. The CONTRACTOR shall restore the lawn irrigation system removed or damaged due to excavation operations to a condition equal to the previous condition.
- H. Excavation in Vicinity of Trees:
1. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without written permission of the CONSTRUCTION MANAGER. Trees shall be supported during excavation by means previously reviewed by the CONSTRUCTION MANAGER.
- I. Rock Excavation:
1. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.

2. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the WORK, an appropriate adjustment of the contract price will be made.

3.4 FILL AND BACKFILL

A. General:

1. Fill and Backfill shall be placed in accordance with the applicable provisions of SSPWC, Section 300, and the requirements stated herein.
2. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has been properly cured in accordance with the requirements of Section 03300 – Cast-in-Place Structural Concrete and has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.
3. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall not be placed until all water is removed from the excavation.

B. Placing and Spreading of Materials:

1. Materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted, each layer shall not exceed 8 inches in thickness. When compaction is achieved using flooding and jetting methods, each layer shall not exceed 3 feet in thickness after compaction.
2. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Bedding materials shall be brought up evenly around the pipe so that when compacted, the material will provide uniform bearing and side support.
3. Where the material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
4. Where the material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

C. Compaction Requirements

1. Compaction tests shall be performed in accordance with SSPWC, Subsection 211-2.
2. The relative compaction of fill, backfill, and base material shall be in accordance with SSPWC, Section 300, with the following exceptions:
 - a. Subgrade where trench has been over-excavated: 95 percent
 - b. One foot layer of crushed aggregate backfill in over-excavated trench. Where trench is over-excavated more than 2 feet, minimum of 2 layers shall be compacted: 95 percent
 - c. Pipe zone for flexible rigid pipe: 95 percent

- d. Fill beneath structures, including water containing structures: 95 percent
- e. Backfill on underground structure roof: 90 percent

D. Unclassified Fill:

- 1. All fill shall be of unclassified material unless separately designated. Construction of unclassified fill, including preparing the area on which fill is to be placed, and the depositing, conditioning, and compacting of fill material shall be in accordance with SSPWC, Subsection 300-4.

E. Structure Backfill:

- 1. Backfill at structure shall be select material placed in accordance with SSPWC, Subsections 300-3.5 and 300-4.5.

F. Underground Conduit Backfill:

- 1. Bedding around pipe shall be bedding material placed in accordance with the requirements of SSPWC, Subsection 306-1.2.
- 2. Backfill above shall be considered as starting 1 foot above the pipe or conduit, or at the subgrade for cast-in-place structures such as manholes, transition structures, junction structures, vaults, and valve boxes.
- 3. Backfill at underground conduits shall be select material placed and densified according to SSPWC, Subsection 306-1.3.

3.5 PREPARATION OF SUBGRADE UNDER IMPROVEMENT

- A. The preparation of subgrade for pavement, curbs and gutters, driveways, sidewalks and other roadway structures shall be in accordance with SSPWC, Subsection 301-1.

3.6 UNTREATED BASE

A. Spreading and Compacting:

- 1. Aggregate base material shall be spread and compacted in accordance with SSPWC, Subsection 301-2.

**** END OF SECTION ****

SECTION 02270 - EROSION CONTROL (VEGETATIVE)

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing vegetative erosion control including fertilizing, seeding, planting and mulching for all areas as indicated.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02200 Earthwork
 - 2. Section 02900 Landscaping

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Catalogue information on fertilizer, seed, plants and mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Materials shall comply with SSPWC Subsection 212-1 and as indicated herein.
- B. Fertilizer: Fertilizer shall be a commercial, chemical type, uniform in composition, free-flowing, conforming to state and federal laws and suitable for application with equipment designed for that purpose. Fertilizer shall have a guaranteed analysis showing not less than 11 percent nitrogen, 8 percent available phosphoric acid, and 4 percent water soluble potash.
- C. Seed: Seed shall be delivered in original unopened packages bearing an analysis of the contents. Seed shall be guaranteed 95 percent pure with a minimum germination rate of 80 percent.

Seed mix shall be as identified in 02900.

- D. Mulch: Mulch shall be a fibrous, wood cellulose product produced for this purpose. It shall be dyed green and shall contain no growth or germination inhibiting substances, and shall be manufactured so that when thoroughly mixed with seed, fertilizer, and water in the proportions indicated, it will form a homogenous slurry which is capable of being sprayed.

PART 3 - EXECUTION

3.1 GENERAL

- A. Weather Conditions: Fertilizing, seeding, or mulching operations shall not be conducted when wind velocities exceed 15 miles per hour or when the ground is unduly wet or otherwise not in a tillable condition.
- B. Soil Preparation: The ground to be seeded or planted shall be graded in conformance with the Drawings and shall be loose and reasonably free of large rocks, roots, and other material which will interfere with the WORK.
- C. Method of Application: Fertilizer, seed, and mulch may be applied separately (Method A), or they may be mixed together with water and the homogeneous slurry applied by spraying (Method B), as specified in SSPWC Subsection 308-4.8.2, except that all slopes steeper than 3 units horizontal to 1 unit vertical shall be stabilized by Method B.

3.2 METHOD A

- A. Fertilizing: The fertilizer shall be spread uniformly at the rate of 800 lbs per acre (approximately 1 lb per 55 square feet). The fertilizer shall be raked in and thoroughly mixed with the soil to a depth of approximately two inches prior to the application of seed or mulch.
- B. Seeding: The seed shall be broadcast uniformly at the rate of 60 lbs/acre (approximately 1 lb per 730 sq ft). After the seed has been distributed, it shall be incorporated into the soil by raking or by other approved methods.
- C. Mulch Application: Mulch shall be applied at the rate of 1,500 lb (air dried weight) per acre (approximately 1 lb per 30 sq ft).

3.3 METHOD B

- A. Method B consists of the uniform application by spraying of a homogeneous mixture of water, seed, fertilizer, and mulch. The slurry shall be prepared by mixing the ingredients in the same proportions per acre as indicated above for Method A. The slurry shall have the proper consistency to adhere to the earth slopes without lumping or running. Mixing time of materials shall not exceed 45 minutes from the time the seeds come into contact with the water in the mixer to the complete discharge of the slurry onto the slopes, otherwise the batch shall be recharged with seed. The mixture shall be applied using equipment containing a tank having a built-in, continuous agitation and recirculation system, and a discharge system which will allow application of the slurry to the slopes at a continuous and uniform rate. The application rates of the ingredients shall be the same as those indicated for the Method A. The nozzle shall produce a spray that does not concentrate the slurry nor erode the soil.

3.4 WATERING

- A. The seeded and planted areas shall be watered so as to provide optimum growth conditions for the establishment of the vegetative ground cover. In no case, however, shall the period of maintaining such moisture be less than two weeks after the application of the seed or after sprigging.

3.5 MAINTENANCE

- A. The CONTRACTOR shall maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, as may be necessary, and sufficient watering to maintain the plant materials in a healthy condition. The CONSTRUCTION MANAGER may require replanting of any areas in which the establishment of the vegetative ground cover does not develop satisfactorily.

** END OF SECTION **

SECTION 02510 - A.C. PAVEMENT AND BASE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing asphalt concrete pavement, cement-treated base, and associated materials.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02100 Site Preparation
 - 2. Section 02200 Earthwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

PART 2 - PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. Base: Materials for aggregate base shall be crushed rock and rock dust complying with SSPWC Subsection 301-2.1.
- B. Tack Coat: Tack coat material shall comply with SSPWC Subsection 302-5.4.
- C. Asphalt Concrete: Asphalt concrete shall comply with SSPWC Subsection 400-4. Where construction of the pavement is to be accomplished in a single course, Class C2 grading shall be used. Where construction consists of 2 or more courses, the surface course shall be Class C2 grading and the lower courses shall be Class B3 grading. Paving asphalt of viscosity grade AR 8000 (for parking lots) shall be used.
- D. Pavement Marking Paint: Pavement marking paint shall comply with SSPWC Subsection 210-1.6.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Subgrade Preparation: The subgrade shall be prepared as specified in Section 02200 - Earthwork as applicable to roadways and embankment. Two-inch by 4-inch redwood headers shall be firmly staked in the proper positions along all edges other than those where the pavement is to be placed against existing concrete or paved surfaces.

- B. Cement-Treated Base: Cement-treated base shall be installed where indicated and to the thickness indicated. Construction of the cement-treated base shall comply with SSPWC Subsection 301-3.3.
- C. Tack Coat: A tack coat shall be applied in accordance with the requirements of SSPWC Subsection 302-5.4.
- D. Asphalt Concrete: Asphalt concrete paving shall be constructed in accordance with SSPWC Subsection 302-5.
- E. Traffic Marking: Application of paint shall comply with SSPWC Subsection 310-5.6.

** END OF SECTION **

SECTION 02575 - PAVEMENT REHABILITATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes removal and rehabilitation of pavement affected by CONTRACTOR'S operations such as trenching, modification to facilities or as otherwise indicated.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02200 Earthwork
 - 2. Section 02510 A.C. Pavement and Base
 - 3. Section 03280 Joints in Concrete Pavement
 - 4. Section 03310 Cast-in-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 PROJECT RECORD DRAWINGS

- A. The following shall be included in the PROJECT RECORD DRAWINGS in compliance with Section 01300 – Contractor Submittals:
 - 1. Drawings indicating the exact extent of pavement removed and rehabilitated.

PART 2 - PRODUCTS

2.1 ASPHALT CONCRETE

- A. Asphalt concrete shall conform to the requirements of SSPWC subsection 203-6. Composition and grading of the asphalt concrete mixture shall conform to SSPWC subsection 203-6.3.2, class F.
- B. Tack coat shall comply with subsection 302-5.4 of SSPWC.

2.2 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete shall comply with the requirements of subsection 201-1 of SSPWC; class 560-C-3250 per subsection 201-1.1.2 of SSPWC.

- B. Curing compound for concrete that is to be topped by an asphaltic wearing course shall comply with SSPWC subsection 201-4 and shall be asphaltic type. Pigmentation is not required.

PART 3 - EXECUTION

3.1 REMOVAL OF PAVEMENT

- A. Existing AC pavement shall be sawcut to a minimum depth of 1-1/2 inches or 25 percent of its thickness, whichever is greater.
- B. Removal of the existing cement concrete pavement for trench excavation shall be done in accordance with subsection 300-1.3 of SSPWC.

3.2 PLACEMENT OF PORTLAND CEMENT CONCRETE PAVEMENT

- A. Subgrade preparation shall be done in accordance with subsection 301-1 of the SSPWC.
- B. Prior to placing concrete, pavement edges shall be trimmed to neat horizontal and vertical lines. In case of AC pavement, a tack coat shall be applied to the existing pavement prior to placing cement concrete; while in the case of concrete pavement, the surface of edges shall be thoroughly wetted with water.
- C. Portland cement concrete pavement shall be reconstructed in accordance with the applicable provisions of SSPWC subsection 302-6.

3.3 PLACEMENT OF WEARING SURFACE COURSE FOR AC PAVEMENT

- A. In the case of rehabilitation of AC pavement, use only asphaltic type concrete curing compound.
- B. Apply tack coat, to cement concrete pavement surface after it has cured, in accordance with SSPWC subsection 302-5.4.
- C. Install asphaltic concrete, Class F, wearing course in accordance with the applicable provisions of SSPWC subsection 302-5.

**** END OF SECTION ****

SECTION 02600 - PIPELINE CONSTRUCTION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for pipelines, including pipe, joints, specials, and appurtenances, complete and in place.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01530 Protection of Existing Facilities
 - 2. Section 0214 Dewatering
 - 3. Section 0220 Earthwork
 - 4. Section 02666 Water Pipeline Testing and Disinfection
 - 5. Section 02730 Sanitary Sewerage System Testing
 - 6. Section 02900 Landscaping

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 02200 – Earthwork, and the pipe material specifications, the following shall be submitted in compliance with Section 01300 – Contractor Submittals.
 - 1. Post-installation videotape and inspection reports.
 - 2. Line layout and marking diagrams which indicate the specific number of each pipe and fitting and the location of each pipe and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of retained and/or welded joints, or of concrete encasement.
 - 3. Shop drawings and design calculations for joint restraint systems using reinforced concrete encasement of pressure pipe and fittings.
 - 4. Drawings and calculations for thrust blocks.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer. Materials delivered onsite without an approved submittal for verification shall be rejected and payment withheld.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.
- C. Protection of Equipment: Equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment with anti-friction or sleeve bearings shall be stored in weather tight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers shall not be used to prevent accumulation of condensate in gears and bearings. Gears and bearings to be stored for extended periods shall be containerized suitable for export shipment.

1.6 FACTORY INSPECTION AND TESTING

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors for the number of days indicated to complete such inspections or observations, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400 – Quality Control.

PART 2 - PRODUCTS

2.1 PIPE AND APPURTENANCES

- A. Provide pipe materials, coatings and linings, and appurtenances of the sizes and types indicated on the Drawings and comply with Section 02630 - Ductile Iron Pipe, Section 02644 - PVC Non-Pressure Pipe, and Section 02646 - PVC Pressure Pipe.

2.2 FILL AND BACKFILL MATERIAL

- A. Fill and backfill materials shall be in accordance with Section 02200 - Earthwork.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Traffic: Conform to requirements of Section 01570 – Traffic Regulation.
- B. Utility Relocation: Notify the CONSTRUCTION MANAGER of property which must be relocated of existing public utilities and franchise holders which must be relocated and the reasonable time for doing so. The OWNER will contact the utility or franchise holder and request relocation. Relocation and protection of existing utilities which are the CONTRACTOR's responsibility shall be in accordance with Section 01530 – Protection of Existing Facilities.
- C. Before submitting joint shop drawings, where the proposed piping will connect to existing piping, the CONTRACTOR shall excavate the point of connection to verify size, layout, and depth. Prepare a sketch of the proposed point of connection for submittal with the joint shop drawings. The CONTRACTOR shall give the CONSTRUCTION MANAGER a minimum of two hours to inspect the existing piping before backfilling.

3.2 DEWATERING

- A. Install and operate according to Section 02140 – Dewatering, a continuous dewatering system capable of maintaining the ground water level 2 feet below the excavated trench bottom. Only well points located on both sides of the trench shall be used for dewatering, unless otherwise approved by the CONSTRUCTION MANAGER.
- B. Operate the dewatering system 7 days per week, 24 hours per day with water level as indicated above until backfilling is completed.
- C. Field-determined departures from the dewatering plans may necessitate adjustments to the trench shoring and bracing methods to achieve soil stability. Adjustment shall be at no additional cost to the OWNER.
- D. Dewatering shall prevent softening of the bottom of excavations or formation of Aquick@ conditions. Dewatering shall not remove native soils. All loose soil shall be removed and re-compacted in accordance with Section 02200 - Earthwork.

3.3 EXCAVATION

- A. Unless indicated otherwise, excavation and over-excavation shall be in accordance with Section 02200 - Earthwork.
- B. Trench width shall be as indicated.
- C. Stabilize the trench subgrade by compaction to 95 percent relative density. Where trench bottom has been over-excavated, compact the bedding to 95 percent in 1-foot thick layers.

3.4 LAYOUT AND HANDLING

- A. Handling of Pipe and Accessories: Pipe shall be lifted in such a manner as to minimize bending and prevent damage to the pipe. During transport, pipe shall be supported to prevent distortion or damage to the pipe. When not being handled, pipe shall be stockpiled on timber cradles or properly prepared ground with all rocks larger than 3 inches eliminated. All pipe, fittings valves and accessories shall be carefully lowered into the trench in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. The CONTRACTOR shall smooth out any burrs, gouges, or weld splatter and repair other defects prior to laying the pipe. Any pipe section, including coatings and linings, that becomes damaged as a result of handling or stockpiling shall be replaced with a new unit or repaired at the discretion of the CONSTRUCTION MANAGER at no additional cost to the OWNER.

3.5 DIVERSION PUMPING

- A. Where the proposed piping will connect to existing piping which is in sewage service, install and operate bulkheads, plugs, piping, and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow.
- B. Design diversion piping, joints, and accessories to withstand 50 psi.
- C. No sewage shall be diverted into any open area outside of a sanitary sewer.
- D. In the event of spill or overflow, immediately stop the overflow and take action to clean up and disinfect the spillage area to original condition. Promptly notify the CONSTRUCTION MANAGER.

3.6 INSTALLATION

- A. General: Pipe shall be installed in accordance with the pipe manufacturer's recommendations and the applicable provisions of SSPWC Subsection 306-1.2, and the requirements herein.
- B. Interferences
 - 1. CONTRACTOR shall protect and maintain all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the WORK in compliance with Section 01530 – Protection of Existing Facilities. Where indicated that the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, or pipes, the obstruction shall be supported until it is relocated, removed, or reconstructed by the CONTRACTOR in cooperation with owners of such utility structures. Unless otherwise indicated, this WORK shall be performed at no additional cost to the OWNER.
 - 2. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the CONSTRUCTION MANAGER may direct a change in the alignment or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and integrity of the finished joint.
- C. Line and Grade Tolerance: Each section of pipe shall be laid in the order and position shown on the laying schedule. Unless indicated otherwise, the pipe shall be laid to the design line and grade, within approximately one-quarter (1/4) inch plus or minus. No tolerance is permitted on pipes designed for zero slope.
- D. Curved Alignments: Where curved alignments are indicated, deflecting the joints will be allowed only in accordance with the written instructions of the pipe manufacturer and these specifications. Where a smaller radius of curvature is required than can be accommodated by deflecting the joints, sections of pipe with beveled ends may be laid unless fabricated bends are indicated. Maximum joint deflection and maximum bevel for different pipe sizes and joint designs shall be in accordance with the pipe manufacturer's recommendations and these specifications.
- E. Cutting and machining of the pipe shall only be in accordance with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe, produce ragged, uneven edges, or otherwise impair the condition of the pipe.
- F. The CONTRACTOR shall install all pipe, fittings, closure pieces, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials, bolts, nuts, gaskets, jointing materials, and all other appurtenances as indicated and as required to provide a complete and workable installation. No pipe or appurtenance shall be installed when the interior or exterior surfaces show cracks or other defects that may be harmful as determined by the CONSTRUCTION MANAGER. Damaged interior and exterior surfaces shall be repaired to the satisfaction of the CONSTRUCTION MANAGER or a new undamaged pipe or appurtenance shall be provided.
- G. Pipe laying operations shall be stopped and dewatering operations shall be adjusted to prevent the pipe from floating due to water entering the trench from any source. The CONTRACTOR shall reinstall all affected pipe to its specified condition and grade.

- H. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean during and after laying. All openings in the pipe line shall be closed with water tight expandable type sewer plugs or PVC test plugs at the end of each day's operation or whenever the pipe openings are left unattended. The use of burlap, wood, or other similar temporary plugs will not be permitted.
- I. Immediately before placing each section of pipe in final position for jointing, the bedding shall be checked for firmness and uniformity of surface.
- J. Pipe shall be laid directly on the bedding material. No blocking will be permitted and the bedding shall form a continuous, solid bearing for the full length of the pipe. Excavate to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings and to facilitate placement of grout bands. Excavation shall be adequate to permit access to the joints for bonding operations and for application of coating on field joints.
- K. Backfilling and compaction shall comply with Section 02200 – Earthwork, and the pipe specifications.
- L. Sheet piling used for shoring shall extend at least 2 feet below the bottom of the trench. After completion of the pipe, it may be removed by cutting at least 12 inches above the top of the pipe. No vibratory methods for pile removal will be accepted, and piling lower than 12 inches above the top of the pipe shall be left in place.
- M. Lay section of pipe with the bell end upgrade.
- N. Except for short runs which may be permitted by the CONSTRUCTION MANAGER, sections of pipe shall be laid in a sequence moving in an upgrade direction on grades exceeding 10 percent. Pipe which is laid in a downgrade direction shall be blocked and held in place until sufficient support is furnished by the following pipes to prevent movement.
- O. Where indicated, concrete thrust blocks shall be provided.

3.7 FIELD TESTING

- A. Field testing shall be in accordance with Section 02666 – Water Pipeline Testing and Disinfection and 02730 – Sanitary Sewerage System Testing.

3.8 CORROSION CONTROL

- A. Joint Bonding/Test Stations: Except where otherwise indicated, all joints shall be bonded in accordance with the details indicated. The CONTRACTOR shall furnish all materials required for joint bonding and test station installations. The pipe shall be cleaned to bare bright metal at the point where the bond is installed. The pipe manufacturer shall be responsible for determining and implementing a suitable procedure and schedule for installation of bonding field versus factory versus combination in such a manner that the corrosion resistance of the lining and coating is not degraded by the bonding process. It may involve welding joint bonding pads, or welding the bonding wires in the factory before applying the lining and coating specified and/or may involve patching impaired areas in the factory or the field.

To accommodate attachment of the joint bonding pad, which is used to eliminate damage to the interior pipe lining “fusion-bonded epoxy” during the alumino-thermal welding, 2.5" x 2" x 0.375" thick pads of the same metal as the pipe shall be welded on both ends of the pipe prior to lining and coating. Following field welding of the bond wires to the pipe, the exterior coating shall be repaired per Section 09800 – Protective Coating. The CONTRACTOR shall use the proper size of alumino-thermal welding charge for installing the joint bonding wires.

3.9 SITE RESTORATION

- A. Backfill and compact soil in accordance with Section 02200 - Earthwork.
- B. Place subgrade and base materials in accordance with Section 02200 - Earthwork.
- C. Replace damaged pavement, curbs, gutters, and sidewalks, shrubs, and trees as indicated in SSPWC Subsection 306-1.5.2.
- D. Provide hydro-seeding in areas indicated. Grade surface as indicated on the Drawings. Provide a minimum of 4 inches of topsoil and apply hydro-seeding according to Section 02900.

** END OF SECTION **

SECTION 02630 - DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing ductile iron pipe and all appurtenant work. Fusion bond epoxy coating and lining material shall be furnished only by an OWNER-approved manufacturer.
- B. The WORK requires that one pipe manufacturer accept responsibility for furnishing the coated and lined pipe without altering or modifying the CONTRACTOR's responsibilities under the Contract Documents.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02140 Dewatering
 - 2. Section 02200 Earthwork
 - 3. Section 02600 Pipeline Construction
 - 4. Section 02666 Water Pipeline Testing and Disinfection
 - 5. Section 09800 Protective Coating
 - 6. Section 15000 Piping Components

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. AWWA C110/ANSI A21.10 Ductile-Iron and Gray-Iron Fittings
 - 2. AWWA C150/ANSI A21.50 Thickness Design of Ductile-Iron Pipe
 - 3. AWWA C151/ANSI A21.51 Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
 - 4. AWWA C153/ANSI A21.53 Ductile-Iron Compact Fittings for Water Service

5. ANSI/AWWA C203 Coal Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied
6. ANSI/AWWA C213 Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
7. ASTM D16 Terminology for Paint, Related Coatings, Materials, and Applications
8. ASTM D471 Test Method for Rubber Property – Effect of Liquids
9. ASTM D2240 Test Method for Rubber Property – Durometer Hardness
10. ASTM D4060 Test Method for Abrasion Resistance of Organic Coatings by Taber Abraser
11. ASTM D4541 Method for Pull-Off Strength of Coatings using Portable Adhesion Testers
12. ASTM E96 Test Methods for Water Vapor Transmission of Materials
13. ASTM G14 Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)
14. NAPF 500-3 Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings
15. References herein to “SSPC Specifications” or “SSPC” shall mean the published standards of the Steel Structures Painting Council, 40 24th Street, 6th Floor, Pittsburgh, PA 15222.
16. References herein to “NACE” shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 281340, Houston, TX 77218-8340.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 1. Certified dimensional drawings of all valves, fittings, and appurtenances.
 2. For pipe 24 inches in diameter and larger, line layout and marking diagrams which indicate the specific number of each fitting and the location and the direction of each fitting in the completed line.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. A certified affidavit of compliance for pipe and other products or materials with the requirements of this Section.

1.7 FACTORY INSPECTION AND TESTS

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors for one day required to complete such inspections or observations exclusive of travel days, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400 – Quality Control.
- B. Inspection: All pipe shall be subject to inspection at the place of manufacture and place of coating and lining application in accordance with the provisions of the referenced standards, as supplemented by the requirements herein. The CONTRACTOR shall notify the CONSTRUCTION MANAGER in writing of the manufacturing starting date not less than 14 calendar days prior to the start of the pipe manufacture and coating application.
- C. During the manufacture of the pipe, the CONSTRUCTION MANAGER shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.
- D. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.
- E. The CONTRACTOR shall perform said material tests at no additional cost to the OWNER. The CONSTRUCTION MANAGER will witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR'S schedule is not delayed for the convenience of the CONSTRUCTION MANAGER.
- F. In addition to those tests specifically required, the CONSTRUCTION MANAGER may request additional samples of any material including lining and coating samples for testing by the OWNER. The additional samples shall be furnished at no additional cost to the OWNER.

1.8 MARKING, HANDLING, AND STORAGE

- A. Markings: All pipes shall be factory marked indicating size and class. Legibly mark specials 24 inches in diameter and larger in accordance with the laying schedule and marking diagram. Mark the surface of each fitting and special that is intended to be at the top when the fitting or special is placed in the trench.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe And Fittings: Ductile iron pipe and fittings shall be in accordance with SSPWC, Subsection 207-9 and the requirements contained herein. The pipe shall be of the diameter and class indicated.

2.2 PIPE JOINTS

- A. Ductile iron pipe joints shall comply with the requirements of SSPWC, Subsection 207-9.2.2 and shall be of the type indicated.
- B. Restrained joints shall be an approved type provided and recommended by the pipe manufacturer.

2.3 MATERIALS

- A. Ductile Iron Pipe: Pipe materials shall conform to the requirements of SSPWC, Subsection 207-9.2, and AWWA C151.
- B. Polyethylene Sleeves: Polyethylene sleeves shall not be used.
- C. Wax-Tape: Wax-tape shall conform to the requirements of Section 09800 – Protective Coating.

2.4 SPECIAL FITTINGS

- A. Fittings of the compact type for ductile iron pipe shall conform to the requirements of AWWA C153/ANSI A21.53, and shall have a minimum pressure rating of 250 psi. Ductile iron fittings larger than 48-inch shall conform to the above referenced standard with the necessary modifications for the larger size.
- B. Fittings shall be of the diameter and class shown in the Specifications or the Plans. Compact type fittings shall only be used where expressly specified.

2.5 FUSION-BONDED EPOXY COATING AND LINING FOR DUCTILE IRON PIPE

- A. General: Ductile iron pipe, fittings, and specials shall be lined and coated with fusion bonded epoxy in accordance with Section 09800. Except as described below, the material system for the exterior and interior of ductile iron pipe and fittings installed underground or underwater shall be in accordance with ANSI/AWWA C213.
- B. Minimum Pipe Diameter: The minimum pipe diameter for application of an internal lining shall be 4 inches.
- C. Maximum Temperature: This material system shall be able to withstand a maximum service temperature of 190° F.
- D. Thickness: The powder shall be applied to the preheated pipe at a uniform cured thickness. The minimum uniform cured thickness of the applied material shall be as follows:
 - 1. Interior 30 mils
 - 2. Exterior 30 mils
 - 3. Maximum thickness shall be determined by the applicator based on the roughness of the pipe so as to obtain a holiday free product. Lining and coating thickness for pipe joints shall be compatible with the pipe dimensional tolerances.
- E. Degassifying:
 - 1. The pipe and fittings shall be heated to between 425° F and 475° F and held at that temperature for 60 minutes or until total outgassing is achieved.
- F. Blast Cleaning:
 - 1. The pipe surfaces to be covered in the plant shall be blast-cleaned with steel grit to achieve a near white surface conforming to SSPC SP10 or NACE TM-01-70 grade NACE No.1, as applicable to ductile iron pipe. Surface preparation shall be in accordance with NAPF 500-3.

G. Continuity Tests for Coatings with Thickness Exceeding 20 Mils:

1. Interior of pipe shall be electrically inspected at the factory for continuity at 3000 volts. At the option of the CONSTRUCTION MANAGER, if the number of holidays exceeds one per 3 linear feet of pipe 20 inches O.D. or smaller, or one per 2 linear feet of pipe over 20 inches O.D., the pipe shall be reprocessed. Unless reprocessed, all defects disclosed by the holiday detector shall be repaired in the shop according to Subsection 3.4 - Coating Repair of ANSI/AWWA C213.
2. Exterior of pipe shall be electrically inspected at the factory for continuity at 3000 volts. If the number of holidays exceeds one per 3 linear feet of pipe 20 inches in O.D. or smaller or one per 2 linear feet of pipe over 20 inches O.D., the CONSTRUCTION MANAGER will determine if the pipe coating shall be removed and reapplied or if holidays shall be repaired in the shop. Shop repairs shall be performed similar to the procedures in ANSI/AWWA C213.

H. Coating Repair and Field Touch-Up:

1. Exothermic weld connections required for the installation of bond cables across joints of the pipeline for cathodic protection shall be repaired and touched-up with 3M-312 coating material or equal.

I. Qualifications, Approval, and Documentation of Fusion Bond Epoxy Manufacturers

1. Qualifications: The fusion bond epoxy manufacturer shall have a record of at least one application of the proposed coating/lining material on a successfully performing ductile iron piping installation of comparable size and complexity constructed in the recent past.
2. Approval:
 - a. Bidders shall submit the name and documented qualifications of the manufacturer proposed for the fusion bond epoxy material. The OWNER will review and approve the proposed selection.
 - b. Documentation to be submitted by CONTRACTOR
 - (1) Documentation of at least one ductile iron pipe project constructed in the recent past and successfully performing under similar service conditions.
 - (2) The name, telephone number, and address of the owner and completion date and location for the project listed above.
 - (3) The name, telephone number, and address of the firm which applied the fusion bond epoxy in the project listed above.
 - (4) Descriptive literature, including Material Safety Data Sheet, for the proposed material.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE

- A. Ductile iron pipe shall be installed in accordance with the applicable provisions of SSPWC, Subsection 306-1.2, Section 02600 – Pipeline Construction, and the recommendations of the manufacturer.

- B. Apply wax-tape to all fusion-bonded epoxy coated buried couplings, fittings, valves and flanged joints in accordance with Section 09800 – Protective Coating, and the recommendations of the manufacturer.

3.2 FIELD TESTING FOR COATING CONTINUITY

- A. All exterior surface coatings, except for cement mortar, shall be inspected electrically immediately before the pipe is lowered into the trench, following the same requirements for factory inspection procedure and voltage indicated above for the protective material. All holidays shall be repaired before the pipe is placed in the trench.

3.3 CORROSION CONTROL

- A. Joint Bonding/Electrolysis Test Stations: Except where otherwise indicated, all joints shall be bonded in accordance with the details indicated. The pipe shall be cleaned to bare bright metal at the point where the bond is installed. The pipe manufacturer shall be responsible for determining and implementing a suitable procedure and schedule for installation of bonding (field versus factory versus combination) in such a manner that the corrosion resistance of the lining and coating is not degraded by the bonding process. It may involve welding joint bonding pads, or welding the bonding wires in the factory before applying the lining and coating specified and/or may involve patching impaired areas in the factory or the field.
- B. Bonding and Electrical Conductivity: All pipe joints shall be prepared for bonding for electrical conductivity in accordance with the details indicated. The CONTRACTOR shall furnish all materials required for joint bonding and electrolysis test station installations. To accommodate attachment of the joint bonding pad, which is used to eliminate damage to the interior pipe lining - fusion-bonded epoxy - during alumino-thermal welding, 2 1/2" X 2" X 3/8" thick ductile iron pads on both ends of the pipe shall be welded to the pipe prior to lining and coating. Bonding of consecutive ductile iron pipe and fittings 12-inch and smaller shall be accomplished by two AWG No. 6 wires with HMWPE insulation per joint. Following welding of the bond wires to the pipe, the exterior coating shall be repaired per Section 09800 – Protective Coating.
- C. Cathodic Protection: Corrosion mitigation and testing materials, such as an impressed current cathodic protection system, magnesium anodes, reference electrodes, and test lead wires shall be provided where indicated.

** END OF SECTION **

SECTION 02644 - PVC NON-PRESSURE PIPE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing underground PVC nonpressure pipe for gravity flow and all appurtenant work, complete in place.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 01530 Protection of Existing Facilities
2. Section 02140 Dewatering
3. Section 02200 Earthwork
4. Section 02600 Pipeline Construction
5. Section 02730 Sanitary Sewerage System Testing
6. Section 03310 Cast-in-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 1. ASTM D 2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 1. Samples of all the materials proposed for use on the WORK. The samples shall be clearly marked to show the manufacturer's name and product identification and shall be submitted along with the manufacturer's technical data and installation instructions.
 2. Shoring and bracing drawings in accordance with the requirements of Section 02200 - Earthwork.

3. Shop drawings and laying diagrams of all pipe, joints, bends, special fittings, and piping appurtenances.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. Manufacturer's certificates of compliance indicating that all materials furnished under this Section meet the requirements of the Contract Documents.

1.7 FACTORY TESTING

- A. The manufacturer shall perform all tests and submit the test results data and certification in compliance with SSPWC Subsection 207-17.4.

PART 2 - PRODUCTS

2.1 GENERAL

- A. PVC pipe, fittings, couplings and appurtenances shall comply with SSPWC Subsection 207-17.
- B. In addition to the identification marks specified in SSPWC 207-17.2.1, the CONTRACTOR shall also require the manufacturer to mark the date of extrusion on the pipe. This dating shall be done in conjunction with records to be held by the manufacturer for 2 years, covering quality control tests, raw material batch number, and other information deemed necessary by the manufacturer.
- C. All PVC pipe shall be suitable for joining by compression joints unless otherwise shown or indicated.

2.2 BEDDING MATERIAL

- A. Unless otherwise indicated, all material used for pipe bedding shall conform to the requirements of SSPWC Subsection 306-1.2.13, and the trench backfill material shall comply with Section 02200 - Earthwork.

PART 3 - EXECUTION

3.1 GENERAL

- A. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the CONSTRUCTION MANAGER, and shall be subject to his approval before acceptance
- B. Installation shall conform to the recommendations of pipe manufacturer, the requirements of ASTM D 2321, SSPWC Subsection 306-1.2.13, Section 02600 – Pipeline Construction, and as indicated herein.

3.2 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of Sections 02200 – Earthwork, 02600 – Pipeline Construction, and SSPWC Subsection 306-1.3.

- B. The minimum depth of cover over the top of the pipe shall be 36 inches unless otherwise shown. The width of the trenches shall be as indicated on the Drawings.
- 3.3 FIELD JOINTING
- A. Pipe shall be jointed in compliance with manufacturer's printed instructions.
- 3.4 COMPACTION OF PIPE BEDDING AND BACKFILL
- A. Compaction of pipe bedding and backfill material shall conform to the requirements of Sections 02200 – Earthwork and 02600 – Pipeline Construction.
- 3.5 TESTING
- A. Field testing of gravity sewer pipe shall conform to the requirements of Section 02730 – Sanitary Sewerage System Testing.

** END OF SECTION **

SECTION 02646 - PVC PRESSURE PIPE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing polyvinyl chloride (PVC) pressure pipe and all appurtenant work, complete in place.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, also apply to the extent required for proper performance of this WORK.
 1. Section 01530 Protection of Existing Facilities
 2. Section 02140 Dewatering
 3. Section 02200 Earthwork
 4. Section 02600 Pipeline Construction
 5. Section 02730 Sanitary Sewerage System Testing
 6. Section 03310 Cast-In-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current additions of the following apply to the WORK of this Section:
 1. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings
 2. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 3. ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and Appurtenances
 4. ANSI/AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-in Through 12-in, for Water Transmission and Distribution
 5. ANSI/AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-inch through 48-inch, for Water Transmission and Distribution

6. ASTM D2584 Test Method for Ignition Loss of Cured Reinforced Resins
7. PPI Technical Report TR 3/4 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
8. AWWA Manual M23 PVC Pipe - Design and Installation

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 - Contractor Submittals:
 1. Shop drawings and laying diagrams of all pipe, joints, bends, special fittings, and piping appurtenances.
 2. Shoring and bracing drawings in accordance with Section 02200 - Earthwork.
 3. Manufacturer's technical data and installation instructions plus samples of all materials proposed for use on the WORK. Samples shall be clearly marked to show the manufacturer's name and product identification.
 4. Test Reports from:
 - a. Hydrostatic proof testing
 - b. Sustained pressure testing
 - c. Burst strength testing

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. Manufacturer's certificates of compliance indicating that all materials provided under this Section meet the requirements of the Contract Documents.

1.7 FACTORY INSPECTION AND TESTING

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors for one day required to complete such inspections or observations exclusive of travel days, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400 – Quality Control.
- B. Inspection: All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The CONTRACTOR shall notify the CONSTRUCTION MANAGER in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

- C. During the manufacture of the pipe, the CONSTRUCTION MANAGER shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.
- D. Tests: Except as modified herein, pipe shall be tested in accordance with the requirements of this Section and AWWA C900 and C905, as applicable.
- E. The CONTRACTOR shall perform said material tests in accordance with the requirements of the Contract Documents. The CONSTRUCTION MANAGER will witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR'S schedule will not be delayed for the convenience of the CONSTRUCTION MANAGER.
- F. All expenses incurred in obtaining samples for testing shall be borne by the CONTRACTOR at no increased cost to the OWNER.
- G. In addition to those tests specifically required, the CONSTRUCTION MANAGER may request additional samples of any material for testing by the OWNER. The additional samples shall be furnished at no additional cost to the OWNER.

PART 2 - PRODUCTS

2.1 GENERAL

- A. PVC pressure pipe in sizes 4 through 12 inches shall conform to the applicable requirements of ANSI/AWWA C900 and pipe in sizes 14 through 24 inches shall conform to ANSI/AWWA C905. Pipe in both pipe size ranges shall also be subject to additional requirements indicated herein.
- B. All force main PVC pressure piping shall be Class 305 (DR 14).

2.2 PIPE DESIGN CRITERIA

- A. Pipe wall thickness for internal pressure shall be the greater of those calculated for the pressure type and safety factor below.
 - 1. Pipe in sizes from 4 inches to 12 inches shall be designed for a minimum wall thickness, t, or dimension ratio, DR, in accordance with paragraph A3 in Appendix A of ANSI/AWWA C900. Safety factor of 2.0 for sustained working pressures shall be considered.
 - 2. Pipe in sizes from 14 inches to 24 inches shall be designed for a minimum wall thickness, t, or dimension ratio, DR, in accordance with paragraph A3 of Appendix A of ANSI/AWWA C905. Safety factor of 2.0 for sustained working pressures shall be considered.
- B. Determination of Earth Loads: Earth loads on pipe from 4 inches to 24 inches shall be computed using the prism formula:

$$W_c = HwB_c$$

Where:

- W_c = Earth load in pounds per linear foot
- H = Depth of cover, feet
- w = 120 lb/ft³
- B_c = Outside diameter of pipe, feet

- C. Determination of Live Loads: In lieu of the method in paragraph A.4 of both standards, the truck live loads shall be determined using the method recommended by AASHTO in "Standard Specifications for Highway Bridges." For depths of cover less than 10 feet HS-20 live loads shall be added to the earth loads to determine the total load. For depths of cover 3 feet or less, HS-20 live load plus impact shall be included.
- D. Deflection Control: With reference to paragraph A.5 in both standards, the deflection of the pipe after installation shall not exceed 0.03 times the outside diameter. If the calculated deflection exceeds 0.03 times the outside diameter, the pipe class shall be increased or the quality of the pipe zone backfill shall be improved to achieve a higher modulus of soil reaction, E'. For purposes of calculation, values of E' shall be 1100 psi at 90 percent Standard Proctor; 1500 psi at 95 percent Standard Proctor. Similarly, the deflection lag factor for dead loads shall be 1.5 and the bedding constant shall be 0.1.

2.3 PIPE

- A. The pipe shall be of the diameter and pressure class or pressure rating indicated, shall be provided complete with rubber gaskets, and all specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for Dimension Ratios shall conform to the requirements of AWWA C900 or AWWA C905, as appropriate.
- B. Additives and Fillers: Unless otherwise required in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin). If requested by the CONSTRUCTION MANAGER, the additive and filler content shall be determined using the pyrolysis method as specified in ASTM D 2584.
- C. Joints: As indicated, all joints for the pipe shall be either an integral bell manufactured on the pipe or a restrained joint employing a harness, coupling, or gland type restraint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.
- D. Joint Deflection: Deflection at the joint shall not exceed 1.5 degrees or one-half the maximum deflection recommended by the manufacturer, whichever is less. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.

2.4 FITTINGS

- A. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110, Class 350 and Section 02630. Fittings shall be mechanical joint.

2.5 MARKING

- A. Pipe shall be identified in conformance with ANSI/AWWA C900 or C905, as appropriate.

PART 3 - EXECUTION

3.1 GENERAL

- A. All laying, jointing, and testing for defects and for leakage shall be performed in the presence of the CONSTRUCTION MANAGER, and shall be subject to approval before acceptance.

- B. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, ASTM D 2321, SSPWC Subsection 306-1.2.13 and Supplement Amendments, and to the supplementary requirements or modifications specified herein. Wherever the requirements of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.
- 3.2 PIPE STORAGE
- A. Storage: Pipe should be stored at the job site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe shall be stored in such a way as to prevent sagging or bending and shall be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.
- 3.3 TRENCHING AND BACKFILL
- A. Trench excavation and backfill shall conform to the requirements of Sections 02200 – Earthwork, and 02600 – Pipeline Construction, and as specified herein.
- 3.4 INSTALLATION OF BENDS, TEES, AND REDUCERS
- A. Ductile iron fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into the trench by means of rope, cable, chain, or other acceptable means without damage to the fittings or linings or coating. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the interior for handling. Fittings shall be carefully connected to the pipe or other facility, and joints shall be checked to insure a sound and proper joint. Recoat damaged coatings.
- 3.5 COMPACTION OF PIPE BEDDING AND BACKFILL
- A. Compaction of pipe bedding and backfill material shall conform to the requirements of Sections 02200 – Earthwork, and 02600 – Pipeline Construction.
- 3.6 INSTALLATION OF TAPE
- A. Warning tape, appropriate for the pipeline service, shall be placed on the backfill above pipelines, 2 feet below finished grade. Tape shall be continuous and shall not deviate outside the horizontal profile of the pipe.
- 3.7 FIELD TESTING
- A. Field testing shall conform to the requirements of Section 02730 – Sanitary Sewerage System Testing.

** END OF SECTION **

SECTION 02666 - WATER PIPELINE TESTING AND DISINFECTION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes flushing and testing of all pressure pipelines and appurtenant piping and disinfection of all pipelines and appurtenant piping for potable water, complete, including providing test water and all disposal thereof.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 01560 Temporary Environmental Protection

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- 1. ANSI/AWWA B300 Hypochlorites
- 2. ANSI/AWWA B301 Liquid Chlorine
- 3. ANSI/AWWA C651 Disinfecting Water Mains
- 4. APHA, AWWA, and WEF Standard methods for the Examination of Water and Wastewater

1.5 TESTING SCHEDULE

- A. The following shall be submitted:

- 1. A testing schedule, including proposed plans for water conveyance, control, and disinfection shall be submitted in writing for approval a minimum of 48 hours before testing is to start. The submittal shall also include the CONTRACTOR'S plan for the release of water from pipelines after testing and disinfection has been completed.

PART 2 - PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, temporary blow-offs, bulkheads, or other water control equipment and materials shall be determined and furnished by the CONTRACTOR. No materials shall be used which would be injurious to the pipeline or its future function.

- B. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
 - 1. In combination with appropriate gas flow chlorinators and ejectors;
 - 2. Under the direct supervision of an experienced technician;
 - 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

PART 3 - EXECUTION

3.1 GENERAL

- A. Unless otherwise indicated, potable water for testing and disinfecting water pipelines will be furnished by the CONTRACTOR. The CONTRACTOR shall also make all necessary arrangements for conveying the water to the points of use.
- B. All pressure pipelines shall be tested. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be performed in the presence of the CONSTRUCTION MANAGER.
- C. Disinfection operations shall be scheduled by the CONTRACTOR as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted by the OWNER.

3.2 HYDROSTATIC TESTING OF PIPELINES

- A. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. The CONTRACTOR shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. The CONTRACTOR shall provide sufficient temporary air tappings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.
- B. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the CONSTRUCTION MANAGER shall be taken.

- C. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 4 hours. The test pressure for distribution and transmission pipelines shall be 133 percent of the pipe pressure class indicated measured at the lowest point of the pipeline section being tested. The test pressure for yard piping shall be as indicated on the Piping Schedule measured at the lowest point of the pipeline section being tested. No pressure test will be required for a reservoir overflow line. All visible leaks shall be repaired in a manner acceptable to the CONSTRUCTION MANAGER.
- D. The maximum allowable leakage for distribution and transmission pipelines shall be 10 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 40-ft or greater lengths between joints and with rubber-gasketed joints and 20 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 20-ft or less lengths between joints and with rubber-gasketed joints. The maximum leakage for yard piping shall be as shown on the Piping Schedule. Pipe with welded joints shall have no leakage. In the case of pipelines that fail to pass the prescribed leakage test, the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines.

3.3 DISINFECTING PIPELINES

- A. General: All potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 using the Continuous-Feed Method as modified herein. Preliminary and final flushing shall be done at the ends of mains which have been hydrostatically tested.
- B. Chlorination: A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be approximately 50 mg/l. Care shall be taken to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water.
- C. Chlorine Residual Test: The OWNER will make 24-hour chlorine residual tests. The OWNER will notify the CONTRACTOR of the chlorine test result. Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/l.
- D. Repetition of Test: The disinfection testing procedure shall be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results shall be required after any unsatisfactory test. The tablet method shall not be used for repeated disinfection.
- E. Chlorinating Valves: During the process of chlorinating the pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the heavily-chlorinated water.
- F. Final Flushing: Final Flushing shall be done by the CONTRACTOR after he has been notified of a satisfactory chlorine residual test by the OWNER. After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for the intended use. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water at no additional cost to the OWNER.

- G. Disinfection of Connections: Pipe and appurtenances used to connect the newly installed water main shall also be disinfected in accordance with AWWA C651.
- H. Neutralization of Chlorinated Water: Neutralizing and disposing of chlorinated water shall be in accordance with Appendix "B" of AWWA Standard C651.

3.4 BACTERIOLOGICAL TESTING OF DISINFECTED PIPELINES

- A. The CONSTRUCTION MANAGER will collect 2 sets of samples at least 24 hours apart after completion of final flushing as indicated above. Samples will be taken at locations indicated in ANSI/AWWA C651 and will be tested for coliform organisms and standard plate count according to the latest edition of the Standard Methods for the Examination of Water and Wastewater. Laboratory costs of initial testing will be the OWNER's responsibility.
- B. If disinfection fails to produce satisfactory bacteriological counts, the pipe shall be reflused and will be resampled and retested. If counts from analysis of the second samples exceed the criteria in Standard methods, the pipe shall be re-disinfected and will be resampled and retested until satisfactory results are obtained. The CONTRACTOR shall be responsible for all repeat bacteriological testing costs.

** END OF SECTION **

SECTION 02667 - TESTING OF HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.2 WORK OF THIS SECTION

- A. The WORK of this Section includes cleaning, flushing, and testing, of all hydraulic structures and appurtenant piping, including conveyance of test water and all disposal thereof.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02730 Sanitary Sewerage System Testing
 - 2. Section 03300 Cast-in-Place Structural Concrete

1.3 TESTING PLAN

- A. The following shall be submitted in compliance with the shop drawing requirements of Section 01300 – Contractor Submittals:
 - 1. A testing schedule, including proposed plans for water conveyance, control and disposal shall be submitted in writing for approval a minimum of 14 days before testing is to start. The submittal shall include the methods to determine evaporation loss and the CONTRACTOR'S plan for the release of water from structures after testing has been completed.

PART 2 - PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. Temporary valves, bulkheads, or other water control equipment and materials shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the structure or its future function.

PART 3 - EXECUTION

3.1 GENERAL

- A. Except as otherwise indicated, potable water for testing will be furnished by the CONTRACTOR who shall also make necessary arrangement for conveying the water to the points of use.
- B. All hydraulic structures and appurtenant pressure piping shall be tested where indicated. All testing operations shall be done in the presence of the CONSTRUCTION MANAGER.
- C. Release of water from structures, after testing have been completed, shall be as reviewed by the CONSTRUCTION MANAGER, however, this review shall not relieve the CONTRACTOR of his obligations and responsibilities under this Contract.

3.2 PRELIMINARY CLEANING AND FLUSHING

- A. Prior to testing, all hydraulic structures shall be cleaned by thoroughly hosing down all surfaces with a high pressure hose and nozzle of sufficient size to deliver a minimum flow of 50 gpm. All water, dirt, and foreign material accumulated in this cleaning operation shall be discharged from the structure or otherwise removed.

3.3 TESTING OF HYDRAULIC STRUCTURES

- A. General: Testing shall be performed prior to backfilling, except where otherwise acceptable to the CONSTRUCTION MANAGER. Testing for concrete structures shall not be performed sooner than 14 days after all portions of structure walls and associated roof systems have been completed. The test shall consist of filling the structure with water to the maximum operating water surface. The rate of filling shall not exceed 24 inches of depth per day. All visible leakage shall be repaired.
- B. Leakage Test and Repairs: After the structure has been filled, the water loss leakage test shall be performed as follows:
 - 1. An initial water level reading shall be made. Seven days following the initial reading, a second reading shall be made.
 - 2. The structure shall be considered to have passed the test if water loss during the 7-day period, as computed from the two water level readings, does not exceed 0.2 percent of the total volume of water in the structure, after allowance is made for evaporation loss.
 - 3. If intermediate readings or observed leakage indicate that the allowable leakage will be exceeded, the test may be terminated before the end of the 7-day period and appropriate action taken to correct the problem before commencing a new 7-day test period.
 - 4. Should the structure fail to pass the test, the test shall be repeated for up to 3 additional 7-day test periods.
 - 5. If, at the end of 28 days, the structure still fails to pass the leakage test, the CONTRACTOR shall empty the structure as acceptable to the CONSTRUCTION MANAGER and shall examine the exterior and interior for evidence of any cracking or other conditions that might be responsible for the leakage. Any cracks shall be repaired and sealed with polyurethane sealant in accordance with Section 03300 – Cast-in-Place Structural Concrete. Any evidence of leakage shall be repaired. Following these operations, the CONTRACTOR shall again test the hydraulic structure. In the case of a reservoir, the retesting shall again be combined with disinfection, exclusive of the spraying operation.
- C. Acceptance: The structure will not be accepted as completed until the water loss leakage test is passed and all visible leakage repaired.

3.4 TESTING OF APPURTENANT PIPING

- A. Piping appurtenant to hydraulic structures shall be tested as specified in Section 02730 – Sanitary Sewerage System Testing.

** END OF SECTION **

SECTION 02701 - PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing precast concrete manholes and related appurtenances.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02140 Dewatering
 - 2. Section 02200 Earthwork
 - 3. Section 06650 Plastic Liner for Concrete Surfaces
 - 4. Section 09800 Protective Coating

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM A 48 Specification for Gray Iron Castings
 - 2. ASTM C 478 Specification for Precast Reinforced Concrete Manhole Sections

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Design calculations and detailed drawings of manhole component sections.
 - 2. Shop drawings of cast iron frames and covers, and all appurtenances.

1.5 INSPECTION

- A. After installation, the CONTRACTOR shall demonstrate to the CONSTRUCTION MANAGER that all manholes have been properly installed, level, with tight joints, and at the correct elevations.

PART 2 - PRODUCTS

2.1 MANHOLE SECTIONS

- A. Precast concrete manhole risers, grade rings, tops, cones, and base sections shall be designed and constructed in accordance with the requirements of ASTM C 478.

- B. Mortar for joining manhole sections shall consist of 1 part cement to 2-1/2 parts of sand by volume.
- C. Risers, base sections, and all exposed concrete shall be lined with PVC sheet complying with Section 06650 – Plastic Liner for Concrete Surfaces. PVC shall be T-Lock or Linabond.

2.2 FRAMES AND COVERS

- A. Manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Unless otherwise indicated, manhole frames and covers shall be heavy duty cast iron type with 36-inch opening. Manhole cover insert shall be 24-inch diameter with lettering "CITY OF SAN DIEGO" and "SEWER" following the arrangement similar to what is indicated on Standard Drawing M-1.

Manholes located outside of the public right-of-way shall have covers locked to the frame as indicated on Standard Drawing SDM-113.

Imported covers, cover inserts, and frames shall have the country of origin marking in compliance with federal regulations.

2.3 WARNING SIGNS

- A. The entrance to every unventilated manhole shall be fitted with a plastic warning sign, located 12 inches below the top of the manhole frame, with the inscription "CAUTION - VENTILATE BEFORE ENTERING" in clear letters no smaller than 1/2-inch in height. The sign shall be attached to the concrete with four Type 316 stainless steel screws and anchors.

2.4 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):
 1. Manhole Sections: Ameron; Jensen Precast; Oldcastle Precast
 2. Frames and Covers: Neenah Foundry Co.; Alhambra Foundry Co.
 3. Warning Sign: W.H. Brady Company; Seton Identification Products

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Precast concrete manholes shall be installed in strict conformance with the manufacturer's written instructions, on a well-compacted foundation.

3.2 INSPECTION

- A. Upon request, the CONTRACTOR shall provide the CONSTRUCTION MANAGER a workman with ladder or other safe and adequate means for inspection access.

**** END OF SECTION ****

SECTION 02715 - PVC LINER SPOT REPAIR

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing repairs to existing PVC liner in manholes and pumping stations at locations indicated on the Drawings. Repairs shall employ fully-adhered PVC sheet applied to prepared surfaces.
- B. The WORK of this Section requires that materials and installation procedures be from Linabond, Inc. No substitutions will be considered.

1.2 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.3 REGULATORY REQUIREMENTS

- A. The WORK of this Section shall comply with the current versions of the following:
 - 1. Construction Safety Orders, Division of Industrial Safety, State of California.
 - 2. California Department of Transportation Traffic Manual

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

ASTM D 746	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM C 805	Test Method for Rebound Number of Hardened Concrete
ASTM D 882	Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
ASTM D 1004	Standard Test Method for Tear Resistance of Plastic Film and Sheeting
ASTM D 2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D 4258	Practice for Surface Cleaning Concrete for Coating
ASTM D 4259	Practice for Abrading Concrete

ASTM D 4262 Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. In addition to the shop drawings required by SSPWC Subsection 500-1.1.2, the following shall be submitted.
 - a. A written verification at least 2 days before commencing patching that the sewer and manholes are free of obstructions and debris and are in suitable condition for repairs.
 - b. Manufacturer's technical literature on the proposed repair system, including an affidavit attesting to the previous successful use of the material for lining sanitary manholes and pumping stations.
 2. Written certification from the manufacturer that the proposed Subcontractor is licensed by Linabond, Inc. to install the indicated System.
 3. Copy of Linabond, Inc. certification for each individual who will apply the System.
 4. Manufacturer's application instructions, including details of seams and terminations, Material Safety Data Sheets, maximum storage life and storage condition requirements, mixing and proportioning requirements, environmental requirements for worker safety such as ventilation, humidity, and temperature, thickness of activator and mastic and seam material applied to the existing PVC liner and at joints, and curing time requirements.

1.6 INSTALLER QUALIFICATIONS

- A. The CONTRACTOR or subcontractor performing the WORK of this section shall be licensed by the repair system manufacturer. Each individual installing the repair material shall be certified by the manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Repair shall be made with a fully adhered mastic and polyvinyl chloride (PVC) sheet applied to prepared surfaces of existing concrete and PVC liner. Repairs shall be leakproof under a minimum external hydrostatic pressure equal to the lateral pressure of saturated soils outside the wall.
- B. Applications of the repair material shall be performed under the supervision of a technical representative of the manufacturer who shall be present at the site during repair operations.

2.2 MATERIALS

- A. Primer: Primer shall be a 2-component high solids material recommended by the repair system manufacturer for concrete surface preparation.
- B. PVC Sheet Liner: Polyvinyl chloride lining material shall be a 30 mil thick homogenous thermoplastic sheet recommended by the repair system manufacturer. Liner shall conform to SSPWC Subsection 210-2 except that paragraphs 210-2.4.2 and 210-2.4.4 shall not apply.

1. Instead of the properties in Table 210-2.2(A), the PVC sheet shall have the following properties:

<u>Property</u>	<u>Standard</u>	<u>Initial Requirement</u>	<u>After Exposure</u>
Specific gravity	ASTM D 792	1.33	1.20
Hardness, Shore A	ASTM D 2240	84	--
Tensile Strength	ASTM D 882	2300 psi	2070 psi
Elongation	ASTM D 882	300 percent	270 percent
Brittle Point, ModE	ASTM D 746	-30 degrees C	--
Tear Strength	ASTM D 1004	250 ppi	225 ppi
Color		White	--

- C. Surface Activator: Surface activator shall provide cross linking with the PVC sheet liner and the seam material. Surface activator shall be as required by the manufacturer.
- D. Seam Material: Seam material shall retain chemical and adhesive properties while permitting relatively flat, smooth laps between adjacent PVC sheets. Seam material shall be as required by the manufacturer.
- E. Chemical Resistance: The PVC sheet liner, sealant material, and surface activator shall act as a cured seam through molecular bonding and shall conform to the chemical resistance test requirements of SSPWC subsection 210-2.3.3 for chemical solutions at listed concentrations. SSPWC subsection 210-2.3.4 shall not apply: the criteria above shall apply.
- F. Hydraulic Plug: Quick-setting material recommended by the manufacturer for sealing active leaks into sewers. Material shall be compatible with the seam material.

PART 3 - EXECUTION

3.1 PRODUCT, DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be shipped in original manufacturer's containers and such additional packaging as needed to protect the material from damage during transport. Containers shall be plainly labeled to show manufacturer's name, product name, batch number, date of manufacture, quantity of contents, and storage requirements.
- B. Stored materials shall be protected from excessive heat, cold, and weathering. PVC sheeting pretreated with activator prior to delivery to the job site shall be protected from debris contamination and be maintained at 70 degrees F minimum.

3.2 WORKING CONDITIONS

- A. The CONTRACTOR is hereby notified that the wet well is a permit required confined space.
- B. Wastewater will continue to flow through the manholes during liner repair, and the CONTRACTOR shall be prepared to perform liner repair during prevailing flow conditions or to divert the sewage as indicated below. Liner repair operations shall not be performed if weather conditions are such that anticipated wastewater flows can exceed diversion pumping capacity or depths that prevent proper and safe work within the sewer. Liner repair operations shall be conducted only when the sewage level is at minimal depth.
- C. The CONTRACTOR shall employ means and methods which prevent blockage and minimize surcharge of wastewater in upstream manholes and tributary pipelines.

3.3 DIVERSION PUMPING

- A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow upstream.
- B. Design all piping, joints, and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater. A spare pump and piping shall be at the site, ready for use in case of a breakdown.
- C. In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up spillage and disinfect the spill area to the satisfaction of the CONSTRUCTION MANAGER.

3.4 CLEANING AND SURFACE PREPARATION

- A. Cleaning and Debris Removal:
 - 1. Prior to blasting the concrete surfaces and installing the new liner systems, the CONTRACTOR shall remove all accumulated debris and dispose of it in compliance with all Federal, State and local regulations. Debris includes sludge, dirt, sand, rocks, grease, roots, and other solid or semi solid materials.
 - 2. Remove defective PVC liner from the entire damaged area plus 2 inches in all directions.
 - 3. The CONTRACTOR shall employ suitable equipment to collect all debris dislodged during cleaning operations. At a minimum, debris shall be removed prior to the end of each day and shall be disposed of daily at an approved off-site location. Hauling containers shall be watertight.
 - 4. Active leaks, if present, shall be sealed by application of hydraulic plug material.
- B. Surface Preparation: The CONTRACTOR may choose any of the surface preparation methods below that will produce a clean, contamination-free, sound, roughened surface acceptable to the manufacturer's representative.
 - 1. Wet Abrasive Blast: Water and blast material at 80 psi or greater at the nozzle. Abrasive shall be free of arsenic and free silica. Residue shall be removed by washing with water and brushing if necessary.
 - 2. Hydroblast: Water pressurized to at least 6000 psi.
 - 3. Dry Sandblasting: Air and blast material at 80 psi or greater at the nozzle. Abrasive shall be free of arsenic and free silica. Residue shall be removed by brushing, vacuuming, or oil-free compressed air.

3.5 SURFACE TESTING

- A. The surface of the abraded concrete shall be tested for soundness by the use of an impact rebound testing device (Schmidt hammer) with a measurement accuracy of plus or minus 500 psi, in accordance with ASTM C 805. Testing shall be performed by the CONTRACTOR in the presence of the manufacturer's representative and the CONSTRUCTION MANAGER. Abraded concrete shall have a compressive strength of 3000 psi or further surface preparation shall be undertaken.

- B. The pH of the abraded surface shall be tested according to ASTM D 4262. The acceptable pH range for the prepared surface shall be greater than 7 and less than 11 unless the manufacturer's representative accepts otherwise. Surfaces with pH less than 7.0 shall be reblasted and retested until the pH is in the acceptable range. All testing shall be performed by the CONTRACTOR in the presence of the manufacturer's representative and the CONSTRUCTION MANAGER.
- C. The manufacturer's representative shall inspect the prepared surfaces and observe the surface testing above and approve surface conditions before repairs begin.

3.6 REPAIR

- A. Repair and surface preparation operations shall be separated sufficiently that contamination with abrasive does not occur.
- B. Prior to application of the primer, the abraded concrete shall contain no more than 30 percent moisture when tested by a Delmhorst Moisture Meter Model "DP". Surfaces contaminated by sewage or debris shall be cleaned and dried before application of the lining system. The CONTRACTOR shall be responsible for methods and equipment to achieve a dry condition. If compressed air equipment is utilized, it shall be equipped with an oil filter.
- C. Existing PVC liner shall be solvent-cleaned to remove grease and oil for a minimum of 6 inches in all directions from an area which will be repaired.
- D. Areas deteriorated to the degree that an uneven, unsightly lined surface will result shall be repaired with a polymer cement patching compound acceptable to the repair system manufacturer.
- E. Patch:
 - 1. Proportioning and Mixing: Materials shall be mixed and proportioned in accordance with the manufacturer's written instructions using the equipment recommended by the manufacturer.
 - 2. Primer: Apply primer to clean, prepared and dry, sound concrete at the rate recommended by the manufacturer and allow to cure adequately.
 - 3. Seam Material on Primer: Apply seam material over primer to provide a smooth surface for application of liner. Thickness of seam material shall be as recommended by the system manufacturer.
 - 4. Activator: The CONTRACTOR may use preactivated sheets or apply activator at the site. Apply activator to clean, dry PVC sheets in accordance with manufacturer's instructions. Allow to dry "tack-free" prior to applying sheet. Activator shall be applied to sheets in a warm (70 degree F minimum), protected environment. Protect prepared sheet from debris contamination. Do not exceed the manufacturer's recommended elapsed time between application of activator to sheet and application of sheet to mastic and seam material.
 - 5. Sheet Liner:
 - a. Seams between new sheets of liner shall overlap a minimum of 4 inches in the downstream direction of wastewater flow. Apply seam material as recommended by the manufacturer.

- b. The activator-prepared surface of the new PVC sheet shall be pressed onto the tacky seam material and be rolled carefully to remove trapped air.
6. Sheet Liner Terminations: Where the new lining meets the existing lining, the new liner shall overlap the existing liner by a minimum of four inches. Termination of new liner on concrete at upstream, downstream, top, and bottom edges shall be in accordance with the shop drawings and the manufacturer's recommendations.

3.7 FIELD TESTING

- A. The liner will be inspected by the CONSTRUCTION MANAGER for proper adhesion, air pockets, edges or seam defects, rips, tears, and punctures. Defective repairs shall be removed, replaced, and retested.
- B. The newly applied PVC liner shall be spark tested and any lining failing to meet the spark test shall be properly repaired and retested. The spark testing shall be done with a Tinker and Razor Holiday Detector set at 20,000 volts.
- C. Areas failing the spark test shall be repaired by trimming, application of new mastic or seam material, as determined by the manufacturer's representative, and activated PVC sheet, overlapping the acceptable repairs at least 4 inches all around.

** END OF SECTION **

SECTION 02730 - SANITARY SEWERAGE SYSTEM TESTING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes testing of sanitary sewerage systems.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02630 Ductile Iron Pipe
 - 2. Section 02644 PVC Non-Pressure Pipe
 - 3. Section 02646 PVC Pressure Pipe

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:
 - 1. International Plumbing Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/ASTM F 1417 Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
 - 2. AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances
 - 3. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Proposed plans for testing, and for water conveyance, control, and disposal, design and manufacture data for the mandrel (if proposed) and minimum 48-hour advance written notice of proposed testing schedule, for review by the CONSTRUCTION MANAGER.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The WORK of this Section includes temporary valves, plugs, bulkheads, and other air pressure testing and water control equipment and materials. No materials shall be used which would be injurious to piping systems and future function. Air test gages shall be laboratory-calibrated prior to the leakage test.

PART 3 - EXECUTION

3.1 GENERAL

- A. Except as otherwise indicated, water for testing will be furnished by the CONTRACTOR and the OWNER is not responsible for conveying the water to the points of use.
- B. Release of water from pipelines, after testing has been completed, shall be performed in the presence of the CONSTRUCTION MANAGER.
- C. Testing shall be performed in the presence of the CONSTRUCTION MANAGER.

3.2 TESTING OF PIPE FOR LEAKAGE

- A. General: Sewer pipes shall be tested for leakage in compliance with SSPWC Subsection 306-1.4 except as modified herein. Testing shall be completed prior to resurfacing. When leakage exceeds the indicated limits, piping shall be repaired or replaced and leakage shall be reduced to the indicated limits.
- B. Water Exfiltration Test: The water exfiltration test shall comply with SSPWC Subsection 306-1.4.2 except that the measurements of water level and head shall be from the centerline of the pipe instead of the invert, and allowable leakage shall be determined as follows:

$$E = 0.000012 LD(H)^{1/2}$$

Where:

E = Allowable leakage in gallons per minute of sewer tested.

L = Length of sewer and lateral connections tested, in feet.

D = Internal diameter of the pipe in inches.

H = Difference in elevation in feet between the water surface in the upper manhole and the centerline of the pipe at the lower manhole; or if ground water is present above the centerline of the pipe in the lower manhole, the difference in elevation between the water surface in the upper manhole and the ground water at the lower manhole.

- C. Water Infiltration Test: The water infiltration test shall comply with SSPWC Subsection 306-1.4.3 except that the measurements of water level and head shall be from the centerline of the pipe instead of the invert, and allowable leakage shall be determined as follows:

$$E = 0.000012 LD(H)^{1/2}$$

- D. Air Pressure Test: The air test shall comply with SSPWC Subsection 306-1.4.4. Joints may be air tested individually with the use of specialized equipment provided the joint testing procedure is submitted for the CONSTRUCTION MANAGER's review prior to testing. Prior to each test, the pipe at the joint shall be wetted with water. The maximum test pressure shall be 3.0 psi. The maximum allowable pressure drop shall be 1.0 psi over a 30-second test period.
- E. Hydrostatic Testing of Sewage Forcemains:
1. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. The CONTRACTOR shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. The CONTRACTOR shall provide sufficient temporary air tappings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the test, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling. Testing shall be conducted and acceptability determined in accordance with AWWA C600/C605.
 2. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the CONSTRUCTION MANAGER shall be taken.
 3. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 4 hours. The test pressure for sewage forcemains shall be 133 percent of the pipe pressure class shown or specified measured at the lowest point of the pipeline section being tested. The test pressure for yard piping shall be as shown or specified on the Piping Schedule measured at the lowest point of the pipeline section being tested. All visible leaks shall be repaired in a manner acceptable to the CONSTRUCTION MANAGER.
 4. The maximum allowable leakage for sewage forcemains shall be 10 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 40-ft or greater lengths between joints and with rubber-gasketed joints and 20 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 20-ft or less lengths between joints and with rubber-gasketed joints. The maximum leakage for yard piping shall be as shown on the Piping Schedule. Pipe with welded joints shall have no leakage. In the case of pipelines that fail to pass the prescribed leakage test, the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines.

3.3 TESTING OF MANHOLES

- A. Manholes shall be hydrostatically tested for leakage after installation, but prior to being backfilled. Prior to hydrostatic testing, manholes shall be visually inspected for leaks. Leaks or cracks shall be repaired prior to hydrostatic testing. Pipes entering the manhole shall be sealed at a point outside the manhole walls so as to include testing of the pipe/manhole joints. The manhole shall be filled with water to a level 2 inches below the top of the frame. Safety lines shall be secured to all plugs. After a period of at least one hour and when the water level has stabilized, the manhole shall be refilled and the water level shall be checked. The water level shall again be checked after a period of 4 hours. If the water level is reduced by more than 1/4-inch, the leakage shall be considered excessive, and the manhole shall be repaired and retested. The exterior of the manhole shall be inspected during this period for visible evidence of leakage. Moisture, sweating, or beads of water on the exterior of the manhole shall not be considered leakage, but any water running across the surface will be considered leakage and the manhole shall be repaired.

** END OF SECTION **

SECTION 02735 - TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes pre-cleaning, when necessary, and performing a closed circuit television (CCTV) inspection of new reaches of sewers. The minimum diameter of sewer for television inspection shall be 4 inches.
- B. The purpose of inspection is to document the condition of the new sewer.
- C. The CONTRACTOR is cautioned that sewage will continue to flow to the sewers and that the WORK must be performed under permit required for confined space entry conditions.

1.2 SHOP DRAWINGS AND STANDARDS

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals.
 - 1. CCTV equipment operational manual.
 - 2. Location where debris from cleaning sewers will be disposed.
 - 3. Schedule for cleaning and inspecting each sewer reach.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DIVERSION PUMPING

- A. The CONTRACTOR shall install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow or spill.

3.2 CLEANING

- A. The CONTRACTOR shall select the cleaning equipment and method for cleaning based on the age, the material, and the probable condition of the sewer. More than one type of equipment or attachments may be required on a single reach or at a single location. The CONTRACTOR shall not damage the sewer or any manhole during cleaning.
- B. When requested by the CONSTRUCTION MANAGER, the CONTRACTOR shall demonstrate the performance capabilities of the cleaning equipment and method proposed for use. If results obtained by the demonstration are not satisfactory, the CONTRACTOR shall select other methods or equipment that will clean the sewer line, and shall perform another demonstration.
- C. For water pressure cleaning equipment, the CONTRACTOR shall install a gauge to monitor working pressure on the discharge of high-pressure water pumps.
- D. The CONTRACTOR shall remove dirt, debris, and grease from the entire circumference of the sewer between manholes.

- E. Acceptance of sewer cleaning work is contingent upon the successful completion of the television inspection. If television inspection shows debris, solids, sand, grease, or grit remaining in the line, the cleaning will be considered unsatisfactory, and the CONTRACTOR shall repeat cleaning and televising of the sewer line at no increased cost to the OWNER until cleaning is acceptable to the CONSTRUCTION MANAGER.
- F. The CONTRACTOR shall remove sludge, dirt, sand, rocks, grease, roots, and other solid or semi-solid material resulting from the cleaning operation at the downstream manhole of the section being cleaned. A suitable sand trap, weir, dam, or suction in the next downstream manhole shall be installed so that solids and debris are trapped for removal. Passing debris from one sewer section to any other sewer section shall not be allowed. Debris from the manholes shall be loaded into a leak-proof, enclosed container that is permitted by applicable regulations for liquid waste hauling. All solids or semi-solid wastes shall be removed from the Site at the end of each work day. Debris, liquid waste, or sludge shall not accumulate at the Site.
- G. The CONTRACTOR shall dispose of waste using a licensed waste transporter to a location licensed for the type of waste involved.

3.3 TELEVISIONING

A. CCTV Equipment

1. The camera system shall include a pan-and-tilt, radial viewing, pipe inspection camera that pans plus or minus 275 degrees and rotates 360 degrees with zooming capability. The CONTRACTOR shall use a camera with an accurate footage counter which displays, on the operator's monitor and the video, the distance of the camera from the centerline of the starting manhole. The CONTRACTOR shall use a camera with height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. The CONTRACTOR shall provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in large diameter pipe. The camera system shall be controlled from the operator's truck.
2. Recording shall be on a DVD recorded in color.
3. DVD
 - a. DVD capacity shall be adequate to record inspection of at least one complete pipe segment between manholes, but no more than 5 segments shall be recorded on a DVD. Recording of a single segment shall not extend to more than one DVD. The CONTRACTOR shall not leave gaps in the recording of a segment between manholes.
 - b. Only segments between manholes on the same sewer reach shall be included on one DVD.
 - c. One permanent label is required. Label shall be placed on the face of the DVD.
 - d. DVD label information:
 - (1) CONTRACTOR NAME
 - (2) Project Name
 - (3) Recording Number

- (4) Date Televised
- (5) Date Submitted
- (6) Name of street
- (7) From Manhole Number to Manhole Number and DVD Chapter Number
- (8) Pipe Length and Size

- e. For each DVD the CONTRACTOR shall prepare a TV Inspection Report which shall be a complete written log of pipe conditions and connections, indexed to the footage counter.

B. Inspection

- 1. The CONTRACTOR shall televise the sewer immediately after cleaning. It shall notify the CONSTRUCTION MANAGER 24 hours in advance of TV inspection so that the CONSTRUCTION MANAGER may observe inspection operations.
- 2. In addition, the CONTRACTOR shall clean all associated sewer manholes, and shall pan the camera to document the conditions of manholes. Camera operator shall slowly inspect each connection and sewer transitions from one pipe material to another.
- 3. The CONTRACTOR shall move the camera downstream at a uniform rate not greater than 30 feet per minute. The CONTRACTOR shall stop and thoroughly inspect each of the following:
 - a. Lateral connections
 - b. Any deviation from standard sewer pipe construction
- 4. The camera operator shall log on a suitable form his/her observations in the inspection of the above items.

**** END OF SECTION ****

SECTION 02810 - LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing a landscape irrigation system which consists of all pipes, fittings, sprinklers, valves, automatic control valves, controllers, valve boxes, drain valves, hose bibb valves, operating wrenches, riser assemblies, direct burial wires, electrical connections, wiring and other appurtenances, piping, connections, testing, clean-up, maintenance and adjustments necessary for a complete operating system, ready for immediate use upon completion.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02200 Earthwork
 - 2. Section 02900 Landscaping
 - 3. Section 03300 Cast-in-Place Structural Concrete
 - 4. Section 15010 Mill Piping - Exposed and Buried
 - 5. Section 16000 General Electrical Provisions

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.
- B. The City of San Diego Landscape Technical Manual (LTM), current edition.

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300, Contractor Submittals:
 - 1. Shop drawings of the complete irrigation system.
 - 2. Complete lists of irrigation materials and equipment, including manufacturer's name and address, specific trade names, catalog numbers complete with illustrations and/or necessary descriptive literature. The proposed items shall be clearly marked or underlined.
 - 3. Controller literature, specifications, installation wiring diagram, and circuit breaker information.

1.5 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300, Contractor Submittals:
 - 1. Operating and maintenance manuals for all irrigation system equipment such as automatic controllers.

1.6 MAINTENANCE SERVICE

- A. The WORK of this Section includes service and maintenance of landscape irrigation system 30 days from Date of Substantial Completion.

1.7 INSTRUCTIONS TO OWNER'S PERSONNEL

- A. The CONTRACTOR shall, upon completion of the maintenance period of the irrigation system, instruct the OWNER'S personnel as to the proper operation and maintenance of the system.

1.8 EXISTING UTILITIES AND CONDITIONS

- A. Prior to cutting into the soil, the CONTRACTOR shall locate all cables, conduits, sewers, septic tanks, and other such underground utilities, and shall take proper precautions not to damage or disturb such utilities. If a conflict exists between such utilities and the proposed work, the CONTRACTOR shall promptly notify the CONSTRUCTION MANAGER.
- B. The CONTRACTOR shall be responsible for coordinating its work with the operation of existing utilities and new utilities on the Project. The CONTRACTOR shall notify the CONSTRUCTION MANAGER or its representative when utilities which are in operation require shut-off.
- C. Due to the scale of Drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. The CONTRACTOR shall carefully investigate the structural and finished conditions affecting all work, and plan work accordingly, furnishing such fittings, and other appurtenances, as may be required to meet such conditions. The Contract Documents are generally diagrammatic and indicative of the work to be installed. The work shall be installed in the most direct and workmanlike manner, so that conflicts between sprinkler systems, planting, structures, and other piping will be avoided.
- D. The CONTRACTOR shall verify the water pressure available at the site before installation of the system to make sure there is adequate pressure to properly operate sprinkler heads and valves, and shall also provide pressure reducing valves if required. If the pressure provided at job site or any other job condition will create problems that will prevent proper operation of the irrigation system, the CONSTRUCTION MANAGER shall be notified before commencement of any work. Minor additions and adjustments of heads, piping, and circuits shall be made at no additional cost to OWNER where it is necessary to make the irrigation system operate properly.

1.9 STORAGE OF MATERIALS

- A. The CONTRACTOR shall be responsible for storage of materials and for damage to the WORK covered by these Contract Documents before final acceptance of its work. The CONTRACTOR shall securely cover openings into the system, and shall cover all apparatus, equipment, and appliances both before and after being set in place to prevent obstruction in the pipes and the breakage, misuse, or disfigurement of said apparatus, equipment, or appliances.

1.10 SCHEDULING AND COORDINATION

- A. The CONTRACTOR shall contact Underground Services Alert (USA) in accordance with SSPWC Subsection 5-1.
- B. The CONTRACTOR shall be responsible for making arrangements for the coordination of its construction operations with those of all others on the project. The CONTRACTOR shall permit others engaged in work to accomplish their portion of the WORK without undue interference or delay.
- C. The CONTRACTOR shall be responsible for the scheduling and coordination of the electrical and water connections and the installation of the piping and equipment in a manner that will complete the WORK in conformance with the construction schedule.
- D. The water capacity charges and the wet tap fees shall be prepaid by the OWNER. The CONTRACTOR shall pay all other fees for the water meter and shall coordinate with the Water Utilities Department for services. Allow three months' notice to the Water Utilities Department.

1.11 PROJECT RECORD DRAWINGS

- A. The following shall be included in the PROJECT RECORD DRAWINGS in compliance with Section 01300, Contractor Submittals.
 - 1. Record drawings, showing locations of all valves, pipes (lines), heads, dimensions, controllers, control lines, and electrical wires. The drawings shall be accurately dimensioned to indicate location including depths of all piping, valves and control equipment as installed. Record drawings shall show manufacturer names and model numbers of all products.
 - 2. A reduced copy (17" x 11") of the as-built irrigation plan(s), color coded by stations and laminated in plastic, shall be mounted on the inside of each controller enclosure.

1.12 FIELD TESTING

- A. After completion of the irrigation system and a thorough flushing to remove dirt, scale, or other material, a pipeline pressure test, a sprinkler coverage test and an operational test shall be performed in accordance with SSPWC, Subsection 308-5.6.

1.13 GUARANTEE

- A. The CONTRACTOR'S guarantee shall comply with General Conditions, Article 13, and the following:

The entire irrigation system shall be guaranteed against defects in materials and workmanship for a period of one year from the date of acceptance of WORK. Should the CONTRACTOR fail during the guarantee period to expeditiously correct a defect upon written notification by the OWNER, the OWNER shall cause the WORK to be corrected and bill the actual costs incurred to the CONTRACTOR. Defect corrections shall include the complete restoration of existing improvements that were damaged as a result of the defect.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless indicated otherwise, irrigation system materials shall be in accordance with SSPWC, Subsection 212-2 and the following requirements.

2.2 PIPING

- A. All pressure pipe to be installed underground shall be Schedule 40 PVC for 1-1/2-inch diameter and smaller. For 2-inch and larger pressure pipe, use ASTM D2241 rated, Class 315 IPS PVC, bell and gasket type pipe, with Schedule 80 PVC fittings.
- B. All pressure pipe installed above ground shall be galvanized steel Schedule 40 pipe.
- C. All lateral, non-pressure pipe shall be Schedule 40 PVC, 3/4-inch minimum.
- D. Pipe sleeves shall be schedule 40 PVC pipe.

2.3 VALVES AND VALVE BOXES

- A. Remote control valves shall have 24-volt electrically controlled solenoids, AC or DC operation, and shall be housed in a concrete valve box of adequate size.

2.4 CONDUCTORS

- A. Direct Burial Control Wires: All control wires shall be solid copper, 600 volt, type UF, conforming to SSPWC, Subsection 212-3.2.

2.5 AUTOMATIC CONTROLLER UNIT

- A. The automatic controller shall be an electrically-timed device for automatically opening and closing remote control valves. All controllers and remote control valves supplied under this contract shall be of the same manufacturer and have similar operational and adjustment features.
- B. Each station shall be capable of 7 independent days of programming and selective repeatability.
- C. Each controller shall be provided with 115-volt and 24-volt circuit breakers.
- D. Each controller shall contain a station index, a 24-hour time index, and a 7-day index that changes at 6:00 a.m.
- E. Each controller shall have the capability of programming 0- to 60-minute watering periods for each station.
- F. The station index shall advance directly to stations programmed to water without delay and shall not repeat until the next scheduled starting time.
- G. The panel controller shall be capable of being operated manually, semi-automatically, and automatically.
- H. The panel assembly shall be removable from the 115-volt AC source by a quick-disconnect plug.

2.6 SPECIAL TOOLS AND SPARE PARTS

- A. **Tools:** Two complete sets of the following keys shall be provided. All keys shall be identified by equipment number by means of stainless steel or solid plastic tags.

1. Controller enclosure key.
2. Remote control valve box key.
3. Hose bibb and locking cap key.

B. **Spare Parts:** The WORK includes the following spare parts:

1. One sprinkler valve with solenoid operator for each size installed.
2. One sprinkler head for each type and size installed, or 10 percent of the number of each identical type and size, whichever is greater.
3. One set of all O rings, washers, backup rings, and nozzles.

Spare parts shall be stored in toolboxes and identified by means of stainless steel or plastic name tags attached to the box.

2.7 MANUFACTURERS

A. **Manufacturers:** Products shall be of the manufacture and model (or equal) listed below or as specified in the Irrigation Legend on Drawing L-1:

1. Pipe: Epco; Pacific Plastic; PW Pipe; Swanson.
2. PVC Fittings: Dura; Lasco; Sloan
3. Swing Joints: Dura; Marlex
4. Quick-coupling valve keys: Rainbird 44-DK
5. Locking cover key: Rainbird 2049 Cover Key
6. Valve boxes: Brooks 3-HL (PB & RCV); 1-R Series (QCV)
7. Shrubbery spray heads with standard nozzles: Rainbird Series 1800; Buckner 13040; Toro 570
8. Spray heads: Rainbird, No. RK-78
9. Wire connectors for splices: Rainbird; Pen-Tite; Scotch-Pac
10. Pressure vacuum breaker: FEBCO Model 775
11. Teflon thread sealant: Rectorseal No. 5
12. Trench marker tap: Alarmatape by Paul Potter Warning Tape, Inc. (for pressure pipe); Allen Marking Tape (for direct burial wire)

PART 3 - EXECUTION

3.1 GENERAL

A. Irrigation system installation shall be in accordance with SSPWC, Subsection 308-5 and the requirements specified herein.

- B. Installation of the irrigation system shall be performed after the finish grading, but prior to landscaping, except that plants in boxes 24 inches and larger shall be planted before installation of lateral irrigation lines.
- C. The total number of sprinkler heads and circuits and size of pipes shall be not less than indicated unless otherwise approved. The indicated maximum spacings for each type of sprinkler head shall not be exceeded.

3.2 VALVE BOXES

- A. Concrete valve boxes shall be set in clean gravel. The CONTRACTOR shall paint the identification number of the valve and the controller clock on the cover of the valve box. The paint shall be aluminum asphaltic-base waterproof paint.
- B. The CONTRACTOR shall adjust the locking toggles of the concrete valve boxes by replacing the existing clevis pin and sheet metal clip with a marine-type stainless steel machine bolt and self-locking nut. Apply oil to lubricate and to prevent rust.

3.3 ANTI-DRAIN/EXCESS FLOW VALVES

- A. An anti-drain/excess flow valve shall be installed under each sprinkler head which is not equipped with an internal check valve, or where changes in elevation exceed 5 feet on a lateral circuit.

3.4 AUTOMATIC CONTROLLER UNIT

- A. The controllers shall be contained in a weatherproof, stainless steel enclosure with an integral lock. Keys for covers shall be interchangeable. Controllers shall be installed "free standing" but not bolted to the enclosure wall.
- B. In multiple controller installations, enclosures shall be sized accordingly. No 110 volt wire runs shall pass from controller cabinet to cabinet. Each controller shall have a separate electrical service through a raceway. Provide one power Off-On switch for each controller.

3.5 CONTROL WIRING

- A. Control wires shall conform to the following wire colors and installation requirements:

Neutral Wires: White (#12 AWG) do not interconnect neutral wires between controllers.

Pilot Wires: (#14 AWG) (Use as many as necessary).

<u>Valve No.</u>	<u>Valve No.</u>
1 Yellow	10 White w/red stripe
2 Orange	11 Yellow w/red stripe
3 Blue	12 Blue w/red stripe
4 Black	13 Orange w/red stripe
5 Brown	14 Purple w/white stripe
6 Purple	15 Brown w/white stripe
7 Yellow w/black stripe	16 Yellow w/white stripe
8 Orange w/black stripe	17 Blue w/white stripe
9 Red w/black stripe	18 Red w/white stripe

Spare Wires: Two red (#14 AWG) from furthest valve or manifold to each controller.

- B. Direct burial control wire and electrical conduit shall be buried in plaster or mortar sand as per SSPWC Subsection 200-1.5.3, with a minimum sand equivalency of 50.
- C. **Wire Connections:** Neutral, pilot and spare wires shall be installed with a 2-foot coiled excess wire length at each end enclosure. Each and every wire splice shall be soldered together (using 60-40 solder), then encased in the waterproof epoxy of the connectors. Wire splices shall be made only in valve or pullboxes.
- D. **Wire Bundles:** Each individual controller clock's control wires shall be bundled and taped together with colored tape at intervals not exceeding 10 feet. Controller identification tape colors shall be as follows (use as many as necessary):

<u>Controller</u>	<u>Color</u>
"A"	Black

- E. All wires in pullboxes shall be loose and shall not come within 3 inches from lid. Boxes shall be sized accordingly to accommodate this requirement.

3.6 THRUST BLOCKS

- A. All pressure pipe 4 inches and smaller shall have the correct sized concrete thrust block installed at every abrupt change of alignment; at gate valves, at tees, elbows and crosses, and at ends of pipe runs; or wherever required as determined by the CONSTRUCTION MANAGER.

3.7 PIPE SLEEVES

- A. PVC pipe sleeves shall be provided under all paving and where necessary for passage under finish surface material, future replacement and for protection of PVC piping and control wire.
- B. Sleeves shall be two times the pipe size diameter and extend 12 inches beyond each side of pavement. The letters "E" for electrical or "W" for water shall be stamped or chiseled on the pavement directly above the sleeve.

3.8 TRENCH MARKER TAPES

- A. All pressure pipe shall have a continuous blue colored trench marker metallic tape placed 9 inches below finished grade directly above the buried pipe.
- B. All direct burial wires shall be marked with a continuous red colored trench marker plastic tape placed 9 inches below finished grade directly above the buried wires.

3.9 TESTING

- A. All wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment. The minimum insulation resistance to ground shall be 50 megaohms. Any wiring not meeting this requirement shall be replaced, at the CONTRACTOR'S expense.
- B. CONSTRUCTION MANAGER shall perform an independent irrigation system check with the CONTRACTOR at a mutually acceptable time prior to the backfilling of trenches. Any defects or deficiencies found in the system shall be corrected by the CONTRACTOR at no additional cost to the OWNER.

** END OF SECTION **

SECTION 02831 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing chain link fencing, gates and appurtenances. Fencing shall completely enclose and restrict access to the subject area.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 03310 Cast-in-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

- 1. International Building Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- 1. ASTM A 90 Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- 2. ASTM A 392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric
- 3. ASTM F 668 Specification for PVC and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals, prior to fabrication and construction.

- 1. Manufacturer's product information including catalog cuts indicating materials.
- 2. The layout of the chain link fence and gates indicating fence height, post sizes, bracing configurations, corner construction, and accessories.

1.7 FACTORY TESTING

- A. Wire fabric shall be factory tested for weight of zinc coating in accordance with method specified in ASTM A 90.
- B. Wire fabric shall be factory tested for determining the thickness of PVC coating in accordance with the provisions of ASTM F 668.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Materials for chain link fencing, gates and appurtenances shall conform to the requirements of SSPWC, Subsection 206-6 and as indicated herein.

2.2 POSTS, RAILS AND BRACES

- A. Materials for posts, rail and braces shall be Class 1 or 1A complying with SSPWC Subsection 206-6.2.
- B. Materials shall be coated with polyvinyl chloride (PVC) in accordance with Subsection 210-5 of SSPWC.

2.3 WIRE FABRIC

- A. Chain link fabric shall be polyvinyl chloride (PVC) coated fabric conforming to Subsection 206-6.3.2 of SSPWC.

2.4 FOOTINGS

- A. Concrete for post footings shall conform to Subsection 201-1 of SSPWC, Class 520-C-2500 concrete.

PART 3 - EXECUTION

3.1 INSTALLATION OF FENCING

- A. All earth, brush, or other obstructions which interfere with the proper alignment of construction of fences shall be removed.
- B. Line posts shall be spaced at not more than 10-foot intervals, measured from center to center of the posts and generally parallel to the ground slope. Posts shall be set plumb and shall be centered in concrete foundation.
- C. Gate post shall be provided with concrete foundation.
- D. Changes in the fence lines, where the horizontal angle is 15 degrees or more, shall be considered as corners and corner posts shall be installed.
- E. Corner, end, and gate posts shall be braced to the nearest line post. Corner and end posts shall be diagonally braced. Bracing for gate posts shall be horizontal braces with truss rods. Line posts shall be braced horizontally and trussed in both directions with truss rods at 1000 feet maximum intervals.

- F. Top rails shall be in lengths not less than 6 feet and shall be fitted with couplings for connecting lengths into continuous runs. Couplings shall be not less than 6 inches long and allow for expansion and contraction of the rail.
- G. Chain link fabric shall be taut and shall be attached to posts, stretcher bars, rails, and wires with galvanized fabric bands or tie wires at a maximum spacing of 12 inches on posts and 18 inches on the rails and tension wires. The tension wires shall be stretched tight with turnbuckles at the end and corner posts. The bottom tension wire shall be installed on a straight grade between posts.
- H. The fabric shall be fastened to the end, corner, and gate posts with stretcher bars and stretcher bar bands spaced at approximately 12 inches.

3.2 GATES

- A. Gate frames shall be fabricated with welded joints or rigid connectors. The fabric shall be the same as that used for the fence and shall be rigidly attached to the frames. Frames shall be suitably braced and trussed. Gates shall be equipped with suitable offset hinges to permit a 180 degree swing and a drop bar locking device with provision for padlocking. A stop to hold the gate open and a center rest with catch shall be provided.

3.3 CONCRETE FOOTINGS

- A. Encasement concrete for footings shall be placed in accordance with Section 03310. Concrete for footings may be placed without forms, providing the ground is firm enough to permit excavation to neat line dimensions. Prior to placing the concrete, the earth around the hole shall be thoroughly moistened. The concrete shall completely fill the hole and top surfaces of the concrete encasement shall be sloped outward to shed water and shall have a neat appearance. Fence fabric and the barbed wire shall not be fastened to the post until a minimum period of 7 days has elapsed after the placement of concrete footing.

** END OF SECTION **

SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing landscaping and all appurtenant work, complete.
- B. Landscaping as referred to herein shall include: soil preparation, installation of headers, installation of stabilized decomposed granite trail, weed control, finish grading, furnishing and installing plant materials, tree staking and tying, and all other pertinent work as required and as indicated.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02200 Earthwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.
- B. The City of San Diego Landscape Technical Manual (LTM), current edition.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes:
 - 1. California Food and Agricultural Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Commercial Standards:
 - ANSI/ASTM D 422 Method for Particle-Size Analysis of Soils
 - ANSI Z60.1 Nursery Stock
 - American Association of Nurserymen, Inc. Rules and Grading Provisions

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. Catalogue information on soil amendments, fertilizers and humic compost demonstrating compliance with the requirements of the soils report, stabilized decomposed granite, composite header and tree stakes.
 2. Samples, in triplicate, of each variety and size of plants shall be submitted for approval at the project site. The contractor shall contact the PROJECT ENGINEER at least 48 hours before delivery. These samples, if approved, shall be planted and maintained as standards for comparison with plants furnished.
 3. A certified report by an approved analytical laboratory showing analyses of representative samples of topsoil proposed for use. If imported Class A topsoil is required due to unsuitability of onsite soil, as indicated by the soils test, topsoil shall not be delivered to the site until approval is received from the CONSTRUCTION MANAGER. Approval of the laboratory report does not constitute final acceptance. Topsoil shall be subject to rejection by the CONSTRUCTION MANAGER on or after delivery if it is found not to meet the requirements of the Specifications or does not conform to the approved laboratory test results.
 - a. The CONTRACTOR shall notify the CONSTRUCTION MANAGER of the proposed hydro-seeding method, mulch, and type of equipment to be used and shall receive approval before beginning this operation.
 5. Transplanting Plan, including pruning schedule, description of preparatory pruning, and plant maintenance.

1.7 CERTIFICATES TO BE FURNISHED WITH EACH DELIVERY OR SHIPMENT

- A. The CONTRACTOR shall furnish a certificate with each delivery or bulk material delivery, stating source, quantity, and type of material. All materials shall conform to specification requirements. All certificates shall be delivered to the CONSTRUCTION MANAGER at time of each delivery. All bulk delivered materials shall be delivered with level load volume plainly marked on the truck bed.
- B. Certificates of inspection of plant material concerning plant diseases and infestations, as required by federal, state, or other authorities having jurisdiction, shall be furnished with each shipment.

1.8 PERMITS

- A. Plants shall be grown in nurseries which have been inspected by the governing authorities. Inspection of plant materials required by City, County, State, or Federal authorities shall be the responsibility of the CONTRACTOR, who shall have secured the required permits or certificates prior to delivery of plants to site.

1.9 INSPECTION BY CONSTRUCTION MANAGER

- A. All indicated inspections will be made by the CONSTRUCTION MANAGER or its representative. The CONTRACTOR shall request inspection at least 24 hours in advance of the time inspection is required. Inspection will be required on the following stages of the WORK:

1. During preliminary grading, soil preparation, and initial weeding.
 2. When trees are spotted for planting, but before planting holes have been excavated.
 3. When finish grading has been completed.
 4. When all specified work, except the maintenance period, has been completed.
 5. Final inspection at the completion of the maintenance period.
- B. Plants will be subject to inspection and approval or rejection by the CONSTRUCTION MANAGER at the place of growth and upon delivery to the site at any time before or during progress of the WORK. Plants will be inspected for:
1. Quantity, quality, size, and variety;
 2. Ball and root condition; and
 3. Latent defects and injuries resulting from handling, disease, and insects.
- C. Plants approved at the place of growth shall be rejected at the site if found to have degraded ball and root conditions or latent defects and injuries.
- D. Rejected plants shall be identified in an obvious manner, removed from the site and replaced with acceptable equals.
- 1.10 CLEANUP
- A. Upon completion of all planting operations, the portion of the project site used for a work or storage area by the CONTRACTOR shall be cleaned of all debris, superfluous materials, and equipment. All such materials and equipment shall be entirely removed from the project site as specified in Section 01700.
- B. All walks, trails, or pavement shall be swept or washed clean upon completion of the WORK of this Section.
- C. During the entire Contract period, plant containers that have been cut or removed from plant materials shall be removed from the project site daily.
- 1.11 MAINTENANCE AND GUARANTEE
- A. The CONTRACTOR shall be responsible for maintaining all landscaping WORK for a period of one year after the date of final acceptance of all WORK.
- 1.12 DELIVERY, STORAGE, AND HANDLING
- A. No plants other than the required samples shall be dug or delivered to the site until the required inspections have been made and the plant samples are approved.
- B. Plants shall not be pruned prior to delivery except upon approval by the CONSTRUCTION MANAGER.
- C. The CONTRACTOR shall protect the stock in a temporary nursery at the project site where it shall be protected from sun and drying winds and shall be shaded, kept moist, and protected with damp soil, moss, or other material. Plants shall be planted within 2 days after delivery.

- D. Fertilizers, soil amendments, additives, seed, peat, etc. subject to moisture damage shall be kept in a weatherproof storage place to preserve dryness.

1.13 SOILS TESTING

- A. After rough grading is completed and at a minimum of four weeks prior to planting, soil samples shall be taken by the Contractor from enough locations on the site to represent an adequate cross section for conditions.
- B. The soil test(s) shall be performed by a soil testing laboratory prior to work specified in this section.
- C. Contractor shall notify Owner's Representative of the sampling date, time and locations. A minimum of three representative samples shall be taken from random and varied locations of the project site that will receive landscaping. Samples should represent all major conditions of soil such as 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 the same information. All samples taken shall be split into two samples, one half will go to a qualified laboratory by the Contractor (at his/her expense) and the other half will be retained by the Owner's Representative. All samples shall be at least one pint in volume.
- D. The Contractor shall submit to the Owner's Representative for approval copies of all laboratory reports prior to proceeding with work.
- E. All soil samples shall be analyzed for and include the following:
 - 1. Organic matter content,
 - 2. NPK (Nitrogen, Potassium, Phosphorus),
 - 3. pH
 - 4. EC (electrical conductivity – soluble salts),
 - 5. Soil Texture (silt, clay, sand),
 - 6. Boron.
- F. Each soil analysis shall include written recommendations for soil treatments and soil amendments to be added based upon test results. Recommendations shall include:
 - 1. Volume of soil amendments,
 - 2. NPK (Nitrogen, Potassium, Phosphorus),
 - 3. pH
 - 4. EC (electrical conductivity – soluble salts),
 - 5. Soil texture (silt, clay, sand),
 - 6. Recommendations for the following:
 - a. Amendments,
 - b. Leaching,
 - c. Maintenance fertilizations for Container Plants,
 - d. Improvement of soil's water retention ability.
- G. The soil test(s) shall be performed by a soil testing laboratory. Approved soil testing laboratories are indicated below:

Wallace Laboratories
365 Coral Circle
El Segundo, CA 90245
Phone: 310 615-0116 Fax: 310 640-6863
<http://www.bettersoils.com>

Soil & Plant Laboratory, Inc.
1594 N. Main Street
Orange, CA 92667
Phone: 714 282-8777 Fax: 714 282-8575
<http://www.soilandplantlaboratory.com>

Fruit Growers Laboratory, Inc.
853 Corporation Street
Santa Paula, CA 93061-0272
Phone: 805 659-0910 Fax: 805 525-4172
<http://www.fglinc.com>

PART 2 - PRODUCTS

2.1 GENERAL

- A. Landscaping materials shall conform to the requirements of SSPWC Subsection 212-1 and the requirements of this Section of the Specifications.
- B. All landscaping materials for soil conditioning, weed abatement, or planting shall be first-grade, commercial quality and shall have certificates indicating the source of material, analysis, quantity, or weight attached to each sack or container or provided with each delivery. Delivery certificates shall be given to the CONSTRUCTION MANAGER as each shipment of material is delivered.
- C. All plants furnished by the CONTRACTOR shall be true to type or name as shown in the Contract Documents and shall be tagged in accordance with the standard practice recommended by the Agricultural Code of the State of California; however, determination of plant species or variety will be made by the CONSTRUCTION MANAGER.

2.2 TERMINOLOGY AND QUALIFICATIONS

- A. Plants or plant material having characteristics not conforming to terms as defined will not be accepted. The terms "plant material" or "plants" refer to all vegetation, whether trees, shrubs, ground cover, or herbaceous vegetation.
- B. Quality refers to structure and form, as evidenced by density and number of canes and branches, compactness, symmetry, and general development without consideration of size or condition. Standard quality indicates the least acceptable quality. Plants shall be typical of the species and variety of good average uniform growth, shall be well formed and uniformly branched, and shall have the minimum number of canes specified, free from irregularities, or shall conform to minimum quality index. Where the number of canes is not specifically stated in describing this grade, the standards of the "Horticultural Standards" as adopted by the American Association of Nurserymen, shall apply. In this case, the number of canes and other factors for the appropriate classification under "quality definition" in the Horticultural Standards shall be the Quality index. Plant material below this standard will be considered "culls" and are not acceptable. All plants shall be nursery grown.
- C. Specimen means an exceptionally heavy, symmetrical, tightly-knit plant, so trained or favored in its development and appearance as to be outstanding, superior in form, number of branches, compactness, and symmetry.
- D. Size is the factor controlled by dimensions representing height or spread, or both, without consideration of quality or conditions. For standard quality, a dimension is given for height or container size, or a dimension is given for height as well as container size.

- E. Height is usually indicated with a tolerance. The smaller dimension is the minimum acceptable. The larger dimension represents the maximum permissible. The average dimension of all plants must equal the average of the tolerance figures shown on each item.
- F. Condition is the factor controlled by vitality and ability to survive and thrive and be comparable with normal plants of the same species and variety in the vicinity of the site, at the same season of the year. In addition, plants shall be free from physical damage or adverse conditions that would prevent thriving. Conditions also sometimes refer to state of growth, i.e., whether "dormant condition" or "growing condition." Leaves and formation of buds on plants required to be in either condition shall be comparable to plants of same species in the vicinity of the site.
- G. Cane means a primary stem which starts from the ground, or close to the ground, at a point not higher than 1/4 the height of the plant.
- H. Caliper shall be taken 12 inches above the finish grade or ground, as a guide, or where a dimension in trunk appears to form the head of the tree.
- I. Collected plants shall not be used.

2.3 TOPSOIL

- A. As required by the results of the soils test, topsoil shall be Class A and shall be obtained from a naturally drained area.
- B. The topsoil shall be of uniform quality and free from materials that would be toxic or harmful to plant growth. Topsoil shall contain no noxious weeds or noxious weed seeds.
- C. The topsoil shall contain at least 6 percent organic matter as determined by loss of weight after ignition of dried (moisture-free) samples in accordance with current methods of the Association of Official Agricultural Chemists.
- D. The salinity level of topsoil shall be less than 3 milliohms/cm.
- E. Clay, as determined by the Bouyoucous hydrometer or by the decantation method, shall not exceed 20 percent of the topsoil material.

2.4 FERTILIZERS AND ADDITIVES

- A. Fertilizer shall be furnished in bags or other standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon.
- B. Chemical fertilizers shall be a mixed commercial fertilizer with percentages of nitrogen, phosphoric acid, and potash at 5-10-5, respectively. Fertilizers shall be uniform in composition, dry, and free flowing.
- C. Manure shall comply with SSPWC Subsection 212-1.2.2.
- D. Fertilizer tablets shall be 12 grams each, of 20-10-5 composition.
- E. Lime shall be dolomitic limestone containing not less than 85 percent of total carbonates. Limestone shall be ground to such fineness that 100 percent will pass a No. 200 sieve.
- F. Agricultural gypsum shall be a standard brand agricultural calcium sulfate (CaSO₄) as applied to soils and shall contain 19 percent combined sulfur.

2.5 PEAT MOSS

- A. Peat shall be a domestic product and may be reed peat, sedge peat, moss peat, reed muck, or sedge muck. Moss shall be of horticultural grade.
- B. Sphagnum peat moss shall be good quality baled peat moss free from injurious materials.

2.6 ORGANIC SOIL AMENDMENT

- A. Organic soil amendment shall be Type 1 complying with SSPWC Subsection 212-1.2.4.

2.7 MULCH

- A. Mulch shall comply with SSPWC Subsection 212-1.2.5 and shall be Type 1 mulch. Install a 3" layer in all planting areas no steeper than 3:1 and within watering dams/berms.

2.8 PLANTS

- A. Plants shall comply with SSPWC Subsection 212-1.4 and shall meet requirements of these Specifications and shall be in accordance with the botanical names and applicable standards of quality, size, condition, and type. They shall be true to name, genera, species, and variety in accordance with reference publications.
- B. Plant names are defined in "Standardized Plant Names" and "Bailey's Encyclopedia of Horticulture." When a name is not found in either reference, the accepted name used in the nursery trade shall apply.
- C. Plants shall be marked for identification. Each bundle of plants and at least 25 percent of each species and variety of separate plants in any one shipment shall have legible labels securely attached before delivery to the site.
- D. All trees and shrubs shall be measured while their branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch or root tip to tip. No trees will be accepted with their leaders cut, or so damaged that cutting is necessary.
- E. All plants shall be symmetrical and shall conform to the size, age, and condition as indicated on the Plant List. Exceptions are as follows:
 - 1. Plants larger than specified in the plant list may be used if approved by the CONSTRUCTION MANAGER, but use of such plants shall not constitute reason for an increase in the contract price. If the use of larger plants is approved, the spread of roots or ball earth shall be increased in proportion to the size of the plant. Bare root plants furnished in sizes greater than indicated shall be balled and burlapped when required by the CONSTRUCTION MANAGER.
 - 2. Where caliper or other dimensions of any plant materials are omitted from the Plant List, it shall be understood that such plant materials shall be normal stock for the type listed.
- F. Plants shall be of healthy, vigorous, and free from plant disease and shall be well-branched, shall have full foliage when in leaf, and shall have a healthy well-developed normal root system. Cold storage plants will not be accepted.

- G. Bare rooted plants shall have well-developed branch systems and vigorous root systems. They shall be dug to sufficient depth to insure full recovery and development of the plants. Roots of these plants shall be covered with a uniformly thick coating of mud being puddled immediately after they are dug.
- H. Balled and burlapped plants shall have firm, balls of natural earth, of diameter not less than that indicated and of sufficient depth to include all the fibrous and feeding roots. No plant moved with a ball will be accepted if the ball is cracked or broken before or during plant operations, except on special approval of the CONSTRUCTION MANAGER.
- I. Roots or balls of all plants shall be adequately protected at all times from sun and/or drying winds.
- J. Plants (indicated to be in marked cans, pots, or other containers on the plant list) shall have been grown in the containers for a minimum of 6 months and a maximum of 2 years. Roots shall fill the containers but show no evidence of being or having been root bound.
- K. Trees shall comply with SSPWC Subsection 212-1.4.2 and shall have straight trunks and all old abrasions and cuts shall be completely callused over. In no case shall trees be topped before delivery.
- L. Plants shall have been transplanted or root-pruned at least once in the last 2 years. Plants shall not be pruned prior to delivery except as authorized by the CONSTRUCTION MANAGER.

2.9 SEED MIXTURES

- A. All seed shall comply with SSPWC Subsection 212-1.3 and the applicable City, County, State, and Federal regulations. Seed shall be mixed by the dealer. The CONTRACTOR shall furnish dealer's guaranteed germination percentage of each variety. Grass seed shall not be delivered to the site until samples have been approved in writing by the CONSTRUCTION MANAGER or his authorized landscape representative. Approval of samples, however, shall not affect the right of the CONSTRUCTION MANAGER, or the authorized landscape representative, to reject seed upon or after delivery if it has become wet, moldy, or otherwise damaged prior to use or does not comply with the indicated requirements.
- B. Grass seed shall be fresh, clean, and new-crop seed, composed of the following varieties mixed in the proportions by weight, as shown, and tested for the minimum percentage of purity and germination indicated.

Bromus madritensis ssp. rubens (non-native) 2 lbs/acre
 Vulpia myuros (non-native) 2 lbs/acre

With some additional
 Plantago ovata (probably naturalized) for additional erosion control 5 lbs/acre

2.10 GRASS STOLONS

- A. Grass stolons shall comply with SSPWC Subsection 212-1.4.5.

2.11 HEADERS, STAKES AND TIES

- A. Headers, stakes and ties and ancillary materials shall comply with SSPWC Subsection 212-1.5, except as otherwise indicated.

2.12 STAKING MATERIALS

- A. Stakes shall be of lodgepole pine. These shall be straight shafts, shaved and cut clean and bare of branches and stubs, of uniform thickness with a minimum diameter of 2 inches and free of loose knots, splits or bends. Stakes shall be no less than ten (10) feet in length.

2.13 MISCELLANEOUS MATERIALS

- A. Wrapping material for trees, 2-inch diameter or larger, shall be 2 thicknesses of crinkled paper cemented together with bituminous material in strips 4-inch wide. Twine for tying shall be medium or coarse sisal yarn with a light impregnation of oil condensate from asphalt or tar.
- B. Cobble shall be clean, rounded river cobble, size 5 to 7 inches. Setting bed shall be 4 inches deep (below grade) with filter fabric under the cobble.
- C. Gravel in planter areas shall be 1-1/2-inch to 2-inch clean, washed gravel. Setting bed shall be 4 inches deep (below grade) with filter fabric under the gravel.
- D. Composite edger shall be as indicated on the landscaping plans.
- E. Jute mesh shall be new and shall be of a uniform, open, plain-weave, flame-retardant mesh. The mesh shall be natural brown-tan and shall be made from unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than 1/2 its normal diameter. Jute mesh shall be furnished in rolled strips and shall meet the following requirements:
 - 1. Width - 48 inches, with a tolerance of one-inch wider or narrower.
 - 2. Not less than 78 warp ends per width.
 - 3. Not less than 41 weft ends per yard.
 - 4. Weight shall average 1.22 pounds per linear yard, with a tolerance of 5 percent heavier or lighter.
- F. Erosion control blanket shall be made up of aspen fibers held together by a soybean netting. The blanket shall be capable of retaining moisture for seed germination, providing nutrients and protecting and holding seed and fertilizer in place. Blanket rolls shall be 48 inches wide, 180 feet long, and shall weigh 78 pounds (minimum) each.
- G. Stabilized Decomposed Granite:
 - 1. Decomposed granite paving with stabilizer binder additive.
 - 2. Decomposed Granite: Crushed stone sieve analysis percentage of weight passing a square mesh sieve AASHTO T11-82 and T27-82.
 - 3. Color shall be as indicated on plans. If not indicated, use natural.
 - 4. ¼ inch minus aggregate gradation sieve designation range of % passing:

Sieve Size	Decomposed Granite
3/8"	100%
#4	95-100%
#8	75-80%
#16	55-65%

#30	40-50%
#50	25-35%
#100	20-25%
#200	5-15%

5. Stabilizer Binder shall be a patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite or crushed 3/8 inch or 1/4 inch minus aggregates together to produce a firm surface. Binder shall be by Stabilizer Solutions, Inc., 1-800-336-2468.

2.14 MANUFACTURERS

- A. Landscaping materials shall be of the following brand names (or equal):
 1. Fertilizer tablets: Scotts "Agriform" or "Agrocote", AgriTab "AgSafe"
 2. Wood fiber mulch: Excel Fibermulch II by American Excelsior Company
 3. Humic Compost: Agri-Service, Inc.
 4. Erosion control blanket: "Curlex" by American Excelsior Company

PART 3 - EXECUTION

3.1 GENERAL

- A. Landscape work shall be performed in compliance with SSPWC Section 308 and as indicated herein.
- B. The landscape work shall not be performed at any time when it may be subject to damage by climatic conditions.
- C. The CONTRACTOR shall carefully scale or otherwise verify all dimensions in the Contract Documents. Dimensions and plant locations shown shall be coordinated with the CONSTRUCTION MANAGER and the final location shall be site-oriented by the CONTRACTOR and CONSTRUCTION MANAGER. Any discrepancies or inconsistencies discovered shall be brought to the attention of the CONSTRUCTION MANAGER.
- D. In case of conflict between the plant list totals and total plant count of the Contract Documents, the CONTRACTOR shall provide the higher number of plants.
- E. Delivery of materials may begin only after samples and test results have been approved by the CONSTRUCTION MANAGER. All materials furnished for the WORK shall be not less than the approved sample.
- F. The CONTRACTOR shall provide temporary fencing, barricades, covering, or other protection to preserve existing landscaping items indicated to remain and to protect the adjacent properties and other structures when they may be damaged by the WORK of this Section.
- G. The CONTRACTOR shall retain the services of a tree surgeon approved by the CONSTRUCTION MANAGER to repair damage to existing trees. Damaged existing trees which are required to be saved and which cannot be restored to full growth, as determined by the tree surgeon, shall be removed and replaced with a new similar tree of 24-inch box size unless otherwise approved by the CONSTRUCTION MANAGER.

- H. The CONTRACTOR shall remove or relocate landscape items such as trees, shrubs, grass, other vegetation, improvements, and obstructions as indicated.
- I. Open excavations shall be provided with barricades and warning lights which conform to the requirements of governing authorities and the Cal-OSHA safety requirements from dusk to dawn each day and when needed for safety.

3.2 SOIL PREPARATION

- A. Landscaping shall not begin until all areas of settlement, erosion, rutting, etc., have been repaired, and the soils have been re-established, re-compacted, and refinished to finish grades. The CONSTRUCTION MANAGER shall be notified of all areas which prevent the landscape work from being executed.
- B. Areas requiring grading, including adjacent transition areas, shall be uniformly level or sloping between finish elevations to within 0.10-ft above or below required finish elevations.
- C. Landscaping shall not proceed until after walks, curbs, pavings, edging, and irrigation systems are in place. Other WORK shall be completed to a degree where the landscape areas will not be disturbed when the other WORK is completed. The subgrade shall be cleaned free of waste materials of all kinds.
- D. During grading, waste materials in the planting areas such as weeds, rocks 2 inches and larger, building materials, rubble, wires, cans, glass, lumber, sticks, etc., shall be removed from the site. Weeds shall be dug out by the roots.
- E. After removal of waste materials the planting areas subgrade shall be scarified and pulverized to a depth of not less than 6 inches and all surface irregularities below the cover of topsoil removed.
- F. Finish grading shall consist of:
 - 1. Final contouring of the planting areas.
 - 2. Placing 4 inches of topsoil over all areas to be planted unless indicated otherwise.
 - 3. Placing all soil additives and fertilizers.
 - 4. Tilling of planting areas.
 - 5. After tilling, bring areas to uniform grades by floating and/or hand raking.
 - 6. Making minor adjustment of finish grades as directed by the CONSTRUCTION MANAGER.
- G. Any unusual subsoil condition that will require special treatment shall be reported to the CONSTRUCTION MANAGER.
- H. Topsoil shall be uniformly distributed over all areas where required. Subgrade and topsoil shall be damp.
- I. Surface drainage shall be provided as shown by molding the surfaces to facilitate the natural run-off of water. Low spots and pockets shall be filled with topsoil and graded to drain properly.

- J. Finish grade of all planting areas shall be 3 inches below finish grades of adjacent pavement of any kind.
- K. In all shrub planting areas, 1-1/2 inches of peat moss or soil-aid shall be raked into the top 3 inches of soil.
- L. As required and approved for use to prevent erosion by the PROJECT ENGINEER, jute mesh shall be installed loosely up and down the slope. The installed mesh shall fit the soil surface contour and shall be held in place by 12-inch long, 11-gauge (minimum) steel wire staples driven vertically into the soil at approximately 24-inch spacing. Jute mesh strips shall overlap along the sides at least 6 inches. Ends of strips shall be buried into the soil at least 6 inches. Staples shall be driven into side overlap at 2 points per side overlap.
- M. Erosion control blanket shall be installed as per manufacturer's recommendations. Anchorage devices shall be two-legged steel staples manufactured for the blanket material.

3.3 PROTECTION AND HANDLING OF PLANTS

- A. Plants shall be planted on the day of delivery, if possible.
- B. All plants which cannot be planted immediately on delivery shall be set on the ground and shall be well protected with soil, wet moss, or other acceptable material. Care shall be taken to prevent air pockets among the roots.
- C. During planting operations, bare roots shall be covered with canvas, wet straw, or other suitable materials. No plants shall be bound with wire or rope at any time so as to damage the bark or break branches.
- D. Plants shall not be picked up or moved by stem or branches, but shall be lifted and handled from the bottom or sides of the containers.
- E. Plants shall be lifted and handled from the bottom of the ball. Plants with balls cracked or broken before or during planting operations will not be accepted and shall be immediately removed from the site.

3.4 TREE AND PLANT LOCATIONS

- A. The CONTRACTOR shall locate and stake all tree and shrub locations and have the locations approved by the CONSTRUCTION MANAGER before starting excavation for same. The plant locations shall be observed, and their locations shall be adjusted as directed by CONSTRUCTION MANAGER before final approval.
- B. No trees shall be located closer than 72 inches to structures unless otherwise indicated. Ground covers and shrubs may be planted up to structures or curbs.

3.5 PLANT PITS

- A. Plant pits, centered on location stakes, shall be excavated circular pits with vertical sides and flat or saucer shape bottom in accordance with the following sizes unless shown otherwise:
 1. Tree pits shall be at least twice the diameter of the box or container.
 2. Shrubs shall be planted in pits or holes two (2) times greater in diameter than the root ball. Compacted soil at sides and bottom shall be loosened by scarifying or other approved methods. Planting pits shall be backfilled with the 'Prepared Backfill'.

3.6 PREPARED BACKFILL

- A. Type and quantity of soil amendments and fertilizers are for bidding purposes only. Soils shall be amended following the results of the soils test, based on the type of plant material to be planted. Final recommendations for soil amendments and fertilizers shall be approved by the PROJECT ENGINEER.
- B. Tree and shrub pit backfilling soil shall consist of 6 parts topsoil, and 1 part humic compost by volume. Commercial fertilizer shall be mixed with the prepared topsoil, using 5 lb/cu yd or as required by manufacturer's printed recommendations.
- C. Materials shall be thoroughly rotary-mixed on the site before placement. Mixing of materials in pits, bins, trenches or beds will not be permitted.
- D. Tree and shrub pits shall be provided with fertilizer tablets as follows:
 - 1 per one-gallon can plant
 - 3 per 5-gallon can plant
 - 5 per 15-gallon can plant

3.7 ROCKS OR UNDERGROUND OBSTRUCTIONS

- A. In the event that rock or underground obstructions are encountered in the excavation of plant pits, alternative locations shall be selected by the CONSTRUCTION MANAGER. Moving of trees to alternative locations shall not entail additional costs to the OWNER.

3.8 SETTING PLANTS, SHRUBS AND TREES

- A. The soil shall not be worked when the moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form or that clods will not break readily. Water shall be applied if necessary to provide ideal moisture for filling and for planting as herein indicated.
- B. Plants shall be set in center of pits as indicated. They shall be set plumb and straight, and at such a level that after settlement the crown of the plant will be 2 inches above the finished grade.
- C. Trees shall have planting soil placed and compacted around the base of the ball to fill all voids. Containers shall be removed from the sides and tops of balls.
- D. All shrubs shall be pruned to remove damaged branches.
- E. Planting soil around roots or balls shall be thoroughly compacted and watered. After planting, the soil in the shrub beds shall be cultivated between shrubs, raked smooth, and neatly outlined. Muddy soil shall not be used for backfilling. All broken or frayed roots shall be properly cut off.
- F. Trees and shrubs on slopes steeper than 6 to 1 shall be provided with watering dams or berms at least 6 inches high and 8 inches wider than planting pit (hole) unless indicated otherwise.
- G. All trees shall be thoroughly watered immediately after planting.
- H. Remove all tags and labels when directed by CONSTRUCTION MANAGER.

3.9 STAKING AND GUYING

- A. Staking of trees shall be done immediately after they are planted. Plants shall stand plumb after staking. Staking shall be as specified unless indicated otherwise.
- B. Trees shall be supported by 2 stakes placed diametrically opposite at the perimeter line of the ball and to sufficient depth to hold tree rigid. Stakes shall be driven vertically and not twisted or pulled.
- C. Staking and guying shall comply with SSPWC Subsection 308-4.6.1. Use Method A for tree staking.

3.10 PRUNING AND MULCHING

- A. Each tree and shrub shall be pruned in accordance with standard horticultural practice to preserve the natural character of the plant in the manner fitting its use in the landscape design, as approved by the CONSTRUCTION MANAGER.
- B. All dead wood or suckers and all broken or badly bruised branches shall be removed by thinning out and shortening branches. All cuts shall be made just above a healthy bud. Pruning shall be done with clean, sharp tools.
- C. Cuts over 3/4-inch diameter shall be painted with a tree paint. The paint shall cover all exposed cambium as well as other living tissue. The paint shall be waterproof, adhesive, elastic antiseptic, shall be free from kerosene, coal tar, creosote, or other materials injurious to the tree; and shall be approved before it is used.
- D. Plants shall be mulched after planting and cultivating have been completed. A layer of mulch materials shall be spread on the finished landscaping grade within all planting areas to a depth of 4 inches. The mulch around isolated plants shall be 6 inches greater in diameter than the planting hole. All shrub and ground cover beds shall be completely covered with the mulch.

3.11 SEEDING

- A. General:
 - 1. Grass seeding shall be provided where lawn is indicated.
 - 2. The soil shall be prepared and fertilized before seeding or shall be prepared per hydro-seeding instructions. The CONTRACTOR shall prepare only enough ground that can be seeded within 24 hours thereafter.
 - 3. All lawn slopes greater than 5 percent, or places where erosion is a problem, shall be protected with an erosion control blanket.
- B. Dry Seeding:
 - 1. Soil additives and fertilizer for finish grading shall consist of commercial fertilizer at 20 lb/1000 sq ft.
 - 2. Sow seed at the rate of 2 lbs to 1000 sq ft of area. Equal quantities of seed shall be sown in the directions at right angles to each other to produce an even distribution of seed over the entire area.
 - 3. No seeding shall be done when wind velocity exceeds 4 mph, within 24 hours after rain, or if the surface has been compacted, without first loosening the ground.

4. The seed shall then be covered with a fine layer of soil to a depth not greater than 1/4-inch.
 5. All lawn areas shall be covered with sphagnum peat moss or clean straw uniformly at a rate of 1-1/2 standard bales per 1000 sq ft.
 6. After covering the seeds with soil and peat or straw, the planted area shall be rolled in 2 directions with a 200-lb roller or other roller designed for lawn seeding.
 7. This seeding method may be utilized between March 1 and September 15.
- C. Hydro-Seeding:
1. One-step hydro-seeding may be utilized between May 1 and September 15. This method shall consist of preparing the seed bed as specified; combining specified seed mixture at the rate of 6 lb per 1000 sq ft for LAWN MIX, 16 lb per acre for NATIVE SEED MIX; fertilizer at the rate of 15 lb per 1000 sq ft; mulch at the rate of 1400 lb per acre and water in tanks; agitating these compounds into a well-mixed slurry suspension; and spraying the mixture under pressure onto the prepared areas to be seeded.
 2. Two-step hydro-seeding may be utilized between March 1 and September 15. This method shall consist of preparing the seed bed as specified; sowing specified seed mixture at the rate of 6 lb per 1000 sq ft for LAWN MIX, 16 lb per acre for NATIVE SEED MIX in 2 directions with an approved mechanical seeder; incorporating fertilizers; and spraying under pressure a mixture of water and mulch at the rate of 1400 lb per acre onto prepared, seeded, and fertilized areas. Fertilizer can be applied with the water and mulch mixture if desired.

3.12 TRANSPLANTING

A. Preparatory Pruning

1. Root Pruning: Perform preparatory root pruning under direction of arborist as far in advance of extracting each plant as the Project Schedule allows.
 - a. Dig exploratory pits or trench around perimeter of plant at required root-ball width to determine locations of main lateral roots. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - b. Root-Ball Width: Minimum 12-inches of root-ball diameter for each inch of plant caliper being transplanted.
 - c. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking.
 - d. Use narrow-tine spading forks to comb soil to expose roots with minimal damage to root system.
 - e. Cut exposed roots manually with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - f. Do not paint or apply sealants on cut root ends.
2. Crown (Tip) Pruning: Prune branches as directed by arborist.

- a. Prune to remove broken, dying or dead branches. Do not prune for shape.
- b. Do not remove or reduce living branches to compensate for root loss caused by cutting root system or to improve natural form.
- c. Cut branches with sharp pruning instruments, do not break or chop.
- d. Do not paint or apply sealants to wounds.
- e. Spray with antidesiccant plants that are leafed out.

3.13 MISCELLANEOUS ITEMS

- A. Stabilized decomposed granite and edging shall be installed as indicated on the plans.

3.14 MAINTENANCE OF LANDSCAPING PRIOR TO ACCEPTANCE OF PROJECT

- A. General: The CONTRACTOR shall be responsible for protecting, watering, and maintaining all planting and irrigation systems until final acceptance of all WORK under the Contract.
- B. Upon completion of lawn seeding, the entire area shall be soaked to saturation by a fine spray. The new planting shall be kept watered by the sprinkling system during dry weather or whenever necessary for proper establishment of the lawn. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the CONTRACTOR at no additional cost to the OWNER.
- C. Protection: The CONTRACTOR shall provide adequate protection to all newly seeded areas including the installation of temporary fences to prevent trespassing and damage, as well as erosion control, until the end of the one-year correction period.
- D. Watering: Trees and shrubs shall be thoroughly soaked after planting and provided with additional water at intervals as necessary to provide for good health and growth.
- E. Mowing of Lawn Areas: First mowing of lawn areas shall begin as soon as the grass has reached a height of 3 inches and subsequent mowing shall be as often as necessary to maintain all lawn areas at a uniform height of 1-1/2 to 2 inches.
- F. All lawns shall be fertilized every three weeks with 6 lb of 16-16-8 commercial fertilizer per 1000 sq ft for the first 7 weeks and fertilized thereafter once every four months prior to acceptance and during the maintenance and correction period.
- G. At time of acceptance of the complete project, the lawn shall be totally established with no bare spots, mowed a minimum of 4 times, and the grass shall be at least 1-1/4 to 2 inches in height.
- H. Plants shall be maintained in a vigorous, thriving condition by watering, cultivating, weeding, pruning, spraying, and other operations necessary. No trees or shrubs will be accepted unless they are healthy and show satisfactory foliage conditions.
- I. All planted areas shall be cultivated at least every two weeks and raked smooth, to present a neat appearance, and additional mulch shall be added where necessary.
- J. Maintenance shall include, in addition to the foregoing, cleaning, edging, repairs to stakes, wire, and wrappings, the repair of erosion, and all other necessary work of maintenance. Sidewalks and other paved areas shall be kept clean while planting and maintenance are in progress.

- K. Any materials, equipment or sprinkler lines broken, disrupted or damaged during construction shall be replaced to proper working order.
- 3.15 FINAL INSPECTION PRIOR TO CORRECTION PERIOD
- A. Inspection of lawns and planting will be made at the time of final acceptance.
 - B. Written notice requesting inspection shall be submitted to the CONSTRUCTION MANAGER at least 10 days prior to the anticipated inspection date.
- 3.16 MAINTENANCE DURING CORRECTION PERIOD FOLLOWING ACCEPTANCE OF PROJECT
- A. General: The CONTRACTOR shall be responsible for a period of one year after date of acceptance of all WORK under the Contract, for maintaining all plantings, including all necessary plant or tree replacements, weeding, cultivating, fertilizing, pruning, controlling insects and diseases, re-guying, and performing all other operations incident thereto.
 - B. The WORK covered by the maintenance and correction period consists of providing all replacements of plants, labor, materials, equipment, and supplies and in performing all operations in connection with maintenance and guarantees.
 - C. Any delay in the completion of any item of WORK in the planting operation which extends the planting into more than one season shall extend the correction period in accordance with the date of completion.
 - D. The CONTRACTOR shall replace, as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition which are noted during and at the end of maintenance and the one-year correction period.
 - E. Plants used for replacement shall be of the same size and variety indicated in the plant list. Plants shall be furnished, planted, staked, and mulched as indicated.
 - F. All water required during the maintenance and correction period will be furnished by the OWNER.
 - G. All lawn and planting areas shall be fertilized during the maintenance and correction period with 16-16-16 chemical fertilizer. The amount of fertilizer applied shall be per the manufacturer's written instructions on the bag. Fertilizers applied to planting areas shall be cultivated into the top 2 inches of topsoil.
 - H. The CONTRACTOR shall clean-up and remove unused or waste materials from the site and leave the area in a neat condition whenever it performs work during the maintenance period.
- 3.17 FINAL INSPECTION AT THE END OF CORRECTION PERIOD
- A. The OWNER and CONTRACTOR shall make a final inspection at the end of the one-year correction period. Any trees, shrubs, plants and any materials found defective at the time of final inspection shall be replaced within a time agreed upon by both parties. If it is too late in the planting season for replanting, the replacements shall be made during the next planting season even though such planting may occur after the maintenance and correction period ends.

** END OF SECTION **

SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing concrete formwork, bracing, shoring, and supports.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the WORK.
 - 1. Section 03200 Reinforcement Steel
 - 2. Section 03280 Joints in Sitework Concrete
 - 3. Section 03290 Joints in Concrete Structures
 - 4. Section 03300 Cast-in-Place Structural Concrete
 - 5. Section 03310 Cast-In-Place Sitework Concrete
 - 6. Section 03315 Grout

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - PS 1 U.S. Product Standard for Concrete Forms, Class I.
 - ACI 117 Standard Tolerances for Concrete Construction and Materials
 - ACI 347 Guide to Formwork for Concrete

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
- B. Falsework Calculations and Drawings: The CONTRACTOR's attention is directed to the provisions of Section 1717 of the Division of Industrial Safety, Construction Safety Orders, as revised November 1973, which requires that all falsework or vertical shoring installations where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure, exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or provision for vehicular or railroad traffic through falsework or vertical shoring is made, shall be approved and signed by a civil engineer, registered in the State of California; provided further, that a copy of the falsework plan or shoring layout shall be available on the job site at all times.

- C. Detailed plans of the falsework proposed to be used. Such plans shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, means of protecting existing construction which supports falsework, and typical soil conditions.
- D. Catalog information on:
 - 1. Form ties and all related accessories, including taper tie plugs, if taper ties are used.
 - 2. Form gaskets.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials for concrete forms and falsework shall conform to SSPWC Subsection 303-1.3 and the requirements herein.
- B. Except as otherwise expressly accepted, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:
 - Walls - Steel or plywood panel
 - Columns - Steel, plywood, or fiber glass
 - Roof and floor - Plywood
 - All other work - Steel panels, plywood or tongue and groove lumber
- C. Form materials which may remain or leave residues on or in the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.2 FORM AND FALSEWORK MATERIALS

- A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:
 - 1. Lumber shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20.
 - 2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.
 - 3. Form materials shall be metal, wood, plywood, or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown. Metal forms shall be an approved type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.
- B. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.
- C. Forms and falsework to support the roof and floor slabs shall be designed for the total dead load, plus a live load of 30 psf (minimum).

2.3 FORM TIES

- A. Form ties with integral waterstops shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming.
- B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when approved. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie.

2.4 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by one of the following (or equal):
 - 1. Form Ties

Meadow Burke Company
Dayton Superior
 - 2. Form ties with Integral Waterstops

Meadow Burke Company
Dayton Superior

PART 3 - EXECUTION

3.1 GENERAL

- A. Forms and falsework shall be designed and constructed in accordance with ACI 347 and SSPWC Subsections 303-1.3, 303-1.6, and 303-5.2, and the requirements herein, except that the submittal of detailed falsework will not be required.
- B. Tolerances: The variation from established grade or lines shall not exceed 1/4-inch in 10 feet and there shall be no offsets or visible waviness in the finished surface. All other tolerances shall be within the tolerances of ACI 117.
- C. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the WORK and replaced at the CONTRACTOR's expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR's personnel and by the ENGINEER and shall be in sufficient number and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.
- D. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly-placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

3.2 FORM DESIGN

- A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 5/8-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight so as to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1- to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the CONSTRUCTION MANAGER. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03300. The size, number, and location of such form windows shall be acceptable to the CONSTRUCTION MANAGER.

3.3 CONSTRUCTION

- A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is shown. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.
- B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the CONSTRUCTION MANAGER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.
- C. Form Ties:
 - 1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as indicated in Section 03300. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.

2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls which are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout which shall match the color and texture of the surrounding wall surface.

3.4 REUSE OF FORMS

- A. Forms may be reused only if in good condition and only if acceptable to the CONSTRUCTION MANAGER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the CONSTRUCTION MANAGER.

3.5 REMOVAL OF FORMS

- A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28-day strength specified in Section 03300; provided, that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the specified 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by the CONSTRUCTION MANAGER who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least 2 days after the concrete has been placed. Forms for all parts of the WORK not specifically mentioned herein shall remain in place for periods of time as determined by the CONSTRUCTION MANAGER.

3.6 MAINTENANCE OF FORMS

- A. Forms shall be cleaned, treated with a releasing agent, and maintained in accordance with SSPWC Subsection 303-1.3 and the following. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant compatible with the waterproofing membrane material and acceptable to the CONSTRUCTION MANAGER. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least two weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.7 FALSEWORK

- A. Falsework, including staging, walkways, forms, ladders, and similar appurtenances, shall be designed, engineered, constructed, and maintained according to the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, and the requirements of the Construction Safety Orders of the California Division of Industrial Safety.

** END OF SECTION **

SECTION 03200 - REINFORCEMENT STEEL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete and masonry construction, including all the wires, clips, supports, chairs, spacers, and other accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03300 Cast-in-Place Structural Concrete
 - 3. Section 03310 Cast-in Place Sitework Concrete

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.
 - 1. ACI 315 Details and Detailing of Concrete Reinforcement.
 - 2. ACI 318 Building Code Requirements for Structural Concrete.
 - 3. CRSI MSP-1 Concrete Reinforcing Steel Institute Manual of Standard Practice
 - 4. WRI Manual of Standard Practice for Welded Wire Fabric.
 - 5. AWS D1.4 Structural Welding Code - Reinforcing Steel.
 - 6. ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 7. ASTM A 185 Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - 8. ASTM A 615 Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 9. ASTM A 775 Specification for Epoxy-Coated Steel Reinforcing Bars.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in accordance with Section 01300:
 - 1. Shop bending diagrams, placing lists, and drawings of all reinforcement steel prior to fabrication.
- B. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the CONTRACTOR at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements indicated. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.
- C. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, manufacturer's literature shall be submitted which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop drawings which show the location of each coupler with details of how they are to be installed in the formwork.
- D. If reinforcement steel is spliced by welding at any location, the CONTRACTOR shall submit mill test reports which shall contain the information necessary for the determination of the carbon equivalent as specified in AWS D1.4. The CONTRACTOR shall submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable.
- E. Mill certificates shall be delivered with each shipment of reinforcing bars.

1.6 FACTORY TESTING

- A. If requested by the CONSTRUCTION MANAGER, the CONTRACTOR shall provide samples from each heat of reinforcement steel delivered in a quantity adequate for testing. Costs of initial tests and sample materials will be paid by the OWNER. Costs of additional tests due to material failing initial tests shall be paid by the CONTRACTOR.
- B. If reinforcement steel is spliced by welding at any location, the CONTRACTOR shall submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as specified in AWS D1.4.

1.7 FIELD TESTING

- A. Products shall be field tested for compliance with the indicated requirements. If requested by the CONSTRUCTION MANAGER, the CONTRACTOR shall provide samples of each type of welded splice used in the work in a quantity and of dimensions adequate for testing. At the discretion of the CONSTRUCTION MANAGER, radiographic testing of direct butt welded splices will be performed. The CONTRACTOR shall provide assistance necessary to facilitate testing. The CONTRACTOR shall repair any weld which fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the OWNER; except, the costs of all tests which fail to meet specified requirements shall be paid by the CONTRACTOR at no additional cost to the OWNER.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials specified in this Section which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.2 REINFORCEMENT STEEL

- A. Reinforcement Steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:
 - 1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement with supplementary requirement S-1, or as otherwise indicated.
 - 2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and as indicated; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.
 - 3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.
- B. Accessories:
 - 1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
 - 2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.
 - 3. Tie wire shall be a minimum 14 gauge annealed steel wire.
- C. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A 775, but its usage shall be subject to City approval.

2.3 MECHANICAL COUPLERS

- A. Mechanical couplers shall be provided where shown and where approved by the CONSTRUCTION MANAGER. The couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars being spliced at each splice.
- B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.

- C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.

2.4 WELDED SPLICES

- A. Welded splices shall be provided where shown and where approved by the CONSTRUCTION MANAGER. All welded splices of reinforcement steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars which are connected.
- B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

2.5 EPOXY GROUT

- A. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements found in Section 03315 - Grout.

2.6 MANUFACTURERS

- A. Products of the type indicated, shall be manufactured by one of the following (or equal):
 - 1. Couplers
 - Lenton Form Saver by Erico Products
 - Dowel Bar Splicer System by Dayton Superior

PART 3 - EXECUTION

3.1 GENERAL

- A. All reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Building Code and the supplementary requirements specified herein.

3.2 FABRICATION

- A. General:
 - 1. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as indicated. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1-1/2-inch for No. 3 bars, 2-inch for No. 4 bars, and 2-1/2-inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the bar diameter, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.
 - 2. The CONTRACTOR shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings.

- B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:
1. Sheared length: ± 1 inch
 2. Depth of truss bars: + 0, - 1/2 inch
 3. Stirrups, ties, and spirals: $\pm 1/2$ inch
 4. All other bends: ± 1 inch

3.3 PLACING

- A. Reinforcement steel shall be accurately positioned and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.
- B. Limitations on the use of bar support materials shall be as follows.
1. Concrete Dobies: permitted at all locations except where architectural finish is required.
 2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
 3. Plastic Bar Supports: permitted at all locations except on grade.
- C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- D. Bars additional to those shown which may be found necessary or desirable by the CONTRACTOR for the purpose of securing reinforcement in position shall be provided by the CONTRACTOR at no additional cost to the OWNER.
- E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the IBC.
- F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to the approval of the CONSTRUCTION MANAGER.
- G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane indicated.

- H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.
- I. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.
- J. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.4 SPACING OF BARS

- A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one inch.
- B. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than one inch.
- C. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.
- D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

3.5 SPLICING

- A. General:
 - 1. Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the CONSTRUCTION MANAGER.
- B. Splices of Reinforcement:
 - 1. The length of lap for reinforcement bars, unless otherwise indicated, shall be in accordance with ACI 318.
 - 2. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.
 - 3. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1-1/2 turns.
- C. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the CONSTRUCTION MANAGER. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the CONSTRUCTION MANAGER.

- D. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2 inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs which have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged.
- E. Unless indicated otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing shown for the adjacent section.
- F. Tack welding of reinforcing bars is prohibited.

3.6 CLEANING AND PROTECTION

- A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.
- B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary recleaned.

3.7 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS

- A. Hole Preparation:
 - 1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 0.25 inch greater than the diameter of the outer surface of the reinforcing bar deformations.
 - 2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.
 - 3. The hole shall be drilled by methods which do not interfere with the proper bonding of epoxy.
 - 4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.
 - 5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.
 - 6. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that insures that excess material will be expelled from the hole during dowel placement.
 - 7. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

** END OF SECTION **

SECTION 03280 - JOINTS IN SITEWORK CONCRETE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing expansion joints, contact joints, and weakened plane joints in concrete pavement, sidewalk, curb and gutter.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03310 Cast-in-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM D 1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - 2. ASTM D 994 Preformed Expansion Joint Filler for Concrete (Bituminous Type)

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Placement shop drawings showing the location and type of all joints.
 - 2. Catalog cuts and samples of the preformed expansion joint filler material including complete product data.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's certification indicating that the preformed expansion joint material meets or exceeds the requirements of these Specifications.

PART 2 - PRODUCTS

2.1 PREMOLDED JOINT FILLER

- A. Premolded joint filler shall be in conformance with SSPWC subsection 201-3.2 and shall be either Preformed Expansion Joint Filler (ASTM D994) or Nonextruding and Resilient Filler (ASTM D 1751) as indicated.

2.2 STEEL BARS AND DOWELS

- A. Steel bars used in construction joints or contact joints shall conform to SSPWC subsection 201-2.2.

2.3 CONCRETE CURING COMPOUND

- A. Curing compound shall comply with SSPWC subsection 201-4.

PART 3 - EXECUTION

3.1 EXPANSION JOINTS

- A. Expansion joints in sitework concrete shall be constructed in accordance with SSPWC subsection 302-6.5.3 except that the configuration of the joint shall be as indicated on the drawings.
- B. Expansion joints in concrete curbs, sidewalk and gutter shall comply with SSPWC subsection 303-5.4.2 except that the joint configuration shall be as indicated on the drawings.

3.2 CONSTRUCTION JOINTS

- A. Construction joints in sitework concrete shall comply with SSPWC subsection 302-6.5.2.

3.3 WEAKENED PLANE JOINTS

- A. Weakened plane joints in sitework concrete shall comply with SSPWC subsection 302-6.5.4 except that the configuration of the joint shall be as indicated on the drawings.
- B. Weakened plane joints in concrete curbs, sidewalks and gutters shall comply with SSPWC subsection 303-5.4.3 except that the joint configuration shall be as indicated on the drawings.

3.4 CONTACT JOINTS

- A. Contact joints in concrete pavement shall be made by placing fresh concrete against hardened concrete. A moisture barrier consisting of curing compound conforming to SSPWC subsection 201-4 shall be applied to the face of any contact joint and allowed to dry prior to placing fresh concrete against that joint face. This provision is also applicable to existing portland cement concrete pavement not constructed as part of the WORK performed under the contract. Application rate shall be as specified in SSPWC subsection 302-6.6 for the compound used.

**** END OF SECTION ****

SECTION 03290 - JOINTS IN CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing the construction joints, contraction joints, expansion joints, and control joints in structural concrete, including waterstops, joint fillers, and joint sealants.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03200 Reinforcement Steel
 - 3. Section 03300 Cast-in-Place Structural Concrete
 - 4. Section 07920 Sealants and Caulking

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.
 - 1. ASTM C 920 Specification for Elastomeric Joint Sealants.
 - 2. ASTM D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension.
 - 3. ASTM D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
 - 4. ASTM D 638 Test Method for Tensile Properties of Plastics.
 - 5. ASTM D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 6. ASTM D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
 - 7. ASTM D 1056 Specification for Flexible Cellular Materials -- Sponge or Expanded Rubber.
 - 8. ASTM D 1752 Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - 9. ASTM D 2240 Test Method for Rubber Property -- Durometer Hardness.

10. CRD-C572 PVC Waterstop.

1.4 TYPES OF JOINTS

- A. Construction Joints: When fresh concrete is placed against a hardened concrete surface, the joint between the two pours is called a construction joint. Unless otherwise specified, all joints in water bearing members shall be provided with a waterstop and/or sealant groove of the shape specified and shown. The surface of the first pour may also be required to receive a coating of bond breaker as shown.
- B. Contraction Joints: Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 4-1/2 inches from the joint; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided when specified or shown.
- C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours, the joint shall be formed as shown. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise specified, all expansion joints in water bearing members shall be provided with a center-bulb type waterstop as shown.
- D. Premolded expansion joint material shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material.
- E. The space so formed shall be filled with a joint sealant material as indicated below. In order to keep the two wall or slab elements in line the joint shall also be provided with a sleeve-type dowel as shown.
- F. Control Joints: The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and dimensions shown, is formed or saw-cut in the concrete. This groove is afterward filled with a joint sealant material.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
- B. Waterstops: Prior to production of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used, and shall be accomplished so that the material and workmanship represents in all respects the material to be furnished under this contract. The balance of the material to be used under this contract shall not be produced until after the CONSTRUCTION MANAGER has reviewed the qualification samples.
- C. Waterstop Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this contract.

- D. Field samples of fabricated fittings (crosses, tees, etc.) will be selected at random by the CONSTRUCTION MANAGER for testing by a laboratory at the OWNER's expense. When tested, they shall have a tensile strength across the joints equal to at least 600 psi.
- E. Joint Sealant: Prior to ordering the sealant material, the CONTRACTOR shall submit sufficient data to show general compliance with the requirements of the Contract Documents.
- F. Joint Location: The CONTRACTOR shall submit placement shop drawings showing the location and type of all joints for each structure.
- G. Certified test reports from the sealant manufacturer on the actual batch of material being supplied indicating compliance with the above requirements shall be furnished before the sealant is used on the job.

1.6 OWNER'S MANUAL

- A. Shipping Certification: The CONTRACTOR shall provide written certification from the manufacturer as an integral part of the shipping form, to show that all of the material shipped to this project meets or exceeds the physical property requirements of the Contract Documents. Supplier certificates are not acceptable.

1.7 SERVICES OF MANUFACTURER

- A. Before work is commenced, the CONTRACTOR shall arrange for a representative of the sealant manufacturer to instruct the crew doing the WORK on the proper methods of mixing and applying the sealant.
- B. When requested by the CONSTRUCTION MANAGER, the CONTRACTOR shall arrange for field technical assistance from the bentonite manufacturer.

1.8 INSPECTION AND TESTING

- A. Waterstop Inspection: It is required that all waterstop field joints shall be subject to rigid inspection, and no such work shall be scheduled or started without having made prior arrangements with the CONSTRUCTION MANAGER to provide for the required inspections. Not less than 24 hours' notice shall be provided to the CONSTRUCTION MANAGER for scheduling such inspections.
- B. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the CONTRACTOR at its own expense.
- C. The following waterstop defects represent a partial list of defects which shall be grounds for rejection:
 - 1. Offsets at joints greater than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.
 - 2. Exterior crack at joint, due to incomplete bond, which is deeper than 1/16-inch or 15 percent of material thickness, at any point, whichever is less.

3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15 percent of material thickness at any point, whichever is less.
 4. Misalignment of joint which result in misalignment of the waterstop in excess of 1/2-inch in 10 feet.
 5. Porosity in the welded joint as evidenced by visual inspection.
 6. Bubbles or inadequate bonding which can be detected with a penknife test. (If, while prodding the entire joint with the point of a pen knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.)
- D. Construction Joint Sealant: The CONTRACTOR shall prepare adhesion and cohesion test specimens as specified herein, at intervals of 5 working days while sealants are being installed.
- E. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:
1. Sealant specimen shall be prepared between 2 concrete blocks (1-inch by 2-inch by 3-inch). Spacing between the blocks shall be 1-inch. Coated spacers (2-inch by 1-1/2-inch by 1/2-inch) shall be used to insure sealant cross-sections of 1/2-inch by 2 inches with a width of 1-inch.
 2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall not exceed 24 hours.
 3. Following curing period, the gap between blocks shall be widened to 1-1/2-inch. Spacers shall be used to maintain this gap for 24 hours prior to inspection for failure.

1.9 GUARANTEE

- A. The CONTRACTOR shall provide a 5-year written guarantee of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of the OWNER, at no additional cost to the OWNER, any such defective areas which become evident within said 5-year guarantee period.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All joint materials specified herein shall be classified as acceptable for potable water use, by the Environmental Protection Agency, within 30 days of application.

2.2 PVC WATERSTOPS

- A. General: Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used. The CONTRACTOR shall obtain from the waterstop manufacturer and shall furnish to the CONSTRUCTION MANAGER for review, current test reports and a written certification of the manufacturer that the material to be shipped to the job meets the physical requirements as outlined in the U.S. Army Corps of Engineers Specification CRD-C572 and those listed herein.

- B. Flatstrip and Center-Bulb Waterstops: Flatstrip and center-bulb waterstops shall be as indicated; provided, that at no place shall the thickness of flat strip waterstops, including the center bulb type, be less than 3/8-inch.
- C. Multi-Rib Waterstops: Multi-rib waterstops, where required, shall be as indicated. Prefabricated joint fittings shall be used at all intersections of the ribbed-type waterstops.
- D. Other Types of Waterstops: When other types of waterstops, not listed above, are required, they shall be subjected to the same requirements as those listed herein.
- E. Waterstop Testing Requirements: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

<u>Physical Property, Sheet Material</u>	<u>Value</u>	<u>ASTM Std.</u>
Tensile Strength-min (psi)	1750	D 638, Type IV
Ultimate Elongation-min (percent)	350	D 638, Type IV
Low Temp Brittleness-max (degrees F)	-35	D 746
Stiffness in Flexure-min (psi)	400	D 747

Accelerated Extraction (CRD-C572)

Tensile Strength-min (psi)	1500	D 638, Type IV
Ultimate Elongation-min (percent)	300	D 638, Type IV

Effect of Alkalies (CRD-C572)

Change in Weight (percent)	+0.25/-0.10	-----
Change in Durometer, Shore A	+5	D 2240

Finish Waterstop

Tensile Strength-min (psi)	1400	D 638, Type IV
Ultimate Elongation-min (percent)	280	D 638, Type IV

2.3 JOINT SEALANT

- A. Joint sealant shall be polyurethane polymer designed for bonding to concrete which is continuously submerged in water. No material will be acceptable which has an unsatisfactory history as to bond or durability when used in the joints of water retaining structures.
- B. Joint sealant material shall meet the following requirements (73 degrees F and 50 percent R.H.):

Work Life	45 - 180 minutes
Time to Reach 20 Shore "A" Hardness (at 77 degrees F, 200 gr quantity)	24 hours, maximum
Ultimate Hardness (ASTM D 2240)	20 - 45 Shore "A"
Tensile Strength (ASTM D 412)	200 psi, minimum
Ultimate Elongation (ASTM D 412)	400 percent, minimum

Tear Resistance (Die C ASTM D 624) 75 pounds per inch of thickness, minimum

Color Light Gray

- C. All polyurethane sealants for waterstop joints in concrete shall conform to the following requirements:
1. Sealant shall be 2-part polyurethane with the physical properties of the cured sealant conforming to or exceeding the requirements of ANSI/ASTM C 920 Type M.
 2. For vertical joints and overhead horizontal joints, only "non-sag" compounds shall be used; all such compounds shall conform to the requirements of ANSI/ASTM C 920 Class 25, Grade NS.
 3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C 920 Class 25, Grade P shall be used. For joints subject to either pedestrian or vehicular traffic, a compound providing non-tracking characteristics, and having a Shore "A" hardness range of 35 to 45, shall be used.
 4. Primer materials, if recommended by the sealant manufacturer, shall conform to the printed recommendations of the sealant manufacturer.
- D. Sealants for non-waterstop joints in concrete shall conform to the requirements of Section 07920.

2.4 JOINT MATERIALS

- A. Bearing Pad: Bearing pad to be neoprene conforming to ASTM D 1752 Type I, 40 durometer hardness unless otherwise noted.
- B. Neoprene Sponge: Sponge to be neoprene, closed-cell, expanded, conforming to ASTM D 1056, type RE-45-E1, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
- C. Preformed Joint Filler: Preformed joint filler material for water retaining applications shall be of the preformed non-extruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. All non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 for Type I, except as otherwise specified herein.

2.5 BACKING ROD

- A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/8-inch larger in diameter than the joint width except that a one-inch diameter rod shall be used for a 3/4-inch wide joint.

2.6 BOND BREAKER

- A. Bond breaker shall contain a fugitive dye so that areas of application will be readily distinguishable.

2.7 BENTONITE WATERSTOP

- A. Where called for, bentonite type waterstop, which shall expand in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast, shall be provided.
- B. The bentonite waterstop shall be composed of 75 percent bentonite. The balance of the material shall be butyl rubber-hydrocarbon with less than 1.0 percent volatile matter. The waterstop shall contain no asbestos fibers or asphaltics.
- C. The manufacturer's rated application temperature range shall be from 5 to 125 degrees F. The service temperature range shall be from -40 to 212 degrees F.
- D. The cross sectional dimensions of the unexpanded waterstop shall be one inch by 3/4-inch.
- E. The waterstop shall be provided with an adhesive backing which will provide excellent adhesion to concrete surfaces.

2.8 SLIP DOWELS

- A. Slip dowels in joints shall be A36 smooth epoxy-coated bars, conforming to ASTM A 775.

2.9 PVC TUBING

- A. PVC tubing in joints shall be Sch. SDR 13.5, conforming to ASTM D 2241.

2.10 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):

- 1. Flatstrip and Center-Bulb Waterstops:

Kirkhill-TA Company
Progress Unlimited, Incorporated
Greenstreak Plastic Products Company

- 2. Multi-Rib Waterstops

Progress Unlimited, Incorporated
Greenstreak Plastic Products Company

- 3. Sealants

Tremco Dymeric 240FC
Elastothane 227R by Pacific Polymers
Sikaflex 2C by Sika Corporation

- 4. Bond Breaker

Super Bond Breaker by Dayton Superior Edoco

PART 3 - EXECUTION

3.1 WATERSTOPS - GENERAL

- A. Waterstops of the type specified herein shall be embedded in the concrete across joints as shown. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. The CONTRACTOR shall take suitable precautions and means to support and protect the waterstops during the progress of the work and shall repair or replace at its own expense any waterstops damaged during the progress of the work. All waterstops shall be stored so as to permit free circulation of air around the waterstop material.
- B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.2 SPLICES IN WATERSTOPS

- A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that:
 - 1. The material not be damaged by heat sealing.
 - 2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.
 - 3. The continuity of the waterstop ribs and of its tubular center axis be maintained.
- B. Butt joints of the ends of 2 identical waterstop sections may be made while the material is in the forms.
- C. All joints with waterstops involving more than 2 ends to be jointed together, and all joints which involve an angle cut, alignment change, or the joining of 2 dissimilar waterstop sections shall be prefabricated by the CONTRACTOR prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.
- D. Where a centerbulb waterstop intersects and is jointed with a non-centerbulb waterstop, care shall be taken to seal the end of the centerbulb, using additional PVC material if needed.

3.3 JOINT CONSTRUCTION

- A. Setting Waterstops: In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support and anchor the waterstops during the progress of the WORK and to insure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it in the vicinity of all joints.
- B. In placing flat-strip waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Unless otherwise shown, all waterstops shall be held in place with light wire ties on 12-inch centers which shall be passed through the edge of the waterstop and tied to the curtain of reinforcing steel. Horizontal waterstops, with

- their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand so as to avoid the formation of air and rock pockets.
- C. In placing centerbulb waterstops in expansion joints, the centerbulb shall be centered on the joint filler material.
 - D. Waterstop in vertical wall joints shall stop 6 inches from the top of the wall where such waterstop does not connect with any other waterstop and is not to be connected to for a future concrete placement.
 - E. Joint Location: Construction joints, and other types of joints, shall be provided where shown. When not shown, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, unless noted otherwise. The location of all joints, of any type, shall be submitted to the CONSTRUCTION MANAGER for acceptance.
 - F. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between 2 sections of concrete is required. Unless otherwise shown, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03300 – Cast-in-Place Structural Concrete. Except on horizontal wall construction joints, wall to slab joints or where otherwise shown or specified, at all joints where waterstops are required, the joint face of the first pour shall be coated with a bond breaker as specified herein.
 - G. Construction Joint Sealant: Construction joints in water-bearing floor slabs, and elsewhere as shown, shall be provided with tapered grooves which shall be filled with a construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sand-blasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed, bond breaker tape placed in the bottom of the groove, and filled with the construction joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned, as outlined for the tapered grooves, prior to application of the sealant.
 - H. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant prior to application. The sides of the sealant groove shall not be coated with bond breaker, curing compound, or any other substance which would interfere with proper bonding of the sealant. All sealant shall achieve final cure at least 7 days before the structure is filled with water.
 - I. All sealant shall be installed by a competent waterproofing specialty contractor who has a successful record of performance in similar installations.
 - J. Thorough, uniform mixing of 2-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application.
 - K. Any joint sealant which, after the manufacturer's recommended curing time for the job conditions of the WORK hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be re-sealed with the specified joint sealant. All costs of such removal, joint treatment, re-sealing, and appurtenant work shall be at the expense of the CONTRACTOR.

L. Bentonite Waterstop:

1. Where a bentonite waterstop is called for, it shall be installed with the manufacturer's instructions and recommendations; except, as modified herein.
2. Bentonite waterstop shall only be used where complete confinement by concrete is provided. Bentonite waterstop shall not be used in expansion or contraction joints nor in the first 6 inches of any intersecting joint.
3. The bentonite waterstop shall be located as near as possible to the center of the joint and it shall be continuous around the entire joint. The minimum distance from the edge of the waterstop to the face of the member shall be 5 inches.
4. Where the thickness of the concrete member to be placed on the bentonite waterstop is less than 12 inches, the waterstop shall be placed in grooves formed or ground into the concrete. The groove shall be at least 3/4 inch deep and 1-1/4 inches wide. When placed in the groove, the minimum distance from the edge of the waterstop to the face of the member shall be 2.5 inches.
5. Where a bentonite waterstop is used in combination with PVC waterstop, the bentonite waterstop shall overlap the PVC waterstop for a minimum of 6 inches and shall be placed in contact with the PVC waterstop.
6. The bentonite waterstop shall not be placed when the temperature of the waterstop material is below 40 degrees F. The waterstop material may be warmed so that it shall remain above 40 degrees F during placement; however, means used to warm the material shall in no way harm the material or its properties. The waterstop shall not be installed where the air temperature falls outside the manufacturer's recommended range.
7. The concrete surface under the bentonite waterstop shall be smooth and uniform. The concrete shall be ground smooth if needed. Alternately, the bentonite waterstop shall be bonded to the surface using an epoxy grout which completely fills all voids and irregularities beneath the waterstop material. Prior to installation, the concrete surface shall be wire brushed to remove any laitance or other materials that may interfere with the bonding of epoxy.
8. The bentonite waterstop shall be secured in place with concrete nails and washers at 12-inch maximum spacing. This shall be in addition to the adhesive backing provided with the waterstop.

** END OF SECTION **

SECTION 03300 - CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing finished cast-in-place structural concrete including forming, mixing, placing, curing, repairing, and finishing.
- B. The following types of concrete shall be covered in this Section:
 - 1. Structural Concrete: Concrete to be used in all cases except where indicated otherwise.
 - 2. Lean Concrete: Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles, where the preceding items are indicated as unreinforced. Lean concrete shall be used as protective cover for dowels intended for future connection.
- C. The term "hydraulic structure" used in these specifications shall refer to environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03200 Reinforcement Steel
 - 3. Section 03280 Joints in Sitework Concrete
 - 4. Section 03290 Joints in Concrete Structures
 - 5. Section 03315 Grout
 - 6. Section 07920 Sealants and Caulking

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.
 - 1. Federal Specifications:
 - UU-B-790A (Int.Amd. 1) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).
 - 2. Commercial Standards:
 - ACI 117 Standard Tolerances for Concrete Construction and Materials

ACI 214	Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	Specifications for Structural Concrete for Buildings
ACI 309	Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Structural Concrete
ASTM C 31	Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 33	Specification for Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C 88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 94	Specification for Ready-Mixed Concrete
ASTM C 131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 143	Test Method for Slump of Hydraulic-Cement Concrete
ASTM C 150	Specification for Portland Cement
ASTM C 157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 289	Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C 309	Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 535	Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Testing Agency Evaluation

ASTM D 1751 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

ASTM D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate

ASTM E 119 Method for Fire Tests of Building Construction and Materials

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals.
1. Mix Designs: Prior to beginning the WORK and within 14 days of the notice to proceed, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed for each class and type of concrete. The mix designs shall be checked by an independent testing laboratory acceptable to the CONSTRUCTION MANAGER. All costs related to such checking shall be borne by the CONTRACTOR.
 2. Provide the following submittals in accordance with ACI-301:
 - a. Mill tests for cement.
 - b. Admixture certification. Chloride ion content must be included.
 - c. Aggregate gradation and certification.
 - d. Materials and methods for curing.
 3. Certified Delivery Tickets: Where ready-mix concrete is used, the CONTRACTOR shall provide certified weighmaster delivery tickets at the time of delivery of each load of concrete. CONTRACTOR'S certificate with each delivery ticket shall show the public weighmaster's signature, and the total quantities, by weight of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate and added at the batching plant as well as the amount of water allowed to be added at the site for the specific design mix. Each certificate shall, in addition, state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished.

1.5 CONCRETE CONFERENCE

- A. A meeting to review the detailed requirements of the CONTRACTOR's proposed concrete design mixes and to determine the procedures for producing proper concrete construction shall be held no later than 14 days after the notice to proceed.
- B. All parties involved in the concrete work shall attend the conference, including the following:
- CONTRACTOR's representative
 - Testing laboratory representative
 - Concrete subcontractor

Reinforcing steel subcontractor and detailer
Concrete supplier
Admixture manufacturer's representative

- C. The conference shall be held at a mutually agreed upon time and place. The CONSTRUCTION MANAGER shall be notified no less than 5 days prior to the date of the conference.

1.6 TESTING

A. General

1. Tests on component materials and for compressive strength and shrinkage of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.
2. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the OWNER. However, the CONTRACTOR shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The laboratory must meet or exceed the requirements of ASTM C 1077.
3. Concrete for testing shall be supplied by the CONTRACTOR at no cost to the OWNER, and the CONTRACTOR shall provide assistance to the CONSTRUCTION MANAGER in obtaining samples, and disposal and cleanup of excess material.

B. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the CONSTRUCTION MANAGER to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 4 cylinders.
2. Compression test specimens for concrete will be made and cured in accordance with ASTM C 31. Specimens will be 6-inch diameter by 12-inch high cylinders.
3. Compression tests will be performed in accordance with ASTM C 39. One test cylinder will be tested at 7 days and 2 at 28 days. The remaining cylinder will be held to verify test results, if needed.

C. Evaluation and Acceptance of Concrete:

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, Chapter 5 "Concrete Quality," and as specified herein.
2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi.
3. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.
4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any 3 consecutive tests being below the specified compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

5. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement at no additional cost to the OWNER.

D. Shrinkage Tests:

1. Drying shrinkage tests will be made for the trial batch indicated below, the first placement of each class of concrete, and during construction to insure continued compliance with these Specifications.
2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gauge length of 10 inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: specimens shall be removed from molds at an age of 23 \pm 1 hours after trial batching, shall be placed immediately in water at 70 degrees F \pm 3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F \pm 3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F \pm 3 degrees F and 50 percent \pm 4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be as indicated below.

- E. Construction Tolerances: The CONTRACTOR shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

<u>Item</u>	<u>Tolerance</u>
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/4-inch; In 20 feet or more: 1/2-inch
Variation from the level or from the grades shown.	In 10 feet: 1/4-inch; In 20 feet or more: 1/2-inch
Variation from the plumb	In 10 feet: 1/4-inch; In 20 feet or more: 1/2-inch

Variation in the thickness of slabs and walls.	Minus 1/4-inch; Plus 1/2-inch
Variation in the locations and sizes of slabs and wall openings	Plus or minus 1/4-inch

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. General:

1. All materials specified herein shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application.
2. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

B. All materials furnished for the work shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.

C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.

D. Materials for concrete shall conform to the following requirements:

1. Cement shall be standard brand portland cement conforming to ASTM C 150 for Type II or Type V, including Table 1A optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the CONSTRUCTION MANAGER. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the CONSTRUCTION MANAGER if requested regarding compliance with these Specifications.
2. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.
3. Aggregates shall be obtained from pits acceptable to the CONSTRUCTION MANAGER, shall be non-reactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as specified herein. Lightweight sand for fine aggregate will not be permitted.
 - a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than 3/4-inch. When the aggregates are proportioned for each batch of concrete the two size groups shall be combined. See the requirements below for the use of the size groups.

- b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D2419, the sand equivalency shall not be less than 75 percent for an average of three samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.
 - c. Combined aggregates shall be well graded from coarse to fine sizes, and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.
 - d. When tested in accordance with ASTM C 289, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.
 - e. When tested in accordance with ASTM C 40, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.
 - f. When tested in accordance with ASTM C 131 or ASTM C 535, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.
 - g. When tested in accordance with ASTM C 88, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.
4. Ready-mix concrete shall conform to the requirements of ASTM C 94.
5. Admixtures: All admixtures shall be compatible and by a single manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior end result, the CONTRACTOR shall discontinue use of the admixture. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion, and shall be non-toxic after 30 days.
- a. Air-entraining agent meeting the requirements of ASTM C 260 shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The OWNER reserves the right, at any time, to sample and test the air-entraining agent received on the job by the CONTRACTOR. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement.
 - b. Set controlling and water reducing admixtures: Admixtures may be added at the CONTRACTOR's option to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at the CONTRACTOR's expense. The use of an admixture shall be subject to acceptance by the CONSTRUCTION MANAGER. Concrete containing an admixture shall be first placed at a location determined by the CONSTRUCTION MANAGER. Admixtures specified herein shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

- (1) Concrete shall not contain more than one water reducing admixture. Concrete containing an admixture shall be first placed at a location determined by the CONSTRUCTION MANAGER.
- (2) Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture shall be used.
- (3) Normal range water reducer shall conform to ASTM C 494, Type A. The quantity of admixture used and the method of mixing shall be in accordance with the Manufacturer's instructions and recommendations.
- (4) High range water reducer shall conform to ASTM C 494, Type F or G. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified. No more than 14 ounces of water reducer per sack of cement shall be used. Water reducer shall be considered as part of the mixing water when calculating water cement ratio.
- (5) If the high range water reducer is added to the concrete at the job site, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3 inches ∇ 1/2-inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.
- (6) Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.
- (7) Flyash shall not be used.

2.2 CURING MATERIALS

- A. Materials for curing concrete as specified herein shall conform to the following requirements and ASTM C 309:
 1. All curing compounds shall be white pigmented, resin based; Sodium silicate compounds shall not be allowed. Only water based resin curing compounds shall be used.
 2. Polyethylene sheet for use as concrete curing blanket shall be white, and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.
 3. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, having a nominal thickness of 2 mils and permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (Int. Amd. 1). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

4. Polyethylene-coated burlap for use as concrete curing blanket shall be 4-mil thick, white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.
5. Curing mats for use in Curing Method 6 as specified herein, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

2.3 NON-WATERSTOP JOINT MATERIALS

- A. Materials for non-waterstop joints in concrete shall conform to the following requirements:
 1. Preformed joint filler for non-water retaining applications shall be a non-extruding, resilient, bituminous type conforming to the requirements of ASTM D 1751.
 2. Elastomeric joint sealer shall conform to the requirements of Section 07920 – Sealants and Caulking.
 3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants.

2.4 MISCELLANEOUS MATERIALS

- A. Dampproofing agent shall be an asphalt emulsion.
- B. Bonding agents shall be epoxy adhesives.

2.5 CONCRETE DESIGN REQUIREMENTS

- A. General: Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The exact proportions in which these materials are to be used for different parts of the work will be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. In mix designs, the percentage of sand of the total weight of fine and coarse aggregate shall not exceed 41 for hydraulic structures or 50 for all other structures, unless noted otherwise. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the OWNER. All changes shall be subject to review by the CONSTRUCTION MANAGER.
- B. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content of concrete shall be not less than that specified in the following tabulation.

Type of Work	Min 28-Day Compr. Strength (psi)	Max Size Aggregate (in)	Minimum Cement per cu yd (lbs)	Max W/C Ratio (by weight)
Structural Concrete:				
Roof, floor slabs, columns, walls and all other concrete items not specified elsewhere.	4,000	1	564	0.45
12 inch and thicker walls, slabs on grade and footings. (optional)	4,000	1-1/2	564	0.45
Pea Gravel Mix. This sections and areas with congested reinforcing, at the CONTRACTOR'S option and with the written approval of the CONSTRUCTION MANAGER for the specific location. Maximum fine aggregate 50 percent by weight of aggregate.	4,000	3/8	752	0.40
Lean concrete	2,000	1	376	0.60

Note: The CONTRACTOR is cautioned that the limiting parameters specified above are not a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by the CONTRACTOR'S construction methods and aggregates. The CONTRACTOR is responsible for any costs associated with furnishing concrete with the required workability.

- C. Adjustments to Mix Design: The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

2.6 CONSISTENCY

- A. The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods herein specified to give the desired density, impermeability and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

<u>Part of Work</u>	<u>Slump (in)</u>
All concrete, unless noted otherwise	3 inches \pm 1 inch
With high range water reducer added	7 inches \pm 2 inches
Pea gravel mix	7 inches \pm 2 inches
Ductbanks	5 inches \pm 1 inch

2.7 TRIAL BATCH AND LABORATORY TESTS

- A. Before placing any concrete, a testing laboratory designated by the CONSTRUCTION MANAGER shall prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the CONTRACTOR. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments shall be considered refinements to the mix design and shall not be the basis for extra compensation to the CONTRACTOR. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the CONTRACTOR's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and 6 compression test specimens from each batch. The cost of not more than 3 laboratory trial batch tests for each specified concrete strength will be borne by the OWNER but the CONTRACTOR shall furnish and deliver the materials in steel drums at no cost. Any additional trial batch testing required shall be performed at the expense of the CONTRACTOR at no increase in cost to the OWNER.
- B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. Three compression test cylinders will be tested at 7 days and 3 at 28 days. The average compressive strength for the 3 cylinders tested at 28 days for any given trial batch shall not be less than 125 percent of the specified compressive strength.
- C. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

2.8 SHRINKAGE LIMITATION

- A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.036 percent or 0.042 percent, respectively. The CONTRACTOR shall only use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete.
- B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.
- C. If the required shrinkage limitation is not met during construction, the CONTRACTOR shall take any or all of the following actions, at no additional cost to the OWNER, for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.9 MEASUREMENT OF CEMENT AND AGGREGATE

- A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the CONTRACTOR and acceptable to the CONSTRUCTION MANAGER.

B. Weighing tolerances:

	<u>Material</u>	<u>Percent of total weight</u>
	Cement	1
	Aggregates	3
	Admixtures	3

2.10 MEASUREMENT OF WATER

- A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the CONSTRUCTION MANAGER and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any specified amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism must be such that leakage will not occur when the valves are closed.

2.11 READY-MIXED CONCRETE

- A. At the CONTRACTOR'S option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94, including the following supplementary requirements.
- B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.
- C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.
- D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.
- E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.
- F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a delivery ticket furnished to the CONSTRUCTION MANAGER.

- G. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the CONSTRUCTION MANAGER.

2.12 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):

1. Air Entraining Agent
 - Micro-Air by BASF
 - Daravair by W.R. Grace
 - Sika AEA-15 by Sika Corporation
2. Set Retarding Admixture
 - Plastiment by Sika Corporation
 - Pozzolith 300R by BASF
 - Daratard by W.R. Grace
3. Set Accelerating Admixture
 - Plastocrete 161FL by Sika Corporation
 - Pozzutec 20 by BASF
 - Daraset by W.R. Grace
4. Normal Range Water Reducer
 - WRDA by W.R. Grace
 - Pozzolith 322-N by BASF
 - Plastocrete 161 by Sika Corporation
5. High Range Water Reducer
 - Daracem 100 or WRDA by W.R. Grace
 - Sikament by Sika Corporation
 - Rheobuild 1000 or Rheobuild 716 by BASF
6. Curing Compound
 - Aqua Resincure by Dayton Superior Edoco
 - Aqua-cure by Euclid Chemical Company
 - Masterkure-W by BASF
7. Evaporation Retardant
 - Confilm by BASF
 - Eucobar by Euclid Chemical Company
8. Dampproofing Agent
 - Hydrocide 600 by BASF Sonneborn
 - Sealmastic by W.R. Meadows
 - Dehydratine 75 by Euclid Chemical Company

9. Agents for Bonding Freshly-Mixed Plastic Concrete to Hardened Concrete

Sikadur 32 Hi-Mod Epoxy Adhesive by Sika Corporation
Concresive Liquid (LPL) by BASF
BurkEpoxy MV by Dayton Superior Edoco

10. Agents for Bonding Hardened Concrete to Steel

Sikadur 31 Hi-Mod Gel by Sika Corporation
BurkEpoxy NS by Dayton Superior Edoco
Concresive Paste (LPL) by BASF

PART 3 - EXECUTION

3.1 PROPORTIONING AND MIXING

- A. Proportioning: Proportioning of the concrete mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.
- B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of ACI 301.
- C. Slump: Maximum slumps shall be as indicated.
- D. Retempering: Retempering of concrete or mortar which has partially hardened shall not be permitted.

3.2 PREPARATION OF SURFACES FOR CONCRETING

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- B. Joints in Concrete up to 60 Days Old: Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the CONSTRUCTION MANAGER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblasting or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.
- C. After the surfaces have been prepared all approximately horizontal construction joints shall be covered with a 6-inch lift of the pea gravel mix indicated above. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.
- D. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the CONSTRUCTION MANAGER.

- E. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the CONSTRUCTION MANAGER at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.
- F. All inserts or other embedded items shall conform to the requirements herein.
- G. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the CONSTRUCTION MANAGER before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.
- H. Casting New Concrete Against Concrete over 60 Days Old: Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the CONSTRUCTION MANAGER.
- I. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the CONSTRUCTION MANAGER.
- J. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.
- K. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.
- L. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.
- M. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.3 HANDLING, TRANSPORTING, AND PLACING

- A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.

- B. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by the CONTRACTOR at no additional cost to the OWNER.
- C. Unauthorized Placement: No concrete shall be placed except in the presence of duly authorized representative of the CONSTRUCTION MANAGER. The CONTRACTOR shall notify the CONSTRUCTION MANAGER in writing at least 24 hours in advance of placement of any concrete.
- D. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.
- E. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of an acceptable type. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.
- F. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.
- G. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.

3.4 PUMPING OF CONCRETE

- A. General: If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.
- B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.
- C. The minimum diameter of the hose (conduits) shall be in accordance with ACI 304.2R.
- D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced.
- E. Aluminum conduits for conveying the concrete shall not be permitted.
- F. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the placement (discharge) end of the line.

3.5 ORDER OF PLACING CONCRETE

- A. The order of placing concrete in all parts of the work shall be acceptable to the CONSTRUCTION MANAGER. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7 days for hydraulic structures and 3 days for all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 14 days for hydraulic structures and 7 days for all other structures.
- B. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

3.6 TAMPING AND VIBRATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be Group 3 (per ACI 309) high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required. Group 2 vibrators may be used only at specific locations when accepted by the CONSTRUCTION MANAGER.
- B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

- C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.7 FINISHING CONCRETE SURFACES

- A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and were indicated above. Tolerances are to be distinguished from irregularities in finish as described below. Aluminum finishing tools shall not be used.
- B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as indicated.
 - 1. Surface holes larger than 1/2 inch in diameter or deeper than 1/4 inch are defined as surface defects in basins and exposed walls.
- C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:
 - 1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.
 - 2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where shown or as determined by the CONSTRUCTION MANAGER.
 - 3. Finish U3 - After the floated surface (as specified for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.
 - 4. Finish U4 - Steel trowel finish (as specified for Finish U3) without local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. The resulting surface shall be rough enough to provide a nonskid finish.

- D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE FINISH SCHEDULE

<u>Area</u>	<u>Finish</u>
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2
Slabs which are water bearing with slopes 10 percent and less	U3
Sloping slabs which are water bearing with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U3
Top surface of walls	U3

- E. Floor Sealer/Hardener (Surface Applied):

1. Floors to receive hardener shall be cured, cleaned, and dry with all work above them completed. Not less than 60 days shall have elapsed between casting floors and application of sealer/hardener. Apply zinc and/or magnesium fluosilicate evenly, using 3 coats, allowing 24 hours between coats.
2. The first coat shall be 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength. Each coat shall be applied so as to remain wet on the concrete surface for 15 minutes. If sodium silicate is used, it shall be applied evenly, using 3 coats, allowing 24 hours between coats, and the material shall be applied full strength at the rate of one gallon per 300 square feet. Approved proprietary hardeners shall be applied in conformance with the manufacturer's instruction. After the final coat is completed and dry, surplus hardener shall be removed from the surface by scrubbing and mopping with water.
3. Floor hardener shall be applied where shown.

3.8 ARCHITECTURAL FINISH

- A. General: Architectural finishes shall be required only where specifically indicated. In all other cases the requirements above shall apply.
1. Immediately after the forms have been stripped, the concrete surface shall be inspected and any poor joints, voids, rock pockets, or other defective areas shall be repaired and all form-tie holes filled as specified herein.
 2. Architectural finishes shall not be applied until the concrete surface has been repaired as required and the concrete has cured at least 14 days.
 3. All architecturally treated concrete surfaces shall conform to the accepted sample required herein in texture, color, and quality. It shall be the CONTRACTOR's responsibility to maintain and protect the concrete finish.

B. Smooth Concrete Finish

1. The concrete surface shall be wetted, and a grout shall be applied with a brush. The grout shall be made by mixing one part portland cement and one part of fine sand that will pass a No. 16 sieve with sufficient water to give it the consistency of thick paint. The cement used in said grout shall be 1/2 gray and 1/2 white portland cement, as determined by the CONSTRUCTION MANAGER. Calcium chloride in the amount of 5 percent by volume of the cement shall be used in the brush coat. The freshly applied grout shall be vigorously rubbed into the concrete surface with a wood float filling all small air holes. After all the surface grout had been removed with a steel trowel, the surface shall be allowed to dry and, when dry, shall be vigorously rubbed with burlap to remove completely all surface grout so that there is no visible paint-like film of grout on the concrete. The entire cleaning operation for any area shall be completed the day it is started, and no grout shall be left on the surface overnight.
2. Cleaning operations for any given day shall be terminated at panel joints. It is essential that the various operations be carefully timed to secure the desired effect which is a light-colored concrete surface of uniform color and texture without any appearance of a paint or grout film.
3. In the event that improper manipulation results in an inferior finish, the CONTRACTOR shall rub such inferior areas with carborundum bricks.
4. Before beginning any of the final treatment on exposed surfaces, the CONTRACTOR shall treat in a satisfactory manner a trial area of at least 200 square feet in some inconspicuous place selected by the CONSTRUCTION MANAGER and shall preserve said trial area undisturbed until the completion of the job.

C. Sandblasted Concrete Finish

1. Sandblasting shall be done in a safe manner acceptable to local authorities and per OSHA requirements. The sandblasting shall be a light sandblast to remove laitance and to produce a uniform fine aggregate surface texture with approximately 1/32- to 1/16-inch of surface sandblasted off. Corners, patches, form panel joints, and soft spots shall be sandblasted with care.
2. A 3-sq ft sample panel of the sandblasted finish shall be provided by the CONTRACTOR for acceptance prior to starting the sandblasting work. The sample panel shall include a corner, plugs, and joints and shall be marked after approval. All other sandblasting shall be equal in finish to the sample panel.
3. Protection against sandblasting shall be provided on all surfaces and materials not requiring sandblasting but within or adjacent to areas being sandblasted. After sandblasting, the concrete surfaces shall be washed with clean water and excess sand removed.

3.9 CURING AND DAMPPROOFING

- A. General: All concrete shall be cured for not less than 14 days after placing, in accordance with the methods specified herein for the different parts of the work, and described in detail in the following paragraphs:

<u>Surface to be Cured or Dampproofed</u>	<u>Method</u>
Unstripped forms	1
Wall sections with forms removed	4 or 6

- | | |
|--|---|
| Construction joints between footings and walls, and between floor slab and columns | 2 |
| Encasement concrete and thrust blocks | 3 |
| All concrete surfaces not specifically provided for elsewhere in this Paragraph | 4 |
| Floor slabs on grade in hydraulic structures | 5 |
| Slabs not on grade | 6 |
- B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 14 days of placing the concrete, curing shall be continued in accordance with Method 6, herein.
- C. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.
- D. Method 3: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.
- E. Method 4: The surface shall be sprayed with a liquid curing compound.
1. Curing compound shall not be used on concrete surfaces to be coated, waterproofed, moistureproofed, or where any coverings are to be bonded.
 2. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.
 3. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
 4. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.
 5. Where curing compound is specified, it shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within 2 hours after removal of forms from contact with formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound, following which repairs shall be made as specified herein.

6. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the previously coated panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.
7. Prior to final acceptance of the WORK, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage surface finish.

F. Method 5:

1. Until the concrete surface is covered with curing compound, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 4, herein. Not less than one hour nor more than 4 hours after the coat of curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.
2. The curing blankets shall be left in place during the 14-day curing period and shall not be removed until after concrete for adjacent work has been placed. Should the curing blankets become torn or otherwise ineffective, the CONTRACTOR shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. The CONTRACTOR shall add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

G. Method 6:

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 14 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.
2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.
3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held in place to prevent being dislodged by wind or any other causes and to be substantially in contact with the concrete surface. All edges shall be continuously held in place.
4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.
5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4, herein.

6. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the work.

H. Dampproofing

1. The exterior surface of all buried roof slabs shall be dampproofed as follows.
 - a. Immediately after completion of curing the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in 2 coats. The first coat shall be diluted to 1/2 strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the specified material, undiluted, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as specified herein.
 - b. As soon as the asphalt emulsion, applied as specified herein, has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used which produces a uniformly coated white surface and which so remains until placing of the backfill. Should the whitewash fail to remain on the surface until the backfill is placed, the CONTRACTOR shall apply additional whitewash

3.10 PROTECTION

- A. The CONTRACTOR shall protect all concrete against injury until final acceptance by the OWNER.
- B. Fresh concrete shall be protected from damage due to rain. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

3.11 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the CONSTRUCTION MANAGER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements herein specified shall be promptly executed by the CONTRACTOR at its own expense.
- B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair proposed shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion

of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

- C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.
- D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- E. Prior to filling any structure with water, all cracks that may have developed shall be "vee'd" as shown and filled with sealant conforming to the requirements of Section 03290 – Joints in Concrete Structures. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired.

3.12 PATCHING HOLES IN CONCRETE

A. Patching Small Holes:

- 1. Holes which are less than 12 inches in their least dimension and extend completely through concrete members, shall be filled as specified herein.
- 2. Small holes in members which are water-bearing or in contact with soil or other fill material, shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 inches from the finished surface. The remaining 2 inches shall then be patched according to the Paragraph above.
- 3. Small holes through all other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.

B. Patching Large Holes:

- 1. Holes which are larger than 12 inches in their least dimension, shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as specified herein.
- 2. Holes which are larger than 24 inches in their least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless indicated otherwise.
- 3. Large holes in members which are water bearing or in contact with soil or other fill, shall have a bentonite type waterstop material placed around the perimeter of the hole as specified in the Section 03290 – Joints in Concrete Structures, unless there is an existing waterstop in place.

3.13 CARE AND REPAIR OF CONCRETE

- A. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the OWNER. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the CONTRACTOR'S expense.

** END OF SECTION **

SECTION 03310 - CAST-IN-PLACE SITEWORK CONCRETE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing finished cast-in-place lean concrete, sitework concrete, minor non-hydraulic concrete structures, air placed concrete, including formwork, steel reinforcement, mixing, placing curing, and repairing, all in conformance with SSPWC.
- B. Sitework concrete includes curbs, gutters, catch basins, sidewalks, pavements, fence and guard post embedment, underground duct bank encasement, and all concrete WORK indicated to be sitework concrete.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03280 Joints in Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 SHOP DRAWINGS AND SAMPLES

- A. Submittals shall be made in compliance with Section 01300 – Contractor Submittals, and in accordance with the requirements of SSPWC, Section 201.

1.5 TESTS

- A. Tests on component materials, for the compressive strength of concrete, and for construction tolerances shall be performed in accordance with the requirements of SSPWC, Section 201.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Concrete component materials, including curing materials and joint materials shall be in accordance with SSPWC, Subsections 201-1, 201-4, and 201-5.

2.2 FORMWORK

- A. Concrete formwork shall comply with SSPWC Subsection 204-1.

2.3 STEEL REINFORCEMENT

- A. Reinforcing steel shall conform to SSPWC Subsection 201-2.

PART 3 - EXECUTION

3.1 GENERAL

- A. Proportioning and mixing, preparation of surfaces for concreting, handling, transporting and placing concrete, finishing and curing concrete surfaces and related procedures shall be performed in accordance with SSPWC, Subsections 303-1 and 303-5.

3.2 AIR-PLACED CONCRETE

- A. Air-placed concrete construction (Guniting and Shotcrete) shall be in accordance with SSPWC, Subsection 303-2 and the applicable provisions of Subsection 303-1.

**** END OF SECTION ****

SECTION 03315 - GROUT

PART 1 - GENERAL

WORK OF THIS SECTION

- A. The WORK of this Section includes providing grout other than that required for masonry work, complete.
- B. The following types of grout are included in the WORK of this Section:
 - 1. Non-Shrink Grout: This type of grout shall be used wherever grout is required, unless another type is specifically indicated.
 - 2. Cement Grout
 - 3. Epoxy Grout
 - 4. Topping Grout and Concrete Fill

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03300 Cast-in-Place Structural Concrete
 - 2. Section 03310 Cast-In-Place Sitework Concrete

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current versions of the following apply to the WORK of this Section:
 - 1. CRD-C 621 Corps of Engineers Specification for Non-shrink Grout
 - 2. ASTM C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
 - 3. ASTM C 531 Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacing, and Polymer Concretes
 - 4. ASTM C 579 Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 - 5. ASTM C 827 Test Method for Change in Height at Early Ages of Cylinder Specimens of Cementitious Mixtures
 - 6. ASTM D 696 Test Method for Coefficient of Linear Thermal Expansion of Plastics

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grouts proposed for use in the WORK.
 - 2. Certified test results verifying the compressive strength, shrinkage, and expansion properties for proposed non-shrink and epoxy grouts.

1.5 TESTING DURING CONSTRUCTION

- A. Field Tests:
 - 1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the CONSTRUCTION MANAGER to insure continued compliance with these specifications. The specimens will be made by the CONSTRUCTION MANAGER or its representative.
 - 2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the CONSTRUCTION MANAGER. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.
 - 3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the CONSTRUCTION MANAGER. A set of three specimens will be made for testing at 7 days, and each earlier time period as appropriate.
 - 4. All grout, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at the cost of the CONTRACTOR.
 - 5. The cost of all laboratory tests on grout will be borne by the OWNER, but the CONTRACTOR shall assist the CONSTRUCTION MANAGER in obtaining specimens for testing. However, the CONTRACTOR shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The CONTRACTOR shall supply all materials necessary for fabricating the test specimens.

PART 2 - PRODUCTS

2.1 CEMENT GROUT

- A. Cement Grout: Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4000 psi.
- B. Cement grout materials shall be as indicated in Section 03300 – Cast-in-Place Structural Concrete.

2.2 PREPACKAGED GROUTS

- A. Non-Shrink Grout:

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout indicated herein shall be that recommended by the manufacturer for the particular application.
 2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C 827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.
 3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.
 4. Application:
 - a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout indicated herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
 - b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.
- B. Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
 2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
 3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.
 4. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.
 5. The epoxy grout shall exhibit a minimum effective bearing area of 95 percent. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface of the grout shall be probed with a sharp instrument to locate all voids.

6. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95 degrees F when tested with 75 degree F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of 30×10^{-6} inches/inch/degree F when tested according to ASTM C 531 or ASTM D 696.
7. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.

2.3 TOPPING GROUT AND CONCRETE FILL

- A. Grout for topping of slabs and concrete fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as indicated herein. All materials and procedures specified for concrete in Section 03300 shall apply except as indicated otherwise herein.
- B. Topping grout and concrete fill shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45. Where concrete fill is thicker than 3 inches, structural concrete as indicated in Section 03300 may be used when accepted by the CONSTRUCTION MANAGER.
- C. Coarse aggregate shall be graded as follows:

<u>U.S. STANDARD SIEVE SIZE</u>	<u>PERCENT BY WEIGHT PASSING</u>
1/2"	100
3/8"	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- D. Final mix design shall be as determined by trial mix design under supervision of the approved testing laboratory.
- E. Strength: Minimum compressive strength of topping grout and concrete fill at the end of 28 days shall be 3000 psi.

2.4 CURING MATERIALS

- A. Curing materials shall be as indicated in Section 03300 – Cast-in-Place Structural Concrete, for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.5 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as required for the particular application.
- B. The slump for topping grout and concrete fill shall be adjusted to match placement and finishing conditions but shall not exceed 4 inches.

2.6 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

2.7 MANUFACTURERS

- A. Products shall be of the following manufacture (or equal):
 - 1. Epoxy Grout: Dayton Superior Edoco BurkEpoxy Anchoring Grout.

PART 3 - EXECUTION

3.1 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300 – Cast-in-Place Structural Concrete. The finish of the grout surface shall match that of the adjacent concrete.
- B. The manufacturer of Class A non-shrink grout and epoxy grout shall provide on-site technical assistance upon request.
- C. Base concrete or masonry must have attained its design strength before grout is placed, unless authorized by the CONSTRUCTION MANAGER.

3.2 GROUTING PROCEDURES

- A. Prepackage Grouts: All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- B. Base Plate Grouting:
 - 1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a one-inch thickness of grout or a thickness as indicated.
 - 2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The mixture shall be of a trowelable consistency and tamped or rodded solidly into the space between the plate and the base concrete. A backing board or stop shall be provided at the back side of the space to be filled with grout. Where this method of placement is not practical or where required by the CONSTRUCTION MANAGER, alternate grouting methods shall be submitted for acceptance.
- C. Topping Grout:
 - 1. All mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete fill. The base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing the aggregates to ensure bonding to the base slab.

2. The minimum thickness of grout topping and concrete fill shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.
3. The base slab shall be thoroughly cleaned and wetted prior to placing topping and fill. No topping concrete shall be placed until the slab is complete free from standing pools or ponds of water. A thin coat of neat Type II cement grout shall be broomed into the surface of the slab just before topping of fill placement. The topping and fill shall be compacted by rolling or tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping and fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

3.3 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

** END OF SECTION **

SECTION 04232 - REINFORCED CONCRETE BLOCK MASONRY

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing concrete masonry work complete, including reinforcing steel, embedded items, and all other appurtenant work.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03200 Reinforcement Steel
 - 2. Section 03300 Cast-in-Place Structural Concrete
 - 3. Section 05500 Miscellaneous Metalwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - REFERENCE STANDARDS.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Commercial Standards
 - ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures
 - ACI 531 Building Code Requirements for Concrete Masonry Structures
 - ASTM A 615 Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - ASTM C 5 Specification for Quicklime for Structural Purposes
 - ASTM C 55 Building Brick, Concrete

ASTM C 90	Specification for Load-Bearing Concrete Masonry Units
ASTM C 140	Methods for Sampling and Testing Concrete Masonry Units
ASTM C 144	Specification for Aggregate for Masonry Mortar
ASTM C 150	Specification for Portland Cement
ASTM C 207	Specification for Hydrated Lime for Masonry Purposes
ASTM C 270	Specification for Mortar for Unit Masonry
ASTM C 404	Specification for Aggregates for Masonry Grout
ASTM C 426	Test Method for Linear Drying Shrinkage of Concrete Masonry Units
ASTM C 476	Specification for Grout for Masonry
ASTM C 1314	Test Method for Compressive Strength of Masonry Prisms
Masonry Industry Advancement Committee	Masonry Design Manual
Portland Cement Association	Concrete Masonry Handbook

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. Samples of concrete masonry unit colors with texture ranges as specified under products shall be submitted to the CONSTRUCTION MANAGER for selection of color. Full size samples of the blocks selected shall be submitted for final approval by the CONSTRUCTION MANAGER after color and texture selection. Samples of mortar colors shall be submitted for color selection by the CONSTRUCTION MANAGER.
 2. Certification shall be submitted showing material compliance with these Specifications. The CONSTRUCTION MANAGER'S approval shall be obtained prior to delivery of concrete masonry units to the job site.
 3. A 4-ft minimum square free-standing sample panel shall be prepared for approval by the CONSTRUCTION MANAGER before starting masonry work and shall remain at the work site for reference until all masonry work is completed.

1.7 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
1. Test reports of mortar and grout.
 2. Test reports of masonry prisms.

1.8 FACTORY TESTING OF MASONRY UNITS

- A. Concrete block masonry units shall be sampled and tested for compressive strength, absorption and moisture content in accordance with ASTM C 140.

1.9 TESTING OF MORTAR AND GROUT

- A. The CONSTRUCTION MANAGER will have the mortar and grout tested in accordance with IBC to assure compliance with the Specifications and the governing codes.
- B. Tests will be taken at the following times:
 - 1. At the commencement of the masonry work, at least 2 test samples each of mortar and grout taken on 3 successive working days.
 - 2. At any change in materials or job conditions, at least 2 samples of each modified material, grout and mortar.
 - 3. Four random tests each of mortar and grout. The random test samples shall be taken when requested by the CONSTRUCTION MANAGER.
 - 4. Additional samples and tests may be required whenever, in the judgment of the CONSTRUCTION MANAGER, additional tests (beyond the random tests) are necessary to determine the quality
- C. The CONTRACTOR shall store the test samples in a moist environment until tested, unless directed otherwise by the CONSTRUCTION MANAGER.
- D. The grout and mortar strengths shall be not less than the minimum strengths specified herein.

1.10 TESTING OF MASONRY PRISMS

- A. The CONSTRUCTION MANAGER will have masonry prisms tested to assure compliance with the Specifications and the governing codes.
- B. Tests will be taken at the following times:
 - 1. At the time of construction of the sample panel, as indicated herein, at least five masonry prisms shall be made for each type of block indicated herein; except separate prisms are not required for block which only varies by texture.
 - 2. At any change in materials during construction, at least five masonry prisms shall be made for each type of block affected.
 - 3. One set of at least five masonry prisms shall be made for each masonry structure, besides the structure that the sample panel is part of, or for each week in which block is laid, for each type of block involved, whichever occurs first.
 - 4. Additional sets of at least five masonry prisms may be required whenever, in the judgment of the CONSTRUCTION MANAGER, additional tests are necessary to determine the quality of the materials.
- C. The prisms shall be constructed by the CONTRACTOR in the presence of the CONSTRUCTION MANAGER or the CONSTRUCTION MANAGER'S representative. The same personnel who are laying the block in the structure shall construct the masonry prisms.

- D. The masonry prisms shall be constructed and will be tested as specified in "Test Methods for Compressive Strength of Masonry Prisms" ASTM C 1314, Method B, except as modified herein. The prisms shall be composed of one complete cell using full-size blocks which are saw-cut. The minimum ratio of height to smaller width dimension shall be 1.5. The prism shall be at least 15 inches high. A minimum of two horizontal bed joints shall be used to form the prism. The prism shall be grouted, after the required 24-hour minimum cure period, using the same grout used in the walls.
 - E. Compression tests will include two prisms tested at 7 days after grouting and three prisms tested at 28 days after grouting.
 - F. The average compressive strength of prisms tested at 28 days after grouting, multiplied by the appropriate correction factor as given in the International Building Code, shall not be less than the indicated masonry compressive strength.
 - G. If the compressive strength of the prisms, made during the construction of the sample panel and tested as indicated herein, fails to meet the requirement, adjustments shall be made to the mix designs for the mortar, or grout, or both, as needed to produce the specified strength. The masonry units shall also be retested to verify compliance with the requirements of ASTM C 90, Grade N-1.
 - H. If the compressive strength of the prisms, made during construction of the WORK and tested as indicated herein, fails to meet the requirement, prisms or cores shall be cut from the walls in sufficient numbers and in sufficient locations to adequately determine the strength of the walls. Those portions of the walls represented by specimens failing to meet the required compressive strength shall be subject to removal and replacement.
- 1.11 SPECIAL INSPECTION
- A. Continuous inspection by a special inspector approved by the local building department having jurisdiction will be required where necessary to conform with code requirements. Costs of special inspection shall be paid for by the CONTRACTOR. Inspection reports shall be submitted to the CONSTRUCTION MANAGER.
- 1.12 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Cement, lime, and other cementitious materials shall be delivered to the site and stored in dry, weather-tight sheds or enclosures, in unbroken bags, barrels, or other containers, plainly marked and labeled with the manufacturers' names and brands. Mortar and grout shall be stored and handled in a manner which will prevent the inclusion of foreign materials and damage by water or dampness. Masonry units shall be handled with care to avoid chipping and breakage, and shall be stored as directed in the Concrete Masonry Handbook. Materials stored on newly constructed floors shall be stacked in such manner that the uniformly-distributed loading does not exceed 30 psf. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete masonry units shall conform to SSPWC subsection 202-2, with maximum linear shrinkage of 0.06 percent from standard to oven-dried condition. Units shall be normal weight classification units unless indicated otherwise.
- B. Concrete masonry units shall be 8-inch by 16-inch by 12-inch modular size, with smooth faces. Units shall be of natural gray color.

- C. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped non-structural blocks may be constructed by saw cutting. Color and texture shall match that of adjacent units.
- D. Concrete masonry units hidden from view entirely may be natural color units the same size as other adjacent masonry units.
- E. Concrete masonry units at interior walls shall be normal weight classification block 8-inch by 16-inch by 8-inch modular size of natural color.

2.2 MATERIALS FOR MORTAR AND GROUT

- A. Materials for mortar and grout shall conform to SSPWC subsection 202-2.1 and the following requirements.
- B. Portland cement shall be Type II, low alkali, conforming to ASTM C 150.
- C. Lime paste shall be made with pulverized quicklime, or with hydrated lime, which shall be allowed to soak not less than 72 hrs before use; except, that hydrated lime processed by the steam method shall be allowed to soak not less than 24 hrs and shall be made by adding the lime to the water. In lieu of hydrated lime paste for use in mortar, the hydrated lime may be added in the dry form. Hydrated lime shall be Type S, conforming to ASTM C 207. Pulverized quicklime shall conform to ANSI/ASTM C 5, shall pass a No. 20 sieve, and 90 percent shall pass a No. 50 sieve.
- D. Sand shall conform to ASTM C 144. Coarse aggregate shall conform to ASTM C 404.
- E. Water for mixing shall be clear potable water.
- F. Reinforcing steel shall be deformed bars conforming to ASTM A 615, Grade 40, or Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.
- G. Admixture for mortar shall not be detrimental to the bonding or help the process of efflorescence.
- H. Veneer ties shall be per the International Building Code.

2.3 MANUFACTURERS

- A. Products shall be of the following manufacture and type (or equal):
 - 1. Admixture for Mortar:

BASF Rheomix
Sika Chemical Co.
 - 2. Admixture for Grout:

Sika Chemical Co. "Sika Grout Aid"
BASF Pozzoloth 100XR

PART 3 - EXECUTION

3.1 GENERAL

- A. Concrete block masonry construction shall comply with SSPWC subsection 303-4.1 and the requirements specified herein.
- B. Concrete masonry units shall not be placed when air temperature is below 40 degrees F (4 degrees C) and shall be protected against direct exposure to the wind and sun when erected when the ambient air temperature exceeds 99 degrees F (37 degrees C) in the shade with relative humidity less than 50 percent.
- C. Concrete masonry shall conform to the International Building Code, the Masonry Design Manual published by the Masonry Industry Advancement Committee, and other applicable codes and standards of governing authorities.
- D. All work shall conform to the standard of quality established by the CONSTRUCTION MANAGER'S acceptance of the free-standing sample panel required to be constructed prior to starting the masonry work.
- E. Tolerances for concrete masonry units shall conform to the following:
 - 1. Maximum variation from plumb:
 - a. In walls and corners: 1/4-inch in 10 feet; 3/8-inch in any story or 20 feet maximum; 1/2-inch in 40 feet.
 - b. For external corners and other conspicuous lines: 1/4-inch in any story or 20 feet maximum; 1/2-inch in 40 feet.
 - 2. Maximum variation from level or indicated elevations: 1/4-inch in any bay or 20 feet; 1/2-inch in 40 feet.
 - 3. Maximum variation from plan position indicated on the Drawings: 1/2-inch maximum.
- F. Measurements for mortar and grout shall be accurately made. Shovel measurements are not acceptable. Mortar proportions shall be accurately controlled and maintained.

3.2 INSPECTION

- A. CONTRACTOR shall thoroughly examine all substrates, areas and conditions under which installation WORK of this Section is to be undertaken and notify CONSTRUCTION MANAGER in writing of conditions detrimental to proper, timely, and successful completion of the installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
- B. Inspection by the CONTRACTOR shall be required during preparation of masonry wall prisms, sampling and placing of all masonry units, placement of reinforcement, and inspection of grout space immediately prior to closing of cleanouts and during all grouting operations.

3.3 SHORING AND BRACING

- A. All shoring and bracing shall be provided as required for the WORK. Shoring and bracing shall be constructed to required shapes and sizes, capable of supporting and sustaining the loads to which they will be subjected without failure or deflection. Shores and bracing shall be left in place until concrete masonry can safely carry all required live and dead loads.

- B. Concrete masonry walls shall be adequately braced to withstand all forces to which they will be subjected during construction. Walls are not designed to be self supporting for lateral loads until attached to floor and roof elements.

3.4 MORTAR

- A. Mortar for concrete block masonry shall be Class D or E, with a minimum 28-day compressive strength of 1800 psi. Proportions shall be one part portland cement, 1/4- to 1/2- part lime paste or hydrated lime, and damp, loose sand in an amount (by volume) of not less than 2-1/4 or more than 3 times the sum of the volumes of cement and lime used, with the precise amount of water required to produce the required workability and strength.
- B. Mortar for use with colored masonry units shall have integral color as approved by the CONSTRUCTION MANAGER. Mortar color shall match block color.

3.5 GROUT

- A. Grout shall have a minimum 28-day compressive strength of 2000 psi. Proportions shall be one part portland cement, not more than 1/10-part lime paste or hydrated lime, 2-1/4 to 3 parts damp, loose sand, not more than 2 parts pea gravel, and water in the amount necessary to produce a consistency for pouring without segregation of components. Where the grout space is less than 4 inches, pea gravel shall be omitted.
- B. Admixtures may only be used when approved by the CONSTRUCTION MANAGER. When it has been approved for use, admixtures shall be used in accordance with the manufacturer's published recommendations for the grout.

3.6 CONSTRUCTION -- GENERAL

- A. All work shall be performed in accordance with the provisions of the applicable code for reinforced concrete hollow-unit masonry.
- B. The CONTRACTOR shall set or embed in his work all anchors, bolts, reglets, sleeves, conduits, and other items as required.
- C. All block cutting shall be by machine.
- D. Masonry units shall be supported off the ground and shall be covered to protect them from rain. Only clean, dry, uncracked units shall be incorporated into the WORK. Concrete masonry units shall not be wetted.
- E. All reinforcing steel shall be cleaned of all loose rust and scale, and all oil, dirt, paint, laitance, or other substances which may be detrimental to or reduce bonding of the steel and concrete.
- F. Immediately before starting work, the concrete upon which the masonry will be laid shall be cleaned with water under pressure.
- G. A full mortar joint for first course shall be provided.
- H. Units shall be shoved tightly against adjacent units to assure a good mortar bond.

3.7 EQUIPMENT

- A. All equipment for mixing and transporting the mortar and grout shall be clean and free from set mortar, dirt, or other foreign matter.

3.8 MIXING

- A. Mortar shall be mixed by placing 1/2 of the water and sand in the operating mixer, after which the cement, lime, and remainder of the sand and water shall be added. After all ingredients are in the mixer, they shall be mechanically mixed for not less than 5 minutes. Retempering shall be done on the mortar board by adding water within a basin formed within the mortar, and the mortar reworked into the water. Mortar which is not used within one hour shall be discarded.

3.9 ERECTION OF CONCRETE BLOCK MASONRY

- A. Masonry work shall be erected in-plane, plumb, level, straight, and true to dimensions shown and executed in accordance with acceptable practices of the trade.
- B. Concrete masonry units shall be laid with full-face shell mortar beds. Vertical head joints shall be solidly filled with mortar from face of unit to a distance behind the face equal to not less than the thickness of longitudinal face shells. Cross-webs of starting course courses shall be solidly bedded in mortar.
- C. Unless noted or shown otherwise, masonry shall be laid up in straight uniform courses with running bonds.
- D. All masonry shall be erected to preserve the unobstructed vertical continuity of the cells measuring not less than 3-inch by 3-inch in cross-section. Walls and cross webs shall be fully bedded in mortar. All head and end joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.
- E. Where horizontal reinforced beams are shown, special units shall be used or regular units shall be modified to allow for placement of continuous horizontal reinforcement bars. Small mesh expanded metal lath or wire screening shall be used in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or units shall be provided with solid bottoms.

3.10 JOINTS

- A. Vertical and horizontal joints shall be uniform and approximately 3/8-inch wide. Exterior joints and interior exposed block joints shall be concave-tooled to a dense surface. Special care shall be used in tooling joints so as to match existing construction. Interior or exterior non-exposed masonry and masonry behind plaster shall have flush joints.

3.11 CLEANOUTS

- A. Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout, where such lift or pour is over 4 ft in height. Any overhanging mortar or other obstructions or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed before grouting and after inspection. Cleanout openings shall match the finished wall in exposed masonry.

3.12 REINFORCEMENT

- A. General: Reinforcement bars shall not be used with kinks or bends not shown on the drawings or final shop drawings, nor shall bars be used with reduced cross-section due to excessive rusting or other causes.

- B. Reinforcement shall be positioned accurately at the spacing indicated. Vertical bars shall be supported and secured against displacement. Horizontal reinforcement shall be placed as the masonry work progresses. Where vertical bars are indicated in close proximity, a clear distance shall be provided between bars of not less than the normal bar diameter or 1-inch, whichever is greater.
- C. Reinforcement bars shall be spliced where shown; bars shall not be spliced at other points unless acceptable to the CONSTRUCTION MANAGER. In splicing vertical bars or attaching to dowels, ends shall be lapped, placed in contact and wire tied. Not less than the minimum lap indicated shall be provided, or if not indicated, as required by governing code.
- D. Splices shall be welded where indicated. CONTRACTOR shall comply with the requirements of AWS D1.4 for welding materials and procedures.
- E. Prefabricated horizontal joint reinforcement shall be embedded as the work progresses, with a minimum cover of 5/8-inch on exterior face of walls and 1/2-inch at other locations. Units shall be lapped not less than 6 inches at ends. Prefabricated "L" and "T" units shall be used to provide continuity at corners and intersections. Units shall be cut and bent as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Anchoring: Reinforced masonry WORK shall be anchored to supporting structures as indicated. Where required, reinforced masonry walls shall be anchored to non-reinforced masonry walls where they intersect.
- G. Deep cut bond beam blocks shall be used where horizontal reinforcing steel is embedded. H-block bond beams may be used at locations other than openings.
- H. Knock-out openings shall have no steel or joint reinforcing running through the opening. Head, jambs, and sill blocks shall be used to provide an even finish surface to install the window unit when blocks are removed. Joints at head, jambs, and sills shall be stacked and continuous.
- I. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 192 diameters of the reinforcement.

3.13 GROUTING

- A. All cells and bond beam spaces shall be filled solidly with grout unless indicated otherwise. Grouting shall not be started until the wall has cured for 24 hours. Grout shall not be poured in more than 8-ft lifts.
- B. All grout shall be consolidated at time of pouring by puddling or vibrating. Where the grouting operation has been stopped for one hour or longer, horizontal construction joints shall be formed by stopping the grout pour 1-1/2 inches below the top of the uppermost unit.

3.14 PROTECTION

- A. Wall surfaces shall be protected from droppings of mortar or grout during construction.

3.15 FINISHING AND CLEANING

- A. Masonry shall not be wet-finished unless exposed to extreme hot weather or hot wind and then only by using a nozzle-regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.

- B. Finish masonry shall be cleaned and pointed in a manner satisfactory to the CONSTRUCTION MANAGER, based upon the standards established by the approved sample panel.
- C. All exposed to view interior and exterior colored masonry work shall be cleaned by light sandblasting to remove all stains and other imperfections.
- D. All exposed masonry surfaces of openings and window and door openings such as sills, heads, and jambs shall be finish block surfaces, not formed surfaces, unless indicated otherwise. Closed bottom bond beam blocks shall be used at heads and sills. Pour holes may be used at the sill under window frame and where approved by the CONSTRUCTION MANAGER.

3.16 VENEER TIES

- A. Veneer ties shall be provided per International Building Code and trade standards where veneered surfaces are shown.

** END OF SECTION **

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing structural steel and related appurtenances.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 09800 Protective Coating

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

- 1. International Building Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the applicable sections of the current editions of the documents indicated apply to the WORK of this Section.

- 1. AISC M011 Manual of Steel Construction for Shop and Field Welding
- 2. AISC S326 Design, Fabrication and Erection of Structural Steel for Buildings
- 3. ASTM A36 Carbon Structural Steel
- 4. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- 5. ASTM A283 Low and Intermediate Tensile Strength Carbon Steel Plates
- 6. ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- 7. ASTM A320 Alloy-Steel and Stainless Steel Bolting for Low Temperature Service
- 8. ASTM A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

- 9. ASTM A490 Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
- 10. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, Grade B
- 11. ASTM A501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- 12. ASTM A666 Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
- 13. AWS-B3.0 Welding Procedures and Performance Qualifications
- 14. AWS-D1.1 Structural Welding Code--Steel
- 15. AWS-W1 Welding Metallurgy

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop drawings, including details, dimensions, details of match markings and all information necessary for fabrication.
 - 2. Welding procedures and welder qualifications.

1.7 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 - 1. Certificates that steels comply with the indicated standards.
 - 2. Certificates that welding operators and procedures comply with the indicated requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for structural steel members and connection, unless otherwise indicated, shall comply with the following:
 - 1. Standard rolled steel sections ASTM A36
 - 2. Pipe columns ASTM A53, Grade B
 - 3. Structural steel tubing ASTM A500, Grade B, or ASTM A501
 - 4. Structural bars, plates and similar items ASTM A36 or A283
 - 5. Stainless steel ASTM A666, Grade A, Type 316L
 - 6. Stainless steel bolts, nuts and washers ASTM A320, Type 316
 - 7. High strength steel bolts ASTM A325 or ASTM A490

2.2 FABRICATION

- A. Fabrication shall be in accordance with AISC S326 and indicated requirements. All structural steel welding in off-site fabrication shops shall be continuously inspected by a City of San Diego Certified Special Inspector. The continuous inspection will be waived if the work is done in a shop certified by the Council of American Building Officials (CABO), or listed by the International Conference of Building Officials (ICBO) Evaluation Services, Inc.. This shall be at no extra cost to the OWNER.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Structural assemblies and shop and field welding shall meet the requirements of AISC M011 and AISC S326.
2. Measurements and dimensions shall be verified at the site.
3. Bolt holes shall be 1/16 inch larger than the nominal size of bolts. Where thick metals are indicated, holes shall be sub-punched and drilled or reamed.
4. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.
5. Bolts shall not be permitted to drift and holes shall not be enlarged to correct misalignment. In the event of mismatching of holes, new materials shall be provided.
6. Structural steel completely encased in concrete shall not be galvanized or painted and shall have a clean surface for bonding to concrete.
7. Damaged structural steel shall be replaced. Use of salvaged, reprocessed, or scrap materials shall not be permitted.

B. Welding:

1. Welding shall be performed by operators who have been qualified by tests as prescribed by AWS-W1 Sect. 7, to perform the type of welding indicated. Welding shall comply with AWS Code for Arc Welding in Building Construction, Section 4, Workmanship. Electrodes shall be matching per AWS.
2. Continuous seal welds shall be applied on structural steel designed to be exposed to weather or submerged in water or wastewater. Continuous seal welds shall be applied on both sides of structural steel designed to be submerged in water or wastewater.

C. Bolted Connections:

1. Where bolted connections are indicated, they shall comply with AISC Specifications for Framed Beam Connections for bearing type connections. The threaded portion of bolts shall not occur at shear planes.

3.2 CORROSION PROTECTION

- A. Unless otherwise indicated, all structural steel, including that used in the fabrication of process equipment, shall be surface prepared and coated in accordance with Section 09800 – Protective Coating, and shall include the following operations:
 - 1. Exterior and interior edges of flame-cut pieces shall be ground smooth.
 - 2. Sharp edges and punched holes shall be ground smooth.
 - 3. Uneven or rough welds shall be ground smooth.

3.3 TOUCH-UP AND REPAIR

- A. After installation, damaged surfaces of shop-primed structural steel shall be cleaned and touched-up with same material used for shop coat.

** END OF SECTION **

SECTION 05500 - MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing miscellaneous metalwork and appurtenances including anchor bolts, ladders, handrails, gratings, stairs, hatches, pipe columns and manhole frames and covers

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01300 Contractor Submittals
 - 2.. Section 03315 Grout
 - 3. Section 05521 Aluminum Railings
 - 4. Section 09800 Protective Coating

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Federal Specifications:
 - MIL-G-18015 Gratings, Metal, Other than Bar Type
 - 2. Commercial Standards:
 - AISC MO11 Manual of Steel Constructions
 - AASHTO HS-20 Truck Loading
 - ASTM A 36 Specification for Carbon Structural Steel

ASTM A 48	Specification for Gray Iron Castings
ASTM A 53	Specification for Pipe, Steel, Black and Hot- Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 125	Specification for Steel Springs, Helical, Heat Treated
ASTM A 153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A320	Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
ASTM A489	Carbon Steel Lifting Eyes
ASTM A 575	Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM B 98	Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
ASTM B 210	Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
ASTM B 221	Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 438	Specification for Bronze Powder Metallurgy (P/M) Bearings (Oil-Impregnated)
ANSI/AWS D1.1	Structural Welding Code - Steel
NFPA 101	Life Safety Code
NAAMM AMP 510	Metal Stairs Manual

1.6 SHOP DRAWINGS AND SAMPLES

- A. Shop drawings of all miscellaneous metalwork shall be submitted in compliance with Section 01300 – Contractor Submittals.
- B. Layout drawings for grating shall be submitted showing the direction of span, type, material and depth of grating, size and shape of grating panels, seat angle details, and details of grating hold down fasteners. Load and deflection tables shall be submitted for each style and depth of grating used.

- C. An ICBO report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor used shall be submitted to the Engineer for review. Contractor shall submit manufacturer's recommended installation instructions and procedures for all adhesive anchors for Engineer's review. Upon review, by Engineer, these instructions shall be followed specifically.
- D. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICBO report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.
- E. Calculations: Engineering calculations shall be submitted for review. Engineering calculations shall include (but not be limited to) guardrail posts, railings, handrail brackets, brackets, support flanges, and fasteners or anchors.

1.7 QUALITY ASSURANCE

- A. All welding shall be inspected by a CONTRACTOR-provided inspector qualified in accordance with AWS requirements and approved by the OWNER.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS METALWORK

- A. Materials: Except as otherwise indicated, products fabricated of structural steel shapes, plates and bars shall comply with the requirements of ASTM A 36 or ASTM A283.
- B. Corrosion Protection: Unless otherwise indicated, miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment or will be submerged, shall be stainless steel or coated in accordance with Section 09800. Other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication except as otherwise indicated.
- C. Stainless Steel: Stainless steel metalwork shall be of Type 316 L stainless steel. Stainless steel shall not be torch heated for welding. The CONTRACTOR shall submit welding methods and procedures. All welded stainless steel shall be passivated after welding by immersing in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid. Temperature and detention time for passivation shall be sufficient for removal of oxidation and ferrous contamination without etching of surface. The passivated steel shall undergo a complete neutralization by immersion in a detergent rinse followed by clean water wash, or shall be buffed with Scotch Brite EXL (or equal) for removal of weld discoloration and heat tint.
- D. Aluminum: Unless otherwise indicated, aluminum metalwork shall be of Alloy 6061-T6. Aluminum in contact with concrete, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with Section 09800. All aluminum shall be anodized after fabrication.
- E. Welding: Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" and supplemented by other standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.

In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS Code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

- F. Galvanizing: Where galvanizing is indicated, structural steel plates shapes, bars and fabricated assemblies shall be thoroughly cleaned of rust and scale and shall be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts (except ASTM A325), anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

2.2 ANCHOR BOLTS

- A General: Anchor bolts shall comply with the following:

1. Anchor bolts shall be fabricated of materials complying with SSPWC Subsections 206-1.4.1 and 209-2.2 and as follows:

Steel bolts	ASTM A325
Fabricated steel bolts	ASTM A36
Stainless steel bolts, nuts, washers	ASTM A320, Type 316

2. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a maximum oversizing of 1/4 inch. Unless otherwise indicated, minimum anchor bolt diameter shall be 1/2 inch. Anchor bolts for equipment shall be 316 stainless steel and shall be provided with leveling nuts which shall be tightened against flat surfaces to not less than 10 percent of the bolt's safe tensile stress.
3. Tapered washers shall be provided where mating surface is not square with the nut.
4. Expansion, wedge, or adhesive anchors set in holes drilled in the concrete after the concrete is placed is not permitted as substitution for anchor bolts except where otherwise indicated. Upset threads shall not be acceptable.
5. ASTM A307 anchor bolts are prohibited.
6. Anchor bolts located within the dry well or vaults shall be Type 316 stainless steel.

- B. Adhesive Anchors: Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors. Substitutions will not be considered unless accompanied with ICBO report verifying strength and material equivalency. Except as otherwise indicated, adhesive anchors shall comply with the following:

1. Epoxy adhesive anchors may be provided for drilled anchors where exposed to weather, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails and reinforcing bars. Threaded rod shall be stainless steel Type 316.
2. Glass capsule, polyester resin adhesive anchors may be permitted in other locations.

- C. Expanding-Type Anchors: Expanding-type anchors, where indicated, shall be Type 316 stainless steel. Size shall be as shown. Expanding-type anchors are prohibited from use in corrosive areas and in deteriorating concrete

2.3 POWER DRIVEN PINS

- A. Materials: Power-driven pins for installation in concrete or steel in interior locations of nonprocess areas shall be heat-treated steel alloy complying with AISI 1062 or 4063 and shall be zinc-plated. Pins shall have capped or threaded heads capable of transmitting the shank loads. Pins that are connected to steel shall have longitudinal serrations around the circumference of the shank.

2.4 BOLTS

- A. Bolt Requirements: Bolts shall comply with the following:
 - 1. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
 - 2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.
- B. Standard Service Bolts (Not Buried or Inside Tanks or Channels): Except where otherwise indicated, bolts and nuts shall be Type 416 stainless steel. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 320.
- C. Bolts Buried or Inside Tanks or Channels: Unless otherwise indicated, bolts, anchor bolts, nuts and washers which are buried, submerged, or below the top of the wall inside any hydraulic structure shall be of Type 316 stainless steel.
- D. Unless otherwise indicated, eyebolts shall conform to ASTM A 489.

2.5 IRON CASTINGS

- A. Castings shall conform to the requirements of ASTM A 48 unless otherwise indicated.

2.6 GRATINGS

- A. General: Both bearing bars and cross bars shall be continuous. Openings shall be banded with bars having the same dimensions as the bearing bars. Perimeter edges shall be banded with bars flush at the top surface of the grating and 1/4 inch clear of the bottom surface. Bars terminating against edge bars shall be welded to the edge bars when welded construction is used. When crimped or swaged construction is used, bars at edges shall protrude a maximum of 1/16 inch and shall be peened or ground to a smooth surface. No single piece of grating shall weigh more than 60 pounds unless otherwise indicated.

Rough weld beads and sharp metal edges on gratings and plates shall be ground smooth. Welds exposed to view shall be uniform and neat. Welds to be galvanized shall be sandblasted prior to galvanizing.

Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled. Cutting, drilling, punching, threading and tapping shall be performed prior to hot-dip galvanizing.

- B. Materials: Aluminum grating bearing bars and aluminum floor plates and cover plates shall be of alloy 6061-T6 conforming to ASTM B221. Aluminum grating cross bars shall be of an alloy conforming to either ASTM B221 (extrusions) or B210 (drawn).

Unless otherwise indicated, grating shall be fabricated of aluminum. Bearing bars shall be punched to receive the cross bars. After insertion in the bearing bars, cross bars shall be deformed by a hydraulic press or similar means to permanently lock the bars into the bearing bar openings. Fabrication methods employing bending or notching of bearing or cross bars will not be permitted.

Fasteners and securing clips shall be Type 316 stainless steel.

- C. Pedestrian grating shall have a uniform live load of 150 pounds per square foot or a concentrated point load of 300 pounds. The maximum allowable deflection shall not exceed 1/4-inch or 1/360 of the span, whichever is less. Stair treads and landings shall be designed for a 33-percent increase in loading for impact, applied at midspan and distributed over the nosing and 4 bearing bars.

2.7 STAIRS

- A. Unless otherwise indicated, stairs shall be aluminum and shall be fabricated in accordance with standard practice of the NAAMM AMP 510 and applicable codes, and as indicated.
- B. Treads shall be grating with integral corrugated non-slip nosing. Provide abrasive stair nosing at concrete slab landing.
- C. Fabricate and design stair, platforms and landings, and all connections to support a 100 psf uniform live load or a concentrated load of 1,000 lbs, whichever requires the stronger component.

2.8 ACCESS HATCHES

- A. Where access hatches are called for on the drawings to be mounted on a concrete slab (including top slabs, which are not covered with a roofing membrane) or on a concrete curb, the hatch shall be a flush type as indicated herein.
- B. All hatches shall be fabricated from Aluminum 6061 T6 unless otherwise indicated. All hatch hardware shall be Type 316 stainless steel. Hatches shall be gutter-type, or as shown.
- C. Access hatches shall be designed for HS-20 highway loading, unless indicated otherwise, with a maximum allowable deflection of 1/150 of the span. Manufacturer to provide structural calculations stamped by a registered professional engineer.
- D. Hatch opening sizes, number and direction of swing of door leaves, and locations, shall be as indicated. Sizes given shall be for the clear opening. Where the number of leaves is not given, openings larger than 42 inches in either direction shall have double-leaf doors. Unless indicated otherwise, hinges shall be located on the longer dimension side. Unless indicated otherwise, ladder hatches shall be a minimum of 30 inches wide by 36 inches long, with the ladder centered on the shorter dimension, and the door hinge opposite the ladder.
- E. Door leaves shall be a minimum of 1/4-inch checkered pattern plate.
- F. Channel frames shall be a minimum of 1/4 inch material with an anchor flange around the perimeter. A continuous Ethylene Propylene Diene Monomer (EPDM) gasket shall be mechanically attached to the aluminum frame to create a barrier around the entire perimeter of the cover and significantly reduce the amount of dirt and debris that may enter the channel frame.

- G. Hatches shall be provided with an automatic hold-open arm with release handle. Hatches shall be designed for easy opening from both inside and outside.
- H. Hatches shall be designed to be water-tight and shall be equipped with a joint gutter and moat-type edge drain. A 1½ inch diameter (minimum) drain connection shall be provided and located by the manufacturer.
- I. Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4-inch gusset support plate.
- J. Hatches shall include a recessed hasp for a padlock that is covered by a hinged lid flush with the surface.
- K. Hinges shall be heavy forged aluminum hinges, each having a minimum 1/4-inch diameter Type 316 stainless steel pin, and shall pivot so the cover does not protrude into the channel frame.
- L. Type 316 stainless steel safety chains, consisting of 3/16-inch thick links, shall be mounted on both open sides of double door hatches.
- M. Installation shall be in accordance with manufacturer's instructions. Manufacturer shall guarantee against defects in material or workmanship for a period of five years.
- N. Finish: Aluminum in contact with other metal or concrete shall be shop-painted with one coat of zinc chromate and 2 coats of approved aluminum metal-and-masonry paint.

2.9 PIPE COLUMNS

- A. Pipe column steel shall conform to the requirements of ASTM A 53, Grade B.

2.10 LADDERS

- A. Ladders: Ladders shall be of aluminum and meet the requirements of OSHA in Title 8, Division 1, Chapter 4, Subchapter 7, Group 1, Article 4, Section 3277. Ladders shall be of welded construction and use ½-inch X 2-3/4-inch channel stringers with 1-3/8-inch diameter ribbed rung. Ladder width length and standoff length shall be as indicated on the construction drawings.
- B. Pop-Up Extensions: Ladders that do not have an exterior handhold shall be equipped with a pop-up extension. Pop-up extension device shall be manufactured of the same material and finish as the ladder with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by stainless steel spring balancing mechanisms. Units shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.
- C. Fall Protection: Ladders five feet or more in height shall be equipped with a sliding harness type fall protection system compliant with OSHA 1910.27 – 1926.53. System shall include a cable, cable grabs with carabiner, ladder rung mounting brackets and cable adjuster. Provide two harnesses per installation.

2.11 MANHOLE FRAMES AND COVERS

- A. Except as otherwise indicated, manhole frames and covers shall comply with SSPWC Subsection 206-3.3 and shall be fabricated of cast iron complying with ASTM A48, Class 30 and shall be the heavy-duty type designed for HS-20 highway loading, shall have a 24-inch clear frame opening and a minimum frame height of 4-1/2 inches and shall be equipped with a continuous-ring type gasket designed to minimize surface water inflow. Cover pattern shall be checkered pattern design and shall have concealed or closed pick holes with sufficient dimensions to allow for removal without special equipment. Bearing and wedging surfaces shall be machined to ensure a tight fit and to prevent rocking. Frames shall be provided with four 1-inch diameter holes for anchor bolts. The use of salvaged or scrap materials will not be permitted.
- B. Covers shall be provided with a continuous, machined groove on either the underside bearing lip or the outer wedging edge of the cover. A groove on the bearing lip shall be fitted with a glued, continuous, low compression, set gasket; a groove on the outside edge shall be fitted with a neoprene O-ring seal.
- C. Locking type, nongasketed frames and covers shall be provided where indicated. Locking covers shall have two locking wedges in the frame. Covers shall have two fingers which engage the locking wedges when the cover is positioned in the frame and turned.

2.12 MANUFACTURERS

- A. Products of the type or model (if any) indicated shall be manufactured by one of the following (or equal):
 - 1. Epoxy Adhesive Anchors:
 - Hilti HIT-RE 500
 - Sika AnchorFix-1 System with Sikadur Injection Gel Epoxy
 - Simpson Strong-Tie Set-XP
 - BASF MBT Concrete Paste LPL
 - 2. Glass Capsule Polyester Resin Adhesive Anchors:
 - Hilti HVA
 - Simpson Strong-Tie VGC
 - 3. Expanding-Type Anchors:
 - ITW "Red Head"
 - Hilti "Kwik-Bolt"
 - 4. Access Hatches:
 - Babcock Davis
 - Bilco Company
 - Milcor
 - 5. Manhole Frames and Covers:
 - Neenah Foundry Company
 - Phoenix Iron Works

6. Aluminum Grating:

Harsco
Seidelhuber
7. Ladder Safety Extension:

Babcock Davis SPM
Bilco Model LU-4
8. Ladder Fall Protection:

North Safety Products "RungMaster"

PART 3 - EXECUTION

3.1 GENERAL

- A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."
- B. General: Fieldwork, including cutting and threading, shall not be permitted on galvanized items. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Grouting of anchor bolts with nonshrink or epoxy grouts, where indicated, shall be in accordance with Section 03315 - Grout.
 1. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.
 2. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if indicated, recesses or blockouts shall be formed in the concrete. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. Recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place. Embedments shall comply with Section 03300 – Cast-in-Place Structural Concrete.
 3. Holes shall be punched 1/16-inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.
 4. Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.
- C. Craftmanship: All Work shall be performed by craftsmen experienced in the fabrication of architectural metal work. Exposed surfaces shall be free from defects or other surface blemishes. All dimensions and conditions shall be verified in the field in advance. All joints, junctions, miters, and butting sections shall be precision-fitted, with no gaps occurring between sections, and all surfaces shall be flush and aligned.

3.2 INSTALLATION OF ANCHOR BOLTS

- A. After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

- B. Installation of adhesive, capsule and expansion anchors shall comply with the following:
1. All installation recommendations by the anchor system manufacturer shall be followed carefully, including maximum hole diameter.
 2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F is not indicated. Overhead applications (such as pipe supports) shall not be allowed.
 3. Use shall be limited to locations where exposure to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is not indicated.
 4. Concrete temperature (not air temperature) shall be compatible with curing requirements recommended by adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.
 5. Anchor diameter and grade of steel shall comply with equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
 6. Adhesive capsules of different diameters may be used to obtain proper volume for the embedment, but no more than two capsules per anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.
 7. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
 8. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.
 9. Anchor shall be left undisturbed and unloaded for full adhesive curing period.

3.3 INSTALLATION OF POWER DRIVEN PINS:

- A. Power-driven pins shall be installed by a craftsman who is certified by the manufacturer as being qualified to install the manufacturer's pins. Pins shall be driven in one initial movement by an instantaneous force that has been carefully selected to attain the required penetration. Driven pins shall conform to the following requirements where "D" = Pin's shank diameter:

<u>Material Penetrated by Pin</u>	<u>Material's Minimum Thickness</u>	<u>Pin's Shank Penetration in Supporting Material</u>	<u>Minimum Space From Pin's CL to Edge of Penetrated Material</u>	<u>Minimum Pin Space</u>
Concrete	16D	6D minimum	14D	20D
Steel	1/4-inch	Steel thickness	4D	7D

3.4 INSTALLATION OF GRATING, FLOOR AND COVER PLATES

- A. Grating, floor and cover plates shall be field measured for proper cutouts and proper sizes.

3.5 INSTALLATION OF STAIRS AND LADDERS

- A. Stairs and ladders shall be fitted accurately and field measured where necessary.

3.6 INSTALLATION OF ACCESS HATCHES

- A. Unless otherwise indicated, the WORK of this Section includes a 1/2-inch drain line to the nearest floor drain for all floor hatches.

3.7 INSTALLATION OF DRILLED ANCHORS

- A. Drilled anchors shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dry. Drilled anchors shall not be installed until the concrete has reached the indicated 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

3.8 INSTALLATION OF MANHOLE FRAMES AND COVERS

- A. The installation of manhole frames and covers shall comply with SSPWC Subsection 301-1.6.

3.9 WELDING

- A. Method: All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
- B. Quality: In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as indicated by the AWS Code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.
- C. Aluminum: All exposed welds shall be ground smooth and flush and shall be polished and anodized. Discoloration of exposed aluminum surfaces, whether or not due to welding, shall constitute a basis for rejection of the entire assembly.

** END OF SECTION **

SECTION 05521 - ALUMINUM RAILINGS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing complete aluminum railings, guardrails and handrailing systems.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 05500 Miscellaneous Metalwork
 - 2. Section 09800 Protective Coating

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 - Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. General Industrial Safety Order (Title 8) Cal-OSHA
 - 3. State Building Code (Title 24) Requirements for Handicapped Persons

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM A320/A320M Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
 - 2. ASTM B241/B241M Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop drawings showing details of railings.

2. Layout plan showing post location and spans, gate locations, and removable railing sections.
3. Engineering calculations for railings, handrail brackets, brackets, support flanges, and fasteners or anchors.
4. Samples of systems and samples of color.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken packages, containers, or bundles bearing the label of the manufacturer.
- B. Storage: All materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements as required by the product manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Railings shall comply with SSPWC Subsection 304-2.1 unless indicated otherwise.
- B. The aluminum railings shall be pipe railing system unless otherwise indicated. Railing system shall be deck base or side bracket mounted unless indicated otherwise.
- C. Railing systems shall meet IBC and Cal-OSHA requirements.
- D. Railings and handrail brackets shall be designed for the two non-simultaneous loading conditions without exceeding the allowable working stress of the material and without permanent deformation: (1) a 200-pound concentrated load applied to any point in any direction (2) a 50-pound per linear foot loading applied perpendicular to the top rail.
- E. The allowable working stress shall be 60 percent of the material yield stress for materials that are more than 3 inches from a weld and 40 percent of the yield stress for all materials within 3 inches of any weld.
- F. Railings shown at curved structures, elements or other areas such as the following: tanks, retaining walls, stairs, process units and ramps shall be bent to the radius necessary to install where indicated.

2.2 MATERIALS

- A. Rail Section: Railings and handrails shall be round pipe design railing system unless otherwise indicated.
- B. Rail Material: Aluminum shall be U.S. Alloy 6063, T-5 or T-6. Aluminum pipe rail shall be not less than 1-1/2-inch diameter, Schedule 40 pipe.
- C. Welding Rods: Aluminum welding rods shall be of type recommended by the aluminum manufacturer for anodized finished products.
- D. Protective Coating: Electrolysis protective material shall comply with Section 09800 – Protective Coating.

- E. Sleeves: Sleeves for grout pockets shall be formed with EZ type removable plastic insert sleeves. Sleeves for removable posts shall be of 316 stainless steel. Sleeves for removable railings at indicated corrosive environment locations shall be fiberglass similar to the railing system used there. EZ type removable plastic insert sleeves shall be EZ Sleeves as manufactured by Auciello Iron Works, Inc., (508) 568-8382, or equal.
- F. Fasteners: Fasteners, screws, and bolts shall be concealed and shall be of stainless steel (316 alloy) or aluminum. Handrail bracket fasteners and fasteners over water basins shall be of stainless steel (316 alloy).
- G. Brackets: Handrail brackets shall be aluminum with a finish that matches the handrail or railing of which they are a part.
- H. Toeboards: Toeboards shall match railing system and shall be fabricated of 3/16 inch (minimum) aluminum and not less than 4 inches in height. Toeboards for picket railings shall be a special extrusion if a snap-in centered type toeboard is not standard with the railing manufacturer. Toeboards for pipe railing shall be channel section for strength.
- I. Socket Grout: Non-shrink grout for handrail post sockets shall consist of an inorganic, non-metallic, premixed grout with a minimum 28-day compressive strength of 4,000 psi.

2.3 FINISHES

- A. Pipe Railing System: Pipe railing system including handrails, railings, tube caps, and other miscellaneous parts of rails shall be provided with a 0.7-mil clear anodized finish, AA-M12-C22-A41.

2.4 SUB-ASSEMBLIES

- A. Height Requirements: Top of upper railing shall be 42 inches above the working surface or finish grade. Toeboards shall be installed not more than 1/4-inch off the working surface and shall be provided where indicated and/or required by codes or standards. Handrail heights shall be per standards.
- B. Round Sections: Round tube and round picket railing posts shall be not less than 1-1/2-inch diameter, Schedule 40 pipe or 1-1/2-inch x 2-inches oval section. The posts shall be evenly spaced at not less than 4 feet nor more than 6 feet on centers. Field conditions may require some adjustment of spacing. Pickets shall be not less than 5/8-inch OD pickets, spaced at 4-1/2 inches on center; or 3/4-inch OD pickets, spaced at 6 inches on centers. Top rails and railings shall be not less than 1-1/2-inch OD pipe or 2-inch oval section. Rails may be type with bottom enclosures. Bottom rails shall be not less than 1-1/2-inch OD pipe or 1-7/8-inch diameter extrusion with bottom enclosures. The top railings shall be as long as possible and the post shall not project through the top rails. Toeboard of picket rails shall be a specially extruded, snap-in bottom rail enclosure with toeboard or special extruded centered toeboard that is screw applied to bottom of the bottom rail.
- C. Round Pipe Railing System (Guardrails): Railing guardrail systems shall have rails spaced equally with equal open spaces between rails (and toeboard where required) with no open space larger than the following:
 - 1. Industrial use areas, such as process and maintenance buildings and exit ways, shall have no spaces larger than 12 inches per IBC requirements.

2.5 MANUFACTURERS OF RAILING SUB-ASSEMBLIES

A. Railing systems shall be manufactured by one of the following (or equal):

1. Round Pipe Railings:

"C-V Pipe Rail" by CraneVeyor Corp.
Moultrie Manufacturing Co., "Wesrail"

PART 3 - EXECUTION

3.1 COMPONENT SYSTEMS

A. Unless otherwise indicated, aluminum handrails and railings shall be component systems, installed complete and ready for use with all sleeves, grout, sealants, anchors, attachments, balusters, brackets, caps, fasteners, gates, posts, sleeves, trim, and all other related items required or necessary for the complete installation.

3.2 CRAFTSMANSHIP

A. WORK shall be performed by craftsmen experienced in the fabrication of architectural metal work. Exposed surfaces shall be free from defects or other surface blemishes. All dimensions and conditions shall be verified in the field in advance. All joints, junctions, miters, and butting sections shall be precision-fitted, with no gaps occurring between sections, and all surfaces shall be flush and aligned.

3.3 ALIGNMENT

A. Extruded, case, molded, or bent work shall be straight and with true edges. Railings and handrails shall be installed with continuous top rails, without post projections or other obstructions.

3.4 FABRICATION

A. Pipe cuts shall be clean, straight, square and accurate for minimum 1/8-inch joint gap. WORK shall be done in conformance with the handrail manufacturer's instructions. WORK shall be free from blemishes, defects, and misfits of any type which can affect durability, strength, or appearance.

B. Railing and handrail brackets shall be connected by screws or bolts. Holes shall be punched 1/16-inch larger than the nominal size of the fasteners, unless otherwise indicated. Wherever needed because of the thickness of the metal, holes shall be subpunched and reamed or drilled. Handrail components with mismatched holes shall be replaced. No drifting of bolts nor enlargement of holes will be allowed to correct misalignment.

C. Aluminum items in contact with concrete or steel or embedded in concrete shall be provided with an electrolysis protective material. The protective material shall be applied to the aluminum surface which will be in contact with the dissimilar material. Protection material shall be pressure tapes, coatings, or isolators.

D. Metal to be embedded in concrete shall be placed accurately and held in correct position while the grout is placed. Railing post shall not be installed until after concrete has attained its design strength.

E. Posts, except for removable railings, shall be provided with weep holes for condensation drainage within 3/16-inch of the finish deck.

3.5 WELD FINISH

- A. Exposed welds shall be ground smooth and flush and shall be polished and anodized. Discoloration of exposed aluminum surfaces, whether or not due to welding, shall constitute a basis for rejection of the entire assembly.

3.6 EXPANSION/CONTRACTION

- A. Exterior railing systems shall provide for 1/4-inch expansion and contraction per 20 linear feet of railing. Interior railing systems shall provide for 1/8-inch expansion or contraction per 20 linear feet of railing.

3.7 FASTENER FINISH

- A. Stainless steel fasteners shall not be painted.

3.8 RAILING CONTINUITY AND END TREATMENT

- A. Handrails and railings shall be designed to form a continuous run system with elbow turns and bends that do not have interferences with hand movement. Handrails shall be continuous for the full length of the stairs and landings. The handrail shall extend no less than 12 inches beyond the top riser and one tread plus 12 inches wherever possible. At work areas and surfaces, handrail extensions need only meet the Cal-OSHA requirements where extensions cannot be provided as a straight run. The ends of handrails shall be returned to wall or shall be terminated in newel posts or safety terminals.

3.9 GATES AND REMOVABLE SECTIONS

- A. Gates shall be provided with self-closing hinges and self-closing latch bolts. Removable handrail sections shall be provided where indicated. The gate and removable railing hardware's color shall match that of the railing system of which it is a part.

** END OF SECTION **

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing rough carpentry for the following applications:
 - 1. Wood framing with plates, studs, joists, rafters, purlins, and similar framing elements.
 - 2. Wood blocking, furring, stripping, backing, and nailers, as indicated, or otherwise required for securing other WORK.
 - 3. Plywood sheathing, board sheathing, sidings and starter boards.
 - 4. Rough hardware appurtenances to the WORK of this Section.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03100 Concrete Formwork
 - 2. Section 03300 Cast-in-Place Structural Concrete
 - 3. Section 04232 Reinforced Concrete Block Masonry
 - 4. Section 05500 Miscellaneous Metalwork

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Fed. Spec. FF-B-575 Bolts, Hexagon and Square
 - 2. Fed. Spec. Nut: Square, Hexagon, Cap, Slotted, Castle,

FF-N-836 Knurled, Welding and Single Ball Seat

3. Fed. Spec FF-S-111 Screw, Wood
4. Fed. Spec. FF-S-1362 Stud, Plain, General Purpose
5. U.S. Product Std. Structural Plywood

PS-1

6. AITC 104 Typical Construction Details
7. AITC 108 Standard for Heavy Timber Construction
8. ANSI A 135 Basic Hardboard
9. ANSI/AITC A 190 American National Standard, Structural Glued Laminated Timber
10. ANSI/HPMA HP Hardwood and Decorative Plywood
11. ASME 18.2.1 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws
12. ASME 18.6.3 Machine Screws and Machine Screw Nuts
13. ASTM D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
14. ASTM F 1667 Specification for Driven Fasteners: Nails, Spikes, and Staples
16. AWWA C1 All Timber Products - Preservative Treatment by Pressure Process
17. FPL Bulletin 1069 Fabrication and Design of Glued Laminated Wood Structural Members
18. RIS Standard Specifications for Grades of California Redwood Lumber
19. SPIB Grading Rules for Southern Pine Lumber
20. WCLIB Standard No.17 Grading Rules for West Coast Lumber
21. WWPA Western Lumber Grading Rules

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 1. Manufacturer's product data showing rough hardware.
 2. Engineering calculations for design of glue-laminated beams and wood trusses and joists, signed by a Registered Professional Engineer.

3. Shop drawings for fabricated wood trusses and other fabricated structural members indicating materials, details of construction, methods of fastening, and erection details.

1.7 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. Certificates of compliance.
 2. Certificate of conformance with ANSI/AITC A 190.
 3. Inspection report of independent inspection agency showing that products comply with applicable AWPA treatment standards. The Quality Mark "LP-22" on each piece will be accepted in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Lumber shall be carefully stored in a manner that will prevent damage and in an area that is protected from the deleterious effects of the elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only lumber certified as complying with the indicated requirements shall be provided.
- B. Products: Lumber shall be new, of current manufacture, and shall be the products of reputable mills specializing in producing such lumber.
- C. SSPWC Compliances: Lumber and plywood shall comply with SSPWC Subsection 204-1 and this Section.

2.2 UNTREATED LUMBER

- A. Grading: Lumber shall be graded in accordance with the rules of one of the following associations: "Grading Rules for Southern Pine Lumber" of the Southern Pine Inspection Bureau; "Standard No.17 Grading Rules for West Coast Lumber" by West Coast Lumber Inspection Bureau; or "Western Lumber Grading Rules" published by Western Wood Products Association.
- B. Grade Marking: Each piece of lumber shall bear the indicated official grade mark.
- C. Size Dressing: Lumber, except as otherwise indicated, shall be dressed to size in accordance with the standards of the association under which the lumber is graded. Lumber shall be S4S unless otherwise indicated.
- D. Drying: Lumber incorporated in the WORK, except where otherwise indicated, shall be air or kiln dried to a moisture content of not more than 19 percent and not less than 1 percent.

- E. Framing Lumber Grades: Grades of framing lumber shall comply with the following:

<u>Use</u>	<u>WCLIB Grade</u>	<u>Grading Rule</u>	<u>StressF_b</u>
Rafters, joists, studs 2 x 6 and larger, miscellaneous framing, ledgers, etc.	No. 1	Para. 123-b	2050 psi rep.
Studs and plates 2 x 4 and 4 x 4	Const.	Para. 112-b	1200 psi rep.
Beams and Stringers	Select. Struct.	Para. 130-a	1600 psi
Posts and Timber	No. 1 Struct.	Para. 131-b	1350 psi

2.3 REDWOOD

- A. Redwood shall conform to requirements of the "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Service. Redwood lumber used for foundation plates or in contact with concrete shall be Foundation Grade, S4S.

2.4 TREATED LUMBER

- A. SSPWC Compliance: Lumber shall be treated with preservatives in compliance with SSPWC Subsection 204-2.1 and this Section.
- B. Marking: Each piece of treated lumber shall bear the approval mark of an approved testing agency.
- C. Kiln Drying: Kiln-dried lumber shall be treated with a water-borne preservative and shall have a maximum moisture content of 15 percent after treatment.
- D. Pressure-Treated Lumber: Wood nailing blocks, sills, and plates resting on or embedded in concrete or masonry within 18 inches of grade shall be pressure-treated in accordance with AWPA C1. Preservative shall conform to American Wood Preservers Association and American Wood Preservers Bureau Standard Specifications. Creosote shall not be used.
- E. Preservative: Two coats of preservative shall be applied at least 2 hours before installation, to surfaces which come in contact with, or are set close to concrete and plaster. Tank dipping or pressure-treating may be used.
- F. Cuts: Wherever necessary to cut, notch, dap, drill, or frame treated lumber, newly cut or bored surfaces shall be treated with 2 heavy coats of the same preservative used in the original treatment. The minimum penetration depth shall be 1/4-inch.
- G. Fire-Retardant Treated Lumber: Where required, fire-retardant treatment for lumber shall conform to the requirements of the indicated code.

2.5 PLYWOOD AND HARDBOARD

- A. Plywood: Plywood shall conform to the requirements of U.S. Product Standard PS-1. Plywood panels shall be marked with grade mark of the American Plywood Association. The mark shall identify the plywood as to species, glue type, and grade and shall comply with the applicable commercial standards. Except as otherwise indicated, plywood shall be Douglas Fir, Exterior, C-D, S1S. Plywood for other specific applications shall comply with the following:

1. Plywood for use in concrete forms shall conform to the requirements of Section 03100 – Concrete Formwork.
 2. Plywood for back-up boards behind telephone equipment, electrical equipment, or communication equipment shall be Douglas Fir, A-C INT grade for interior locations and A-C-EXT for exterior locations.
 3. Plywood tool boards and protective wall paneling shall be Douglas Fir N-D-INT grade.
- B. Hardboard: Hardboard shall be temper-treated panels manufactured from interfelted ligno-cellulose fibers consolidated under heat and pressure in a hot press to produce a smooth, hard-surfaced material which is resistant to water and stains. Hardboard shall conform to the requirements of ANSI A 135.
- ## 2.6 ROUGH HARDWARE
- A. General: The term "rough hardware" includes nails, screws, lag screws, bolts, nuts, washers, plates, metal fasteners, framing anchors, anchor bolts which are to be embedded into concrete, concrete masonry, or brick masonry, and similar items employed in erection and construction of the rough carpentry work. Rough hardware shall be of standard manufacture and shall be approved by a recognized agency for the intended applications. Unless otherwise indicated, hardware items shall be steel, hot-dip galvanized after fabrication, and shall comply with Section 05500 – Miscellaneous Metalwork.
- B. Anchors and Fasteners: Anchors and fasteners for securing wood items, unless otherwise indicated, shall comply with the following:
1. Bolts, nuts, and studs shall conform to the requirements of Federal Specifications FF-N-836, FF-S-1362, and FF-B-575, and Section 05500 – Miscellaneous Metalwork.
 2. Nails and staples shall conform to ASTM F 1667 and shall be the type and size best suited for the intended application. Nails shall be galvanized steel, aluminum, or stainless steel, as appropriate, where exposed to weather. Nails used for fastening plywood to nailers on steel beams shall be short nails of wire gauge as indicated. Nails used for exterior (exposed to view) plywood siding, siding, or trim shall be stainless steel.
 3. Wood screws shall conform to the requirements of Federal Specification FF-S-111 for the style and material indicated. Wood screws shall be galvanized where exposed to view or to weather.
 4. Lag screws or lag bolts shall conform to the requirements of ASME B18.2.1 for the type and grade best suited for the purpose. Lag screws or lag bolts shall be galvanized where exposed to view or weather.
 5. Toggle bolts shall conform to the requirements of ASME B18.6.3 for the bolt, with wing and trunion nut, for the type and grade best suited for the purpose.
 6. Expansion shields shall comply with Section 05500 – Miscellaneous Metalwork.
 7. Power-driven pins shall comply with Section 05500 – Miscellaneous Metalwork.
- C. Metal Framing Devices: Metal framing devices shall be specially-designed joist hangers, header hangers, framing anchors, post anchors, and structural framing connectors fabricated from steel and hot-dip galvanized after fabrication. The framing devices shall be equal or superior to indicated requirements for design, friction, and loading. Framing devices shall include properly sized nails, bolts, lag bolts, or other fasteners required by design calculations for the framing.

- D. Plate/Sill Material: Plates and sills shall be foundation grade redwood or Douglas fir, pressure-treated with a water-borne preservative complying with the requirements of AWWA Standard P5 and AWWA C1.
- E. Plyclips: Plyclips shall be extruded aluminum clips, manufactured from 6063-T6 aluminum alloy, and designed and sized for intended use.

2.7 MISCELLANEOUS PRODUCTS

- A. Building Paper: Building paper or felt shall be non-perforated, asphalt-saturated organic felt conforming to ASTM D 226, 15 lb/100 sq ft.
- B. Termite Shields: Termite shields shall be not less than 26-gauge, zinc-coated steel or 30-gauge, terne steel coated with 40 lb of coating material per 100 square feet.

2.8 MANUFACTURERS

- A. **Manufacturers:** Products of the type indicated shall be manufactured by one of the following (or equal):
 - 1. Preservatives:
 - Wolman “F&P Finish and Preservative
Kop-Coat “Woodlife”
 - 2. Metal Framing Devices:
 - Simpson Strong-Tie
Heckmann Building Products

PART 3 - EXECUTION

3.1 GENERAL

- A. Verification: The WORK of this Section includes verification of drawing dimensions with actual field conditions and inspection of related work and adjacent surfaces, and reporting of conditions preventing proper execution of the WORK of this Section.
- B. Rough Hardware: The WORK of this Section includes rough hardware, not otherwise indicated, and which is necessary for proper framing, including nails, spikes, dowels, fasteners, and similar items.
- C. Framing: Framing members and assemblies shall be closely fitted, accurately set, and rigidly secured to required lines, levels, and arrangements indicated. Framing shall be accurately and neatly cut and shall be securely nailed, spiked, or otherwise fastened in place in a workmanlike manner. Timber connectors and installation shall conform to requirements of AITC 104 and AITC 108.

3.2 FASTENERS AND FRAMING DEVICES

- A. Nailing: Except as otherwise indicated, nails shall not be driven closer together than 1/2 their length unless driven in drilled holes, nor driven closer to the edge of a member than 1/4 of their length. When necessary to prevent splitting, holes shall be drilled slightly smaller than nail diameters. Common nails shall be used unless otherwise indicated.

- B. Bolts and Nuts: Malleable or cut-steel washers shall be provided under bolt heads and nuts except where bearing on steel plates or other steel attachments or where flat-head countersunk bolts are shown. Bolt holes shall be drilled 1/32-inch to 1/16-inch larger diameter than the bolts they are to accommodate, and shall be bored true-to-line. Members shall be clamped together and bolts shall be secured in place and nuts shall be drawn up tightly. Bolts shall be tightened again immediately prior to enclosing with finish or, if left exposed, upon completion of other WORK. Holes at anchor bolts embedded in concrete may be 1/16-inch larger than bolt diameter.
- C. Screws: Holes to receive lag screws shall be bored first of the same diameter and depth as shank, then continued to depth equal to length of screw with diameter equal to the base of the screw thread. Screws shall penetrate into the farther member a distance equal to at least 7 times the diameter of the screw shank. Washers shall be installed under each lag screw head bearing on wood.
- D. Metal Framing Devices: Metal framing devices shall be installed where shown. Nails for the framing devices shall be furnished or recommended by the manufacturer of the anchor device. Nails shall be driven to full depth at all holes in anchors. Bolt and lag fasteners shall be drawn tight.

3.3 FRAMING

- A. Strength Considerations: Structural wood framing members shall not be spliced between bearing points or supports. Due care shall be exercised in placing framing so that structural and other important members do not require cutting for openings, pipes, vents, conduits, or ducts. Bearing surfaces on which wood structural members are to rest shall be finished to give full, true, and even support. Wedges or shims shall not be used to correct faulty work. Wood members which have been split or otherwise damaged shall be removed and replaced.
- B. Cutting and Notching: Skilled workmen shall be used for all cutting and framing of wood members required to accommodate structural members, routing of piping, conduit, ducts, and the installation of mechanical, electrical, or other apparatus or equipment. Members shall not be cut, notched, nor bored more than 1/4 of their depth without proper reinforcing.
- C. Plate and Sill Installation: Bottom plates and sill plates which are secured to concrete shall be located as indicated. The anchor bolts shall be located as indicated or as required. The plates and sills shall be leveled with shims. Washers shall be installed and nuts shall be tightened to level bearing, after which the space (1/2-inch minimum) between the sill and concrete shall be dry-packed with cement grout complying with Section 03300 – Cast-in-Place Structural Concrete.
- D. Wall Framing: Studs shall be installed at a spacing of 16 inches on centers unless otherwise indicated. A single plate shall be provided at the bottom, and a double plate at the top of wall framing unless otherwise shown. Joints in upper and lower members of the top plate shall be staggered not less than 4 feet. Stud walls and partitions shall have a continuous row of blocking or firestopping which shall form a complete and effective separation for the entire width of the wall or partition. Blocking shall be located so that there will be no concealed air spaces greater than 7 ft in horizontal or vertical dimension. Defective materials, including crooked, warped, or bowed materials shall be replaced.
- E. Blocking and Backing: Except as otherwise indicated, blocking and backing in walls and ceilings shall be nominal 2-inch thick material of a depth as needed and shall be accurately located around light fixtures, ceiling registers, grilles, plumbing fixtures, and other mechanical and electrical items, wherever required. Blocking shall fit snugly and shall be spiked into the supporting framing members. Wood blocking (backing) to receive sheathing, siding, metal lath, and gypsum board shall be installed wherever necessary for securing the facing materials.

- F. Backing for Specialties and Accessories: Backing shall be accurately located and installed for all building specialties, toilet accessories, and finish hardware items.
- G. Concrete-Embedded Blocks: Where indicated, nominal 2-inch thick nailing blocks (dovetail type) shall be installed in concrete to receive superimposed wood stripping, grounds, and backing. Applied grounds or stripping shall be securely nailed into wood nailing blocks.
- H. Furring: Furring shall be 2-inch by 3-inch wood studs spaced at 16 inches on center, laid flat to the wall. Light metal framing may be substituted in compliance with Section 05500 – Miscellaneous Metalwork.
- I. Rafters and Joists: Rafters and joists shall be placed crown up and supported firmly on the framing below. Care shall be used in selection and placing of members. Positive and secure attachment shall be provided. Double joists and double headers shall be provided to receive trimmers at openings which cut or interrupt normal rafter spacing.
- J. Roofs: Roofs shall be erected level or shall be sloped as indicated.
- K. Plywood Sheathing: Plywood sheathing shall be installed with face grain across supports and end joints shall be over joists and shall be staggered. Blocking shall be provided at all unsupported edges.
- L. Fire Stops: Fire stops shall be not less than 2-inch nominal thickness and of the same width as the studs. Strips of full-thickness fiber glass or rock wool shall be installed around pipes, ducts, conduits, and other penetrations through fire stops.

** END OF SECTION **

SECTION 06650 - PLASTIC LINER FOR CONCRETE SURFACES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing plastic lining to surfaces of pipes, manholes and other concrete structures.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03300 Cast-in-Place Structural Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or "Greenbook") and the City of San Diego Standard Specifications for Public Works Construction ("WHITEBOOK"), as specified in Section 01090 - Reference Standards.

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Catalogue of the manufacturer of plastic liner, including complete data indicating the physical properties and chemical resistance properties as described in Subsection 210-2 of SSPWC, and all details and dimensions per Subsection 210-2.4 of SSPWC.
 - 2. Shop drawings indicating the installation procedures and dimensions and location of all joints or weld strips.
 - 3. Results of all tests made on plastic liner material as indicated herein.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials for plastic liner and its installation shall comply with SSPWC, Subsection 210-2. PVC shall be T-Lock, Linabond or approved equal.

2.2 TESTS

- A. Tests shall be made on samples taken from plastic sheets, joints or weld strips in compliance with SSPWC, Subsection 210-2.3. However, before testing in conformance with SSPWC, Subsection 210-2.3, the CONSTRUCTION MANAGER, will visually and manually inspect the lining with a putty knife or a similar instrument. Any imperfections found as a result of all of the above tests shall be repaired per manufacturer's instruction and CONSTRUCTION MANAGER's approval, and surfaces restored before placing the lining in service.

PART 3 - EXECUTION

3.1 INSTALLATION OF PLASTIC LINER

- A. Plastic liner shall be installed in compliance with SSPWC, Subsection 311-1.

3.2 LINER ACCEPTANCE

- A. The manufacturer, applicator, and the CONTRACTOR shall, upon completion of the work, make a field inspection of the lining and installation and shall provide the OWNER a written certificate of work compliance in their respective areas of responsibility.

**** END OF SECTION ****

SECTION 07100 - WATERPROOFING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing waterproofing and moistureproofing of concrete surfaces.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 07920 Sealants and Caulking

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

- 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- 1. ASTM D 41 Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
- 2. ASTM D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- 3. ASTM D 312 Specification for Asphalt Used in Roofing

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:

- 1. Manufacturer's product data including catalogue cuts.
- 2. Manufacturer's installation instructions.
- 3. Polystyrene protection board.
- 4. Subsurface drainage mat.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only products certified as complying with the indicated requirements shall be provided.
- B. Products: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. Manufacturer's Recommendations: Products shall be recommended by the manufacturer for the application indicated.

2.2 MOISTUREPROOFING COATING

- A. Product: Moistureproofing coating shall be a coal tar solution.

2.3 WATERPROOFING MEMBRANE

- A. Product: Waterproofing membrane shall be minimum 60-inch wide sheets of heavy-duty rubberized asphalt composite, consisting of 56 mils woven polypropylene geotextile with a release liner on the adhesive side. Puncture resistance of the textile shall be 200 pounds. Total thickness of the membrane shall be 60 mils.

2.4 WATERPROOFING PROTECTIVE BOARD

- A. Product: Protective board shall be 1/4-inch extruded polystyrene foam insulation board with plastic film on one side.

2.5 MOISTUREPROOFING UNDERLAY

- A. Product: Plastic membrane for moistureproofing underlay shall be polyethylene film with a thickness of 6 mils.

2.6 MOISTUREPROOFING UNDERLAY TAPE

- A. Product: Pressure sensitive tape shall be 2-inch wide polyethylene tape.

2.7 BELOW-GRADE WATERPROOFING

- A. Waterproofing materials for use below grade shall be a cold fluid applied, single coat, high build, water-based polymer-modified asphalt emulsion. For protection, use a 1/4-inch thick expanded polystyrene board for vertical surfaces or geotextile for horizontal surfaces. Subsurface drainage mat shall be a formed plastic sheet with one side smooth with concave dimples and the other side bonded to a geotextile.

2.8 MANUFACTURERS

- A. Products shall be of the type and manufacture as indicated below (or equal):

1. Moistureproofing Coating:
W. R. Meadows Sealmastic
LIQUID BOOT, LBI Technologies, Inc.
2. Waterproofing Membrane:
W.R. Grace and Company's "Bituthene"
Protecto Wrap Co.'s "Jiffy Seal"
W.R. Meadows MEL-ROL
3. Waterproofing Protective Board:
Dow Protection Board III Insulation
UPI-PB4 Vertical Protection Board
4. Below-Grade Waterproofing System:
Emulsion: W.R. Meadows MEL-ROL LM, UPI BG-7011
Geotextiles: W.R. Meadows Protection Course, Minadri 300 HV

PART 3 - EXECUTION

3.1 GENERAL

- A. General: Products shall be installed in accordance with the manufacturer's installation instructions.

3.2 MOISTUREPROOFING COATING

- A. Location: Moistureproofing coating shall be applied to exterior of outside concrete walls which are below grade and are common with rooms, tunnels or galleries to be occupied by equipment, piping or personnel, unless a "below-grade waterproofing" system is indicated.
- B. Surface Preparation: Masonry surfaces shall be allowed to age for at least 28 days. Holes or other joint defects shall be filled with mortar and repointed. Loose or splattered mortar shall be removed by scrapping and chipping. Masonry surfaces shall be cleaned with clear water by washing and scrubbing. Muriatic acid shall not be used. After cleaning, masonry surfaces shall be sealed or filled with sealer or block filler compatible with the indicated primer.
- C. Application: Each prime and finish coat shall be applied at the rate of 70 square feet per gallon. The number of finish coats shall be sufficient to produce a dry film thickness of at least 15 mils. Drying time between coats shall be as recommended by the coating manufacturer.

3.3 WATERPROOFING MEMBRANE

- A. Location: Waterproofing membrane shall be applied to surfaces indicated.
- B. Surface Preparation: Concrete surfaces shall be clean, dry and free of voids, spalled areas, loose aggregate, and sharp protrusions, with no coarse aggregate visible.
- C. Application: Waterproofing membrane shall be applied in accordance with the manufacturer's recommendations. Surfaces shall be clean and primed prior to application of the membrane.

Pipes or conduits entering structures shall be watertight. The protective board shall be placed directly against membrane prior to backfilling. Where the membrane is turned up from the base of the walls, at angles in walls, and at any other place where the membrane may be subjected to unusual strain, strips, consisting of two additional plies of membrane shall be applied.

3.4 MOISTUREPROOFING UNDERLAY

- A. Location: Unless otherwise indicated, moistureproofing underlay shall be provided under all concrete slabs-on-grade.
- B. Surface Preparation: Backfilled surfaces to receive moistureproofing underlay shall be leveled off and smoothed over to minimize contact with sharp edges.
- C. Application: At joints, moistureproofing membrane shall be lapped 6 inches and sealed with pressure sensitive tape. Where pipes and conduits pass through the membrane, they shall be wrapped tightly with separate sheets of membrane which shall then be sealed with tape to the main membrane. Reinforcing steel or wire mesh shall be supported to protect the membrane.

3.5 BELOW-GRADE WATERPROOFING

- A. The applicator shall be trained and approved by the manufacturer.
- B. Surface Preparation: Concrete surfaces shall be no rougher than light broom finish and shall have no dirt, debris, loose material, or release agent or curing compound. Masonry joints shall be struck smooth. Provide a $\frac{3}{4}$ -inch cant of trowel grade waterproofing at vertical transitions and inside corners of less than 90 degrees. Allow cant to cure at least 24 hours.
- C. Penetration: Etch metal surfaces of penetrations with 10 percent muriatic acid 3 inches out from the concrete or block surface. Apply 80 mils nominal of trowel grade waterproofing in a 3-inch ring around the penetration and out 3 inches from the wall surface. After trowel grade material cures, spray apply 80 mils nominal on the penetration at least 42 inches from the wall surface and also spray apply material to the wall surface as indicated below. After sprayed material cures, wrap a polypropylene cable tie snugly around the base of the penetration 2 inches out from the wall surface.
- D. Installation:
 - 1. Spray an 80-mil minimum coat, taking care to avoid puncturing the membrane. Test for membrane thickness and repair as necessary.
 - 2. Apply the polystyrene protection board or geotextile. Subsurface drainage mat shall be applied with the geotextile facing the backfill after moisture has evaporated from the membrane.
- E. Testing and Repair:
 - 1. Test the membrane for thickness with a light oiled needle nose depth gauge, taking 4 readings in a one square inch area for each 500 square feet of waterproofed area.
 - 2. Areas thinner than 80 mils shall be built up to 80 mils extending at least 1-inch outside the perimeter of the defective area.

**** END OF SECTION ****

SECTION 07190 - UNDER SLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Under slab vapor retarder.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Division 3 Concrete

1.3 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. E96 Standard Test Methods for Water Vapor Transmission of Materials
 - b. E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs
 - c. E1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
 - d. E1993 Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
 - e. F1249 Standard Test Method for Water Vapor Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. See Specification Section 01300 – Contractor Submittals, for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.

- b. Product data sheet on vapor retarder sheet, bonding bitumen and tape.
- c. All accessories proposed for use.
- d. Manufacturer's installation instructions.

B. Samples:

- 1. Provide two (2) 6 IN x 6 IN samples of vapor retarder material bonded together using the vapor retarder bonding bitumen proposed and two (2) 6 IN x 6 IN samples of vapor retarder material taped together using the vapor retarder tape proposed.
- 2. Provide two (2) samples of all accessories proposed for use.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Vapor retarder:
 - a. WR Meadows, Inc
 - b. Reef Industries Griffolyn
 - c. or approved equal.

2.2 MATERIALS

- A. Vapor Retarder: Multi-ply bituminous material with plasmatic core.
- B. Vapor Retarder Tape: As recommended by vapor retarder manufacturer.

2.3 ACCESSORIES

- A. Pipe Boots: Manufacturer's standard boot fabricated to maintain the integrity of the vapor retarder system.

2.4 FABRICATION

- A. Vapor Retarder:
 - 1. ASTM E1993.
 - 2. Water vapor permeance: 0.002 maximum per ASTM F1249, calibrated to ASTM E96.
 - 3. Puncture resistance: ASTM E154, 90 lbs force.
 - 4. Minimum tensile strength: 140 LBS/IN, ASTM E154.
- B. Vapor Retarder Tape: As recommended by vapor retarder manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and ASTM E1643.
- B. Place continuous vapor retarder above granular fill subgrade material where indicated on the Drawings.
- C. Lap vapor retarder 6 IN at ends and edges of sheets and seal with bonding bitumin.
- D. Extend to extremities of area, turn up at perimeter to form bond breaker between slab and wall.
 - 1. Bond in place.
 - 2. Do not turn up at perimeter if slab is keyed into perimeter wall.
- E. Provide pipe boot for all pipes penetrating the floor slab.
- F. Trim off excess material even with top of slab after slab is placed.

3.2 FIELD QUALITY CONTROL

- A. Ensure proper precautions are implemented to prevent damage to installed vapor retarder membrane prior to and during pouring of concrete floor slab.
- B. Patch all punctures, tears, holes, etc., with additional layer of vapor retarder and seal entire patch with vapor retarder tape.

**** END OF SECTION ****

SECTION 07320 - PORTLAND CEMENT TILE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement tile.
 - 2. Roof underlayment.
 - 3. Asphalt felt.
- B. Related Sections include but are not necessarily limited to:
 - 1. Section 06100 Rough Carpentry
 - 2. Section 07600 Flashing and Sheet Metal
 - 3. Section 07900 Joint Sealants

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM)
 - a. C1492 Standard Specification for Concrete Roof Tile.
 - b. D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - c. D4869 Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
 - 2. National Roofing Contractors Association (NRCA):
 - a. Steep-slope Roofing Manual.
 - 3. International Building Code (IBC):
 - a. 1507.3, Clay and Concrete Tile.
 - 4. Building code:
 - a. International Code Council (ICC):
 - (1) International Building Code and associated standards, 2009 Edition including all amendments, referred to herein as Building Code.

B. Qualifications:

1. Manufacturer shall have minimum of 5 years experience in the production of Portland cement roofing tiles.
2. Installer shall have minimum of 3 years experience installing products similar to those specified.

1.3 SUBMITTALS

A. Shop Drawings:

1. See Section 01300 – Contractor Submittals, for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's complete installation instructions and details showing all accessories required.
 - c. Copy of application requirements dictated by the Building Code.

B. Miscellaneous Submittals:

1. See Section 01300 – Contractor Submittals, for requirements for the mechanics and administration of the submittal process.
2. Manufacturer's qualifications.
3. Installer's qualifications.
4. Warranties.

C. Samples:

1. For initial color selection, provide manufacturer's complete line of colors.
 - a. Provide actual colored tile samples.
 - b. Color brochure is not acceptable.
2. For initial tile type selection, provide manufacturer's complete catalog of all tile types.
3. Fasteners: Two (2) samples of each type of fastener proposed for use.
4. 6 x 6 IN piece of underlayment.
5. For final color selection, provide 2 full tiles of color and type selected during the initial color selection process.

- D. Operation and Maintenance Manuals:
 - 1. See Section 01300 – Contractor Submittals, for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.
 - 2. Complete care recommendations.

1.4 WARRANTY

- A. Provide five (5) year weathertightness warranty signed by installer and Contractor.
- B. Provide manufacturers standard limited material warranty.
 - 1. Warranty term is to be for the life of the structure on which the roof tiles are installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Portland cement roof tile:
 - a. Westile - Division of Old Castle Company.
 - b. Vande Hey Raleigh.
 - c. Eagle Roofing Products.
 - 2. Roofing underlayment:
 - a. GAF Materials Corporation.
 - b. Carlisle Coatings and Waterproofing.
 - c. Owens Corning.
- B. Submit request for substitution in accordance with Specification Section 01600 – Products, Materials, Equipment and Substitutions.

2.2 ACCESSORIES

- A. Provide ridge, rake and starter tiles, risers, closures, highwind clips, snow brackets, tile adhesive fasteners, lap cement and other accessories as recommended by the manufacturer.
- B. Sheet Metal Flashing:
 - 1. Minimum 24 GA sheet metal.
 - 2. See Section 07600 – Flashing and Sheet Metal.

2.3 MANUFACTURED UNITS

A. Portland Cement Roof Tile:

1. Composition: Extruded cured concrete composed of Portland cement, sand and lightweight aggregate complying with ASTM C1492.
2. Coloration: Units shall be colored using integral coloring agents.
3. Size:
 - a. Nominal 13 x 16-1/2 IN.
 - b. Minimum weight per tile: 7.5 LBS.
 - c. Type: S-Tile (Mission, Capistrano).
 - d. Design:
 - (1) Interlocking with anchor lugs located on the underside of the tile.
 - (2) Interlocking ridges provided on the longitudinal edges to restrict lateral movement and provide waterstop.
 - (3) Transverse bars on underside to serve as weather checks.
 - (4) Minimum two (2) nail holes.

B. Roof Underlayment:

1. Nominal 40 mil thick composite sheet of rubberized asphalt and polyethylene film.
2. Permeance: 0.05 perms maximum.
3. Elongation: Minimum 250 percent.
4. Tensile strength: Minimum 250 psi.
5. Pliability: Material shall be unaffected by temperature down to -25 DegF.
6. Manufactured to meet ASTM D1970.
7. Non-slip surface.
8. Provide:
 - a. Carlisle: "QSC-707".
 - b. GAF "WEATHERWATCH".
 - c. Owens Corning "WeatherLock".
9. Acceptable to shingle/tile manufacturer.
10. Lap cement: As recommended by manufacturer.

- C. Asphalt Felt:
 - 1. Non-perforated asphalt saturated felt.
 - 2. Minimum 30 LB weight, Type II.
 - 3. Meet ASTM D4869.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that all penetrations through the roof have been installed, roof openings have been adequately framed and penetrations are flashed to the roof deck.
- B. Seal roof deck joints wider than 1/16 IN with deck tape.
- C. Fill knot holes and surface cracks with latex filler at areas of roof underlayment.
- D. Verify all dimensions and shop drawing details prior to proceeding with installation.

3.2 INSTALLATION

- A. Underlayment:
 - 1. Install underlayment at eave, ridge, valley and rake conditions and for an area of 2 FT beyond the edge of each roof penetrations.
 - 2. Install underlayment starting at eave and overlap fascia edge 1 IN laid parallel to eave.
 - a. Install in accordance with manufacturer's recommendations and in accordance with applicable provision of the Building Code.
 - 3. Lay underlayment shingle fashion maintaining 2 IN head and 6 IN side laps.
 - 4. Interface plies at valleys and ridges to provide full coverage.
 - 5. Secure underlayment with 3/4 IN washered roofing nails at 12 IN on center at laps and 24 IN on center down the longitudinal center line of the ply.
- B. Asphalt Felt.
 - 1. Install in accordance with NRCA recommendations.
 - 2. Cover entire roof deck area.
 - 3. Nail in accordance with applicable NRCA recommendations and to meet requirements of the Building Code.
- C. Tile Installation:
 - 1. Install in accordance with manufacturer's recommendations and to meet all requirements of the Building Code.
 - 2. When cutting of tiles is required use industry accepted cutting methods.

3. Do not use broken, chipped or cracked tiles.
 4. Coordinate with roof mounted equipment and penetrations.
 5. Provide straight rows when appropriate, align each tile so that horizontal lines are parallel to eave and vertical lines are parallel to rake.
 6. When cut tiles are too small to be nailed, secure with adhesive and wire in place.
 7. Install high wind clips as required by the Building Code.
 8. Grout all end closures if not using manufactured starter tile.
- D. Clean-Up:
1. Remove all tile pieces, fasteners and other debris.
 2. Remove all excess sealant and mastic so as to not damage or discolor tile.
 3. Leave roof broom clean.
- E. Protection:
1. Provide ample in place protection at end of days work or when inclement weather is threatening.
 2. Protect finished roof from damage.
 - a. Do not allow other trades to work on roof without adequate protection.

** END OF SECTION **

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1_ WORK OF THIS SECTION

- A. The WORK of this Section includes providing all sheet metal work and appurtenant work, complete.
- B. The principal items of sheet metal work shall include sheet metal flashings, collars, pitch pockets, metal siding, equipment platforms, equipment supports at all roof penetrations, metal wall flashing and expansion joints, and miscellaneous sheet metal accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 07920 Sealants and Caulking
 - 2. Section 09800 Protective Coating
 - 3. Section 15855 Air Handling and Moving Equipment

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. International Mechanical Code
 - 3. International Plumbing Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Federal Specifications:

QQ-T-201	Terneplate, For Roofing and Roofing Products
MIL-DTL-24441/20	Paint, Epoxy-Polyamide, Primer
UU-B-790	Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)
 - 2. Commercial Standards:

ASTM A 176	Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
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ASTM A 653	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 32	Specification for Solder Metal
ASTM B 209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM D 1187	Test Method for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM D 2822	Specification for Asphalt Roof Cement

3. Trade Standards:

Sheet Metal and Air Conditioning Contractors National Association "Architectural Sheet Metal Manual" (ASMM)

The Aluminum Association "Specifications for Aluminum Sheet Metal Work in Building Construction"

American Welding Society (AWS)

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Color samples for color selection by the CONSTRUCTION MANAGER and product samples when requested by the CONSTRUCTION MANAGER for examination.
2. Shop drawings showing materials, gauges, finishes, layout, jointing, profiles, fabrication of special shapes, fasteners, and method of attachment to adjacent construction.
3. Manufacturers' catalogues indicating materials, finish, construction, and method of installation of prefabricated items and sealants.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Manufactured products shall be delivered in original, unbroken packages, containers or bundles bearing the name of the manufacturer in a manner that will prevent damage to the products.
- B. Storage: Products shall be carefully stored in a protected area that will prevent damage or marring of the products and their finishes.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Sheet metal shall be aluminum unless otherwise indicated. Sheet metal work in connection with roofing shall be in accordance with roofing manufacturer's published recommendations and specifications.

- B. All sheet metal flashings necessary to make building weathertight shall be provided, whether or not indicated.

2.2 ALUMINUM PRODUCTS

- A. Aluminum shall be 0.032-inch minimum thickness and shall conform to ASTM B 209, alloy 3003, temper H14, with clear anodized finish AA-C22-A41 unless otherwise indicated. Thickness of aluminum to be welded shall be as necessary for the welding method used.
- B. Reglets shall be extruded aluminum with protective coating, of type and profile indicated, compatible with flashing indicated, non-corrosive.
- C. Metal vent screeds shall be plaster channel screeds and shall be extruded aluminum with either clear plastic coating, clear anodized coating, or clear acrylic baked-on coating.

2.3 FERROUS METALS

- A. Zinc-Coated Steel: Zinc-coated steel shall be commercial quality with 0.20 percent copper, ASTM A 653, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359-inch thick (20-gauge) except as otherwise indicated.
- B. Terne metal for roofing and roofing products shall be not less than 40 lb class conforming to Federal Specification QQ-T-201.

2.4 LEAD AND SOLDERING MATERIALS

- A. Lead shall be 4 to 6 percent antimony and the remainder shall be lead. Lead sheet shall be soft temper, except hard temper for flanges. Weight shall be not less than 4 lb/sq ft unless otherwise indicated.
- B. Solder shall conform to ASTM B 32 Alloy Sn50, 50 percent tin, 50 percent lead.
- C. Soldering flux shall not be injurious to metal surfaces being treated.

2.5 FASTENERS

- A. Fastening devices shall be of the same material as the sheet metal being used or corrosion-resistant metal compatible with sheet metal being used. Fasteners exposed to the weather shall have neoprene washers. Washers shall be 0.04-in minimum thickness. A rubber-type washer shall be used beneath the aluminum washer or fastener head where weathertightness is required.

2.6 PLASTIC CEMENT

- A. Plastic cement shall conform to ASTM D 2822.

2.7 SEALING MATERIALS

- A. Sealants shall be as indicated under Section 07920 or shall be of the silicone type. Colors shall be selected by the CONSTRUCTION MANAGER from manufacturer's standard colors.
- B. Sealer tape shall be polyisobutylene sealer tape specifically formulated for setting flanges on bituminous roofing.

2.8 COATING MATERIALS

- A. Primer coat for galvanized steel shall conform to MIL-DTL-24441/20.
- B. Asphaltic coating compound shall conform to ASTM D 1187.

2.9 BUILDING PAPER OR FELT

- A. Building paper shall conform to Federal Specification UU-B-790 for Kraft waterproof building paper.
- B. Asphalt or coal tar-saturated felt shall conform to IBC 1404.2.

2.10 SHOP FABRICATION REQUIREMENTS

- A. The WORK shall be shop-fabricated to greatest extent possible. Fabricator shall comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. WORK shall be fabricated for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the WORK. The WORK shall be formed to fit substrates. Material manufacturer's instructions and recommendations for forming material shall be complied with. Exposed sheet metal work shall be formed without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Non-moving seams in sheet metal shall be fabricated with flat-lock seams. For metal other than aluminum, tin the edges, form the seams, and solder them. Aluminum seams shall be formed with epoxy seam sealer; joints shall be riveted for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in WORK cannot be used, or would not be sufficiently water/weatherproof, expansion joints shall be formed of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant within joints.
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of WORK, metal shall be formed to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Separation shall be provided of metal from non-compatible metal or corrosive substrate by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Gutters and downspouts shall be of sizes as shown with wire basket type strainers of 14-gauge stainless steel wire or cast bronze.
- G. All aluminum shall be welded unless otherwise indicated. Welding shall conform to the standards of the Aluminum Association and ASMM.
- H. Galvanized steel corner joints shall be soldered. Unless indicated otherwise, other joints shall be as required by the Reference Standards.
- I. All WORK and finishes shall be protected from scratches and abrasions.
- J. All flashings, reglets and counter-flashing and associated flashings shall be fabricated by the same manufacturer and be installed as a complete flashing system. All flashings shall be creased longitudinally or otherwise formed with sufficient spring action to hold the bottom edges firmly against the base flashing or similar material.

- K. Intersecting corners of copings shall be accurately fitted and welded. Corners may be shop-assembled, manufactured, or extruded units. Coping shall be per ASMM Plate 68 except modified as indicated, with Alternate 5 seams that allow for 1/4-inch expansion per each 10 ft of length.
- L. Access doors shall be provided as required or as indicated. Sizes and locations shall be as required by governing authorities, codes, and as indicated.
- M. Flashing required through concrete or clay tile shall be flexible flashing in order to assure against undue separation between tiles on account of rigidity of the flashing material. Flashing around pipes, vents, flues, chimneys, etc., shall be of lead, copper, or other flexible metal flashing material.

2.12 FABRICATED SHEET METAL WORK

- A. Scuppers in walls shall be constructed of 0.040-inch aluminum designed similar to ASMM Plate 26 with all joints welded. Scuppers without head through top course of masonry or concrete shall be similar to ASMM Plate 29.
- B. Stamped sheet metal vents or louver-type vents (where indicated) shall be designed to provide watertight flush corners and shall be of size indicated. Each vent shall be equipped with 1/4-inch square galvanized or aluminum mesh hardware cloth insect screen. Stamped metal items shall be made of coated aluminum or galvanized sheet metal.
- C. Downspouts with conductor head 1/2-inch below gutter or scupper and hangers shall be designed similar to ASMM Plates 32 Fig. B and G, 25 Fig. C, and 35, Figure E, H or I. Connector shall be per Plate 33 Fig. B, Details 1 and 2 with funnel Fig. E (if possible) and with the joint between gutter and outlet welded or soldered. The downspout and conductor head shall be constructed of 1/16-inch aluminum and shall have all joints welded except the joint between head outlet pipe and downspout.
- D. Built-in gutter, downspout and hangers shall be designed similar to ASMM Plates 4 Gutter (similar), 9 and 10 Gutter Expansion Joint, 32 Fig. B Downspout, and Plate 35, Figure H for hangers. Downspout shall be constructed of 16 gauge metal and shall have all joints welded or soldered except the joint between the gutter outlet pipe and downspout. Gutter and gutter outlet pipe shall be fabricated from 40 lb terne metal. Expansion joints shall be spaced not more than 34-feet on centers, or as indicated. All joints shall be welded. Connector (outlet) shall be designed per Plate 33, Fig. B, detail 1 and 2 with funnel per Figure E if possible.
- E. All corners of vent screeds, reglets, and trim shall be mitered.
- F. Wall louvers shall be extruded aluminum louvers conforming to ASMM Plate 141, unless otherwise indicated. Louvers (formed) shall be designed as indicated and conforming to ASMM Plate 139. Louvers and screens shall have clear anodized finish. All exterior louvers shall be provided with 1/8-inch by 1/8-inch mesh bird screen and frame. Screen units shall be removable.
- G. Overflow scuppers in walls and parapets shall be constructed of 0.040-inch thick aluminum sheet similar to ASMM Plate 30. All joints shall be welded, and inlet shall be installed no more than 2 inches above roof drain rim (low point of roof).
- H. Access doors shall be of the types necessary to suit job conditions.
- I. Pitch pockets and equipment coping and support flashings shall conform to the reference standards and shall be provided where necessary.

- J. Sheet metal items at roof penetrations shall be provided and coordinated with the roofing system. The design and details shall conform to the standards unless otherwise indicated.
- K. The following flashings shall be provided at roof penetrations:
1. Vent pipes: Lead collars vent pipe flashing with top of lead sleeve flashing bent into vent pipe. (ASMM. Plates 66 Fig. B and 71 Fig. A).
 2. Single pipes: Sheet metal or lead collars with sheet metal or lead draw band with sealant or cap top. (ASMM. Plates 65 and 66 Fig. C).
 3. Multi-pipes: Lead collars with caps.
 4. Multi-pipes w/curb: Sheet metal with sealant and draw bands. (ASMM. Plate 65, Fig. B, or Plate 66, Fig. A).
 5. Equipment support: Sheet metal. (ASMM. Plate 68).
 6. Roof penetrations: Sheet metal (ASMM Plate 67).
 7. Sleeper covers: Sheet metal. (ASMM. Plate 66, Fig. C and D).
 8. Pitch pockets for supports: Sheet metal with all joints welded or soldered. (ASMM. Plate 68, Fig. E).
 9. Ducts with curb (1): Sheet metal. (ASMM. Plate 148, Fig. B).
 10. Equipment platform (1): Sheet metal. (ASMM. Plate 136, Fig. B and Section A.A).

Note (1): Prefabricated products, curbs, supports, and platforms which are part of mechanical equipment indicated in other Sections of these Specifications shall be provided in compliance with those Sections.

- L. Work bench covering shall consist of tops, box curbs, splashes, edging, and end enclosures (where visible). Work bench top cover shall be 16-gage galvanized steel sheet metal formed over a solid core. The top, back, and edges shall have all joints butt welded and ground to provide a smooth finished unit with no sharp edges or corners.

2.13 MANUFACTURERS

- A. Products shall be of the following manufacture and model number (or equal):
1. Reglets: Superior Concrete Accessories; Morrison and Company "Cushion-Lock"; Fry Reglet.
 2. Sealer Tape: Morrison and Company CL-50.
 3. Metal Vent Screed: Fry Reglet Corp., Model PCS-V-30; H.K. Porter Co.
 4. Access Doors: Milcor Division of Inryco, Inc.; Karp Associates, Inc.; Inland Ryerson Steel Corporation.
 5. Lead Collar: Stoneman Engineering and Mfg. Co.

PART 3 - EXECUTION

3.1 GENERAL

- A. Except as otherwise indicated, installer shall comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Units of work shall be anchored securely in place by methods indicated, providing for thermal expansion of metal units; fasteners shall be concealed where possible, and units set true to line and level as indicated. WORK shall be installed with laps, joints and seams which will be permanently watertight and weatherproof.
- B. The CONTRACTOR shall coordinate the flashings and sheet metal WORK required with the different trades to make sure all items which penetrate the roof are provided with all necessary sheet metal products. Sheet metal shop manufactured curbs, equipment supports, and equipment platforms shall be provided where prefabricated curbs, supports or platforms are not indicated to be provided in other Sections of these Specifications.
- C. All WORK shall conform to Trade Standards. Flashings shall be coordinated with roofing WORK. Sheet metal and roofing shall provide a weather-tight and watertight assembly.
- D. Sheet metal shall be accurately formed to the dimensions and shapes indicated. WORK shall be fitted snugly, with straight, true lines with exposed faces aligned in proper plane, free from waves and buckles. Arrises and angles shall have true and sharp lines, and surfaces shall be free from waves and buckles. All exposed edges shall be hemmed. Holes for fasteners within sheet metal WORK exposed to temperature changes shall be elongated holes for material expansion and movement.
- E. All sheet metal WORK shall be furnished complete with supports, hangers, bracing, anchors, and other devices as required for reinforcement and proper attachment to adjacent construction. Fastenings shall be concealed wherever possible. Joints, fastenings, reinforcements, and supports shall be sized and located as required to preclude distortion or displacement due to thermal expansion and contraction.
- F. All surfaces upon which sheet metal is to be placed shall be dry, smooth, even, and free of any projections and hollows. Sheet metal shall be laid with all joints true and even and firmly attached with all fastener heads flush with the top surface.
- G. The underlayment shall be overlapped at least 2 inches so as to shed water and shall be secured along the lapped edges. Aluminum or stainless steel fasteners shall be used with aluminum sheet metal.
- H. Dissimilar materials shall be isolated with 2 coats of asphaltic paint, asphaltic coating compound, or sealer tape. Only stainless steel fasteners shall be used to connect isolated dissimilar metals.
- I. Joints shall be sized and spaced to permit sheet movement for thermal expansion and contraction of 1/4-inch per 10-ft length, on 100 degree F temperature difference.
- J. Roofing sheet metal items shall be built into the roofing in strict accordance with directions of roofing manufacturer.

3.2 INSTALLATION

- A. Gutters shall be provided with baffle-type expansion joints with expansion caps over 1-1/2-inch baffle flanges at 40-ft centers. A 1-inch gap between the baffles shall be allowed.

- B. Flashings at vertical surfaces shall be installed at intersections of the roof with vertical surfaces and at projections through the roof. Corner units shall be factory-fabricated and shall have mitered soldered or welded corner joints, and shall be installed with 3-inch (min) lap joint over flashings on each side.
- C. Gutters shall be provided to the indicated cross-section, complete with shop-fabricated corners, outlet (nipple) sections, joining plates, concealed hangers and downspouts with standoff brackets.
- D. Gravel stops and copings shall have joints at 10-ft (max) spacing and at 2-1/2 feet from corners. Joints shall be butted with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps. Corner units shall be welded units. All joints shall be provided with cover plates.
- E. Flanges of sheet metal items shall be set on continuous sealer tape on the top edge envelope ply of roofing. Flanges shall be nailed through sealer tape at 3-inch (max) spacing or otherwise securely fastened in an approved manner.
- F. Stainless steel wainscots shall be set in waterproof adhesive and surface screwed into blocking with countersunk flat head stainless steel screws at bottom. Top and sides shall have concealed hemmed edges and be concealed cleat fastened.
- G. Attachment of the metal top of work benches to the wood core shall be done by cementing the materials together under sufficient pressure to assure a complete bond and installation of No. 8 by 1-inch stainless steel flathead wood screws, countersunk at 8-inch centers. Top shall be cleaned of all rust, scale, and foreign substances and finished by oiling.
- H. Stamped sheet metal vents or louver-type vents shall be painted with a protective coating complying with Section 09800 after installation.

3.3 CLEANING AND PROTECTION

- A. Exposed metal surfaces shall be cleaned, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise CONTRACTOR of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that WORK will be without damage or deterioration, other than natural weathering, at time of substantial completion.

** END OF SECTION **

SECTION 07905 - JOINT SEALERS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing joint sealers and appurtenant WORK, complete.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 07920 Sealants and Caulking

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement
 - 2. ASTM C 834 Specification for Latex Sealants
 - 3. ASTM C 919 Practice for Use of Sealants in Acoustical Applications
 - 4. ASTM C 920 Specification for Elastomeric Joint Sealants
 - 5. ASTM C 1193 Guide for Use of Joint Sealants
 - 6. ASTM D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension
 - 7. ASTM D 1056 Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
 - 8. ASTM D 2628 Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
 - 9. ASTM D 3406 Specification for Joint Sealant, Hot-Poured, Elastomeric-Type, for Portland Cement Concrete Pavement
 - 10. ASTM D 6690 Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals.
 - 1. Product Data: Manufacturer's recommended applications and technical data for each joint sealer product required, including instructions for joint preparation and joint sealer application.
 - 2. Samples for Initial Selection Purposes: Submit manufacturer's standard bead samples consisting of strips of actual products showing the full range of colors available, for each product exposed to view.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken packages or containers bearing the manufacturer's label. Packages or containers shall be delivered to the site with seals unbroken.
- B. Manufacturer's labels shall bear name of manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
 - 1. Storage: All materials shall be carefully stored in an area that is protected from deleterious elements and in a manner recommended by the product manufacturer. Storage and handling of materials shall be in such a manner as to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer's Recommendations: Only products recommended for the specific application indicated shall be used.
- B. Single Source Responsibility: All joint sealer materials for a specific application shall be obtained from a single manufacturer.
- C. Compatibility: Joint sealers, joint fillers, and other related materials shall be provided which are compatible with one another and with joint substrates under the indicated conditions of service and application, as demonstrated by manufacturer's testing and field experience.
- D. Colors: Colors of exposed joint sealers shall be provided as indicated or, if not otherwise indicated, as selected by the CONSTRUCTION MANAGER from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standards: Manufacturer's standard chemically curing elastomeric sealant shall be of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
 - 1. Two-Part Nonsag Polysulfide Sealant: Type M; Grade NS; Class 12 1/2; Uses NT, M, G, A, and as applicable to the joint substrate indicated, Use O.
 - 2. Two-Part Pourable Polysulfide Sealant: Type M; Grade P; Class 12 1/2; Uses T, M, G, A, and, as applicable to the joint substrates indicated, Use O.

3. Two-Part Water Immersion Polysulfide Sealant: Type M; Grade NS; Class 12 1/2; Uses T, M, G, A, and, as applicable to the joint substrates indicated, Use O; with a history of successful field experience in sealing joints immersed intermittently or continuously in water.
4. One-Part Polysulfide Sealant: Type S; Grade NS; Class 12 1/2; Uses T, M, G, A, and, as applicable to joint substrates indicated, Use O.
5. One-Part Non-Acid-Curing Silicone Sealant: Type S; Grade NS; Class 25; and complying with the following requirements for Uses NT, M, G, A, and, as applicable to joint substrates indicated, Use O. Modulus and additional joint movement capabilities as follows:
 - a. Low Modulus: Tensile strength of 45 psi or less at 100 percent elongation when tested after 14 days at 77 degrees F and 50 percent relative humidity per ASTM D 412.
 - b. Medium Modulus: Tensile strength of not less than 45 nor more than 75 psi or less at 100 percent elongation when tested after 14 days at 77 degrees F and 50 percent relative humidity per ASTM D 412.
 - c. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, withstand 50 percent increase and decrease of joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920.
6. One-Part Acid-Curing Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to joint substrates indicated, Use O.
7. One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, Use O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.
8. Two-Part Non-Acid Curing Silicone Sealant for Use T: Type M; Grade NS; Class 25; Uses T, M, and, as applicable to joint substrates indicated, Use O; and complying with the following requirement for additional joint movement capability:
 - a. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand an increase and decrease of 50 percent of joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920.
9. Multi-Part Nonsag Urethane Sealant: Type M; Grade NS; Class 25; Uses NT, M, G, A, and, as applicable to joint substrates indicated, Use O.
10. Two-Part Nonsag Low-Modulus Urethane Sealant: Type M; Grade NS; Class 25; Uses NT, M, A, and as applicable to joint substrates indicated, Use O; with additional capability to withstand an increase and decrease of 50 percent of joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920, based on manufacturer's recommendations and testing.
11. Two-Part Pourable Urethane Sealant: Type M; Grade NS; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, Use O.
12. Two-Part Nonsag Urethane Sealant for Use T: Type M, Grade NS: Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, Use O.

13. One-Part Nonsag Urethane Sealant: Type S; Grade NS; Class 25; Uses NT, M, A, and, as applicable to joint substrates indicated, Use O.
14. One-Part Nonsag Low-Modulus Urethane Sealant: Type S; Grade NS; Class 25; Uses NT, M, A, and, as applicable to joint substrates indicated, Use ; with additional capability to withstand an increase and decrease of 50 percent of joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920, based on manufacturer's recommendations and testing.
15. One-Part Pourable Urethane Sealant: Type S; Grade P; Class 25; Uses T, M., and, as applicable to joint substrates indicated, Use O.

2.3 SOLVENT RELEASE CURING JOINT SEALANTS

- A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent release curing, acrylic terpolymer sealant complying with ASTM C 920 for Type S; Grade NS: Uses NT, M, G, A, and, as applicable to joint substrates indicated, Use O; except for selected test properties which are revised as follows:
 1. Heat aged hardness - 40 to 50
 2. Weight loss - 15 percent
 3. Maximum cyclic movement capability - plus or minus 7-1/2 percent (Class)
- B. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent release curing, polymerized butyl sealant complying with FS A-A-272 for Type I and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.
- C. Pigmented Small Joints Sealant: Manufacturer's standard, solvent release curing, pigmented, synthetic rubber sealant formulated for sealing joints 3/16-inch or smaller in width.

2.4 LATEX JOINT SEALANTS

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one-part, nonsag, acrylic, mildew resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than plus or minus 7.5 percent.

2.5 MISCELLANEOUS JOINT SEALANTS

- A. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmissions of airborne sound.
- B. Butyl-Polyisobutylene Sealant: Manufacturer's standard solvent release curing, butyl-polyisobutylene sealant recommended for concealed joints.
- C. Butyl-Polyisobutylene Tape Sealant: Manufacturer's standard, solvent-free, butyl-polyisobutylene tape sealants with a solids content of 100 percent; formulated to be nonstaining, paintable, and non-migrating in contact with nonporous surfaces; packaged on rolls with release paper on one side; with or without reinforcement thread to prevent stretching.

2.6 COMPRESSION SEALS

- A. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by the manufacturer. Provide products which are permanently elastic, mildew-resistant, non-migratory, nonstaining, compatible with joint substrates and other joint sealers, and comply with the following requirements:
 - 1. Impregnating agent: Manufacturer's standard
 - 2. Density: Manufacturer's standard
 - 3. Backing: Pressure sensitive adhesive, factory applied to one side, with protective wrapping or coated on one face with release agent serving as bond breaker for primary joint sealant.
- B. Preformed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with requirements indicated for size, profile and cross-section design.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers.
- B. Plastic Foam Joint-Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, subject to sealant manufacturer's approval; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer for preventing bond between sealant and joint filler or other materials at the back or third surface of the joint. Provide self-adhesive tape where applicable.
- D. Elastomeric Tubing Joint Fillers: Neoprene, butyl or EPDM tubing complying with ASTM D 1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to minus 26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and with surfaces adjacent to joints.

2.9 MANUFACTURERS

A. Products of the type indicated shall be manufactured by one of the following (or equal):

1. Two-Part Nonsag Polysulfide Sealant
Sonneborn Sonolastic Polysulfide Sealant
W.R. Meadows, Inc., Deck-O-Seal
2. Two-Part Pourable Polysulfide Sealant
W.R. Meadows, Inc., Deck-O-Seal, two part
3. Two-Part Water Immersion Polysulfide Sealant
Sonneborn Sonolastic Polysulfide Sealant
W.R. Meadows, Inc., Deck-O-Seal, two part
4. One-Part Polysulfide Sealant
W.R. Meadows, Inc., Deck-O-Seal One Step, one part
5. One-Part Non-Acid Curing Low-Modulus Silicone Sealant
Bostik Construction Products Division, Chem-Calk 1200
Dow Corning Corp., Dow Corning 790
Pecora Corp., 864 NST
6. One-Part Non-Acid Curing Medium-Modulus Silicone Sealant
Dow Corning Corp., Dow Corning 795
General Electric Co., Silpruf
7. One-Part Acid-Curing Silicone Sealant
Bostik Construction Products Division, Chem-Calk 1200-HT
Dow Corning Corp., Dow Corning 999
8. One-Part Mildew-Resistant Silicone Sealant
Dow Corning Corp., Dow Corning 786
General Electric Co., SCS 1702
9. Two-Part Non-Acid Curing Silicone Sealant for Use T
Dow Corning Corp., Dow Corning 888
10. Multi-Part Nonsag Urethane Sealant for Uses NT, M, G, A, and O
Bostik Construction Products Division, Chem-Calk 505
Pecora Corp., Dynatrol II
11. Two-Part, Nonsag Low-Modulus Urethane Sealant
Tremco, Vulkem 922
Sonneborn Sonolastic NP 2

12. Two-Part, Pourable, Urethane Sealant
Bostik Construction Products Division, Chem-Calk 555-SL
Sonneborn Sonolastic SL 2
13. Two-Part Nonsag Urethane Sealant for Use T
Pecora Corp., Dynatred
14. One-Part Nonsag Urethane Sealant
Pecora Corp., Dynatrol II
15. One-Part Nonsag Low-Modulus Urethane Sealant
Tremco, Vulkem 921
Sika Corp., Sikaflex-15LM
16. One-Part, Pourable, Urethane Sealant
Tremco, Vulkem 45
Pecora Corp., NR-201
17. Acrylic Sealant
Sika Corp., Sikacryl
18. Butyl Sealant
Bostik Construction Products Division, Chem-Calk 300
Pecora Corp., BC-158
19. Pigmented Small Joint Sealant
Tremco, Inc., Tremco Seam Sealer
20. Latex Joint Sealers
Bostik Construction Products Division, Chem-Calk 300
Pecora Corp., AC-20
21. Acoustical Sealants for Concealed Joints
Pecora Corp., BA-98
Tremco, Inc., Tremco Acoustical Sealant
22. Butyl-Polyisobutylene Sealant
PARR Technologies Gray Butyl Tape
23. Butyl-Polyisobutylene Tape Sealant
Pecora Corp., Extru-Seal Tape

24. Compression Seals

Emseal Corp., Emseal Greyflex
Illbruck, Will-Seal Tape Type 250
Sandell Manufacturing Co., Inc., Polytite Standard

25. Preformed Hollow-Neoprene Gasket

Acme Highway Products Corp.
Watson Bowman Associates, Inc.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Conditions: CONTRACTOR shall not proceed with installation of joint sealers under the following conditions:
1. When ambient and substrate temperature conditions are outside the limits permitted by the joint sealer manufacturers.
 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Width Conditions: Installation of joint sealers shall not proceed when joint widths are less than, or more than, allowed by the joint sealer manufacturer for the application indicated.

3.2 PREPARATION

- A. Surface Cleaning of Joints: All joints shall be cleaned out immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
1. All foreign material shall be removed from joint substrates which could interfere with adhesion of joint sealer, including dust; paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer) oil; grease; waterproofing; water repellents; water, and surface dirt.
 2. Concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces shall be cleaned by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Loose particles remaining from the above cleaning operations shall be removed by vacuuming or blowing out joints with oil-free compressed air.
 3. Laitance and form release agents shall be thoroughly removed from all concrete surfaces.
 4. Metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces shall be cleaned with chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Joint substrates shall be primed where indicated or where recommended by joint sealer manufacturer. Primer shall be applied so as to comply with joint sealer manufacturer's recommendations. Primers shall be confined to areas of joint sealer bond. Spillage or migration onto adjoining surfaces shall not be allowed.

- C. Masking Tape: Masking tape shall be used where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Tape shall be removed immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. General: Unless otherwise indicated, comply with joint sealer manufacturers' printed installation instructions.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804 for use of solvent-release-curing sealants.
- D. Latex Sealant Installation Standard: Comply with requirements of ASTM C 1193 for use of latex sealants.
- E. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.
- F. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint-fillers of the types indicated to provide support of sealants during application and at position necessary to produce the required cross-sectional shapes and depths.
 - a. Do not leave gaps between ends of joint-fillers.
 - b. Do not stretch, twist, puncture or tear joint-fillers.
 - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints, where required to prevent third-side adhesion of sealant to back of joint.
 - 3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint-fillers.
- G. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- H. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by the sealant manufacturer.
 - 1. Concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.

2. Flush joint configuration per Figure 6B in ASTM C 962, where indicated.
3. Recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.
 - a. Where necessary, use masking tape to protect adjacent surfaces of tooled joints.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and complying with sealant manufacturer's directions for installation methods, materials and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.
- J. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together to provide watertight joints. Recess gaskets below adjoining surfaces by 1/8 inch to 1/4 inch.

3.4 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers and reseal joints with new materials to produce installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as WORK progresses, by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

** END OF SECTION **

SECTION 07920 - SEALANTS AND CAULKING

PART 1 - GENERAL

1.2 WORK OF THIS SECTION

- A. The WORK of this Section includes providing sealants, caulking, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 03290 Joints in Concrete Structures

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM C 920 Specification for Elastomeric Joint Sealants

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's product data including catalogue cuts.
 - 2. Manufacturer's installation instructions.
 - 3. Certification that products comply with indicated requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only products certified as complying with the indicated requirements shall be provided.
- B. Products: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. Manufacturer's Recommendations: Products shall be recommended by the manufacturer for the application indicated.

2.2 SEALANTS AND CAULKING MATERIALS

- A. Caulking and sealing materials shall conform to the following requirements:
 1. Sealant for exterior and interior use shall be 2-part polyurethane, gun grade.
 2. Sealant for interior use shall be 1-part acrylic tripolymer sealant.
 3. Fire-resistant penetration sealants shall be a medium density fire-resistant foam that retains form and stability at high temperature and meets UL test requirements for fire rating required at location used.
 4. Caulking tapes shall be of the butyl-base, vulcanized type.
 5. Filler material shall be resilient, closed-cell polyethylene foam and/or bond breakers of proper size for joint widths and shall be compatible with sealant manufacturer's product.
 6. Primers shall be as recommended by the manufacturer for caulking and sealants.
 7. Cleaning and cleanup solvents shall be as recommended by the manufacturer for caulking and sealants.

2.3 MANUFACTURERS

- A. Products shall be of the type and manufacture as indicated below (or equal):
 1. Sealant for Exterior and Interior Use:
 - Tremco Dymeric 240FC
 - Elastothane 227R by Pacific Polymers
 - Sikaflex 2C by Sika Corporation
 2. Sealant for Interior Use:
 - Tremco "Mono 555"
 - Dap "One-Part Acrylic"
 3. Fire-resistant Penetration Sealant:
 - Dow-Corning Corporation's "3-6548 Silicone RTV" foam
 - 3M Corporation's "Fire Barrier Caulk CP 25"
 - Putty Corporation's "Fire Barrier Caulk CP 25"
 - Putty Corporation's "303"

PART 3 - EXECUTION

3.1 GENERAL

- A. **General:** Products shall be installed in accordance with the manufacturer's installation instructions.
- B. **Authorized Installers:** Caulking and sealants shall be complete systems, and shall be installed only by installers authorized and approved by the manufacturer.
- C. **Acoustic Partition Joints:** Acoustic partition joints shall be made air and sound-tight with acoustic caulking material.

3.2 SEALANT FILLED JOINTS

- A. **Manufacturer's Representative:** The WORK includes the services of the sealant manufacturer's representative (prior to sealant work) for inspection of the joints and for instructing the installer in the proper use of the materials.
- B. **Surface Preparation:** Joints and spaces to be sealed shall be clean, dry, and free of dust, loose mortar, and other foreign materials. Ferrous metal surfaces shall be cleaned of rust, mill scale, and other coatings by wire brush, grinding, or sandblasting. Oil and grease shall be removed by cleaning in accordance with sealant manufacturer's recommendations. Protective coatings shall be removed from aluminum surfaces against which caulking or sealing compound is to be placed. Bituminous or resinous materials shall be removed from surfaces to receive caulking or sealants.
- C. **Sealant Depth:** Sealant depth in joints shall be 1/2 the width of joint, but not less than 1/8-inch deep and 1/4-inch wide nor more than 1/2-inch deep and 1-inch wide. Joints shall have a rigid filler material installed to proper depth prior to application of sealant.
- D. **Joints in Porous Materials:** Where required by the manufacturer, sides of joints of porous materials shall be primed immediately prior to caulking or sealing.
- E. **Applications:** A full bead of sealant shall be applied to the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application, the tip of the nozzle shall be kept at the bottom of the joint to ensure forcing the sealant to fill from the bottom to the top. Sealants shall be tooled immediately after exposure with caulking tool or soft bristled brush moistened with solvent. The finished sealant filled joint shall be slightly concave unless otherwise indicated.
- F. **Cleaning:** After application of sealant and caulking materials, adjacent materials which have been soiled shall be cleaned and left in a neat, clean, undamaged or unstained condition. On porous surfaces, excess sealant shall be removed in accordance with the sealant or caulking manufacturer's printed instructions.

**** END OF SECTION ****

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing steel doors, frames, hardware and appurtenances.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 08710 Finish Hardware
 - 2. Section 09800 Protective Coating

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM A 1008 Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
 - 2. ASTM B 117 Practice for Operating Salt Spray (Fog) Apparatus
 - 3. ASTM D 1735 Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
 - 4. ASTM E 90 Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions and Elements
 - 5. ANSI A115 Series Door and Frame Preparation
 - 6. UL Standards Underwriters' Laboratories, Inc.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's product data including catalogue cuts.

2. Manufacturer's maintenance procedures.
3. Manufacturer's installation instructions.
4. Certification that products comply with the specifications indicated.
5. Door schedules showing sizes, types, louvers, and glass.
6. Certified Sound Transmission Coefficients.
7. Shop drawings showing frame jamb depths, trim profile, stops, and backbends.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Doors and frames shall be shipped and stored with temporary stiffeners and spacers in place to prevent distortion.
- B. Doors and frames shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only products certified as complying with the indicated requirements shall be provided.
- B. Products: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. Manufacturer's Recommendation: Products shall be recommended by the manufacturer for the application indicated.

2.2 MATERIALS AND FABRICATION

- A. Factory Fabrication: Steel doors and frames shall be factory fabricated and assembled. Temporary stiffeners, spacers, and other accessories necessary to facilitate handling and erection shall be included. After fabrication, tool marks and other surface imperfections shall be filled and ground smooth.
- B. Fire Rating and Labeling: Fire-rated doors and frames shall bear a UL label indicating the type of rating. Design and construction of fabricated products shall have UL approval for the fire rating indicated. Hollow steel doors and frames for fire-rated openings shall conform to Underwriters' Laboratories listing and shall be UL labeled.
- C. Materials for Doors and Frames: Exterior doors and frames shall be fabricated of galvanized steel. Other doors and frames shall be fabricated from commercial grade, cold-rolled steel conforming to ASTM A 1008, Type II or III.
- D. Priming and Painting: Doors and frames shall be chemically treated to ensure maximum paint adhesion and exposed surfaces shall be painted with a rust-inhibitive primer after fabrication. Prime coat shall be capable of passing a 120-hour salt spray test in accordance with ASTM B 117 and a 250-hour humidity test in accordance with ASTM D 1735.

- E. Hardware: Doors and frames shall be reinforced and drilled or tapped for templated mortised hardware and shall be reinforced with plates for surface-mounted hardware complying with ANSI A115 Series requirements. Hardware shall comply with Section 08710.

2.3 METAL FRAMES

- A. Pressed Metal Frames: Pressed steel frames for doors and other openings shall be combination buckled frame and trim of type and sizes indicated. Metal shall not be lighter than 16-gauge steel. Frames shall be of the welded unit type. Special frames, oversized frames, and frames with transom shall be provided where indicated.
- B. Frame Jamb Depths, Trim Profile, Stops, and Backbends: Frame jamb depths, trim profile, stops, and backbends shall be as shown on the shop drawings.

2.4 FRAME ANCHORS

- A. Floor Anchors: Floor anchors shall be welded inside each frame jamb head, and holes shall be provided for floor anchorage. Minimum thickness of floor anchors shall be 14-gauge.
- B. Anchors for Masonry/Concrete Installations: Frames for installation in masonry and concrete walls shall include adjustable jamb anchors of the T-strap, stirrups and strap, or wire type. The number of anchors provided for each frame jamb and head shall comply with the applicable standard and the following:
 - 1. Frames up to 7 feet 6 inches in height: 3 anchors.
 - 2. Frames over 7 feet 6 inches to 8 feet 0 inches in height: 4 anchors.
 - 3. Frames over 8 feet 0 inches in height: One anchor for each 2 feet or fraction in height.

2.5 DUST COVER BOXES AND MORTAR GUARDS

- A. Dust cover boxes or mortar guards of not less than 24-gauge steel shall be provided at all hardware mortises on frames to be set in masonry, concrete, or plaster walls.

2.6 SILENCER HOLES

- A. Appropriate holes for silencers shall be provided in the door frames which are not designated to receive weatherstripping, seals, or sound seals.

2.7 STEEL DOORS

- A. Design and Construction: Steel doors shall be of hollow metal construction and shall be of full flush design with no visible seams. Face sheets shall be not less than cold-rolled, stretcher-levelled, 18-gauge steel. Doors shall have flush seamless face sheets with continuously and fully welded seam edges. Doors shall be rigid and neat in appearance, and shall be free from warpage or buckle. Corner bends shall be true and straight and shall be of not less than the minimum radius for the gauge of metal used. The door top and bottom shall be internally reinforced by steel members welded in place. Tops of exterior doors shall be provided with flush, water and weather tight, top enclosures.
- B. Double Doors: Double doors shall be provided with a "T" type steel astragal unless otherwise indicated in Section 08710.

2.8 MANUFACTURERS

A. Products shall be manufactured by one of the following (or equal):

1. Steel doors:

Krieger Steel Products Co.
Ceco Door Co.
Steelcraft

PART 3 - EXECUTION

3.1 GENERAL

A. General: Products shall be installed in accordance with the manufacturer's installation instructions.

3.2 FRAME INSTALLATION

A. Frames shall be set plumb and square in a true plane, and shall be securely anchored to the adjoining construction. Steel shims shall be provided and shall be tight and rigidly attached between frame anchors and structure. Finished metal frames shall be strong and rigid, neat in appearance, and square, true, and free of defects, warpage, or buckling.

B. Molded members, trims, and stops, shall be clean cut, straight, and shall be of a uniform profile throughout their lengths.

C. Corner joints shall have all contact edges tightly closed with all trim faces mitered, welded, and finished smooth. The use of gussets shall not be permitted.

3.3 DOOR INSTALLATION

A. Doors shall be installed plumb, square, and level. Doors shall operate freely, but not loosely. They shall be free from rattling while in a closed position.

B. The door clearances shall be plus 3/32-inch or minus 1/32-inch and shall not exceed the limits recommended by the manufacturer.

C. Doors shall not be installed with an out-of-plane warpage of more than 3/16-inch.

D. Doors and finish hardware shall have hardware protected prior to painting.

3.4 FINISH HARDWARE

A. Finish hardware shall be installed in accordance with hardware manufacturer's standard templates. Operable parts shall be adjusted for proper function and operation.

**** END OF SECTION ****

SECTION 08360 - OVERHEAD DOORS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all overhead door assemblies and frames and all appurtenant work, complete and operable, including manual drive systems and power drive systems, locking hardware, and complete control systems.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 08110 Steel Doors and Frames
 - 2. Section 08710 Finish Hardware
 - 3. Section 09800 Protective Coating

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. International Fire Code
 - 3. National Electric Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Commercial Standards:
 - NEMA National Electric Manufacturers' Association
 - NEC National Electric Code
 - 2. Trade Standards:
 - Aluminum Association Anodizing Systems
 - 4. Manufacturers' Standards: In addition to the standards listed above, the overhead doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:

1. Manufacturer's specifications, literature, installation instructions, along with any engineering calculations that may be required elsewhere in this Section shall be submitted. Calculations by a registered civil or structural engineer shall be submitted which show that the overhead door systems and their structural connections are designed to meet code requirements and loads.
2. Shop drawings showing details of the products and systems, fasteners, and connections to adjoining materials shall be submitted along with any manufacturer's installation instructions. Schedules showing sizes, types, and locations of louvers and glass shall be submitted.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. Upon completion, the CONTRACTOR shall deliver to the CONSTRUCTION MANAGER complete book containing the manufacturer's operation and maintenance instructions for the overhead door assemblies.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: All materials shall be carefully stored in an area that is protected from deleterious elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

PART 2 - PRODUCTS

2.1 ROLL-UP DOORS

- A. General: Roll-up doors shall be of the metal slat curtain design, chain-operated, and shall be weather and dust-resistant. Doors shall be provided complete with slats, guides, hoods, reduction gears, galvanized hand chain, operating mechanism, brackets, gears, head, bottom and side weather stripping, hardware, and all other items necessary for their installation and operation.
- B. Wind Loading: The doors shall be designed to withstand a wind load of 20 lb/sq ft.
- C. Curtain Slats: Curtain slats shall be weather sealing, flat appearance designed slats.
 1. Curtains shall be fabricated from roll-formed galvanized steel of not less than 20 gauge sheets with a height of approximately 2-1/4 inches.
- D. Endlocks: Endlocks shall be continuous malleable iron castings, designed to provide for curtain alignment and security against lateral movement.
- E. Bottom Bar: The bottom bar shall consist of 2 angles galvanized and bolted back-to-back on each side of the curtain or extruded aluminum section to suit the floor profile. A replaceable flexible vinyl or neoprene gasket or astragal shall be provided as a weather seal and cushion bumper.

- F. Guides and Stops: Guides shall consist of a galvanized steel angle assembly of proper size to retain the curtain and to resist the wind loads. Guides shall be provided with weatherstripping. Angle thickness shall be minimum 3/16-inch. Jamb angles shall be anchored to the supporting walls with not less than 3/8-inch bolts spaced at 30 inches on centers, and extending above door opening head to support the coil brackets. Removable stops on guides to prevent over-travel of curtain and a continuous bar for holding windlocks, where required, shall be provided.
- G. Counter Balanced Shaft Assemblies: The barrel shall be a steel pipe of sufficient diameter and thickness to support the roll-up curtain and its design loads without distortion of slats, and to limit deflection of the barrel to not more than 0.03-inch per foot of span under full load. The barrel shall have a minimum diameter of 4 inches. The spring balance shall consist of one or more helical torsion springs of oil-tempered heat-treated steel to transfer full load to a single steel torsion bar in the barrel. Rotating members shall turn on self-lubricating graphite or grease-sealed ball bearings, with adjustment for counterbalance springs accessible from outside barrel. Brackets shall be 5/16-inch-thick, cold-rolled steel plate, or equal strength cast iron, attached to the jamb angle guide with 1/2-inch bolts. Brackets shall have a bell-mouth guide groove for the curtain.
- H. Hood: The hood shall be manufactured of 24-gauge galvanized steel sheet with bonderized treatment. The hood shall fit over the end brackets. Top and bottom edges of hood shall be rolled and reinforced for stiffness, and intermediate supports shall be provided as necessary. The hood baffle shall be of neoprene and sheet metal.
- I. Chain Holder: A chain holder shall be provided on wall with provision for padlocking.
- J. Manual Operation Features: Manual operation shall be accomplished by endless chain, sprocket, and reduction gearing to the barrel, designed to require not more than a 35-lb pull on the chain to move the curtain. Sprockets and gears shall have machine cut teeth, or shall be machine-molded. Bearings shall be lubricated for life and self-aligning, and shall be either self-lubricating graphite bearings or grease-sealed precision ball bearings, depending on size of door. Operating chain shall be hot-dip galvanized, located at side of door as shown on the approved shop drawings, and shall be continuous loop design that extends to a point approximately 24 inches above the floor. Chain and gear guards shall be provided as necessary for protection against malfunction or personal hazard.
- M. Finishes: Galvanized steel curtains and wicket doors shall be provided with a baked acrylic which is compatible with the finish paint indicated in Section 09800 – Protective Coating. All other metal parts, exposed and concealed, and doors, shall be shop-primed with primer which is compatible with the finish paint indicated. The inside working area of the guides shall not be painted.

2.3 MANUFACTURERS

- A. Roll-up doors shall be of the following manufacturers and type or model (or equal):
 1. Weathertight standard door: Cookson "Weatherbar FC" or Wayne-Dalton Air-Bar Extr-Tite.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.2 INSTALLATION

- A. Doors shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be sized for loads imposed and shall be of sufficient length. Doors shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

** END OF SECTION **

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all finish hardware and appurtenant work, complete.
- B. The WORK hereunder shall include all fabrication and mounting templates as needed for fabricators and for control of application of metal items.
- C. In addition thereto, the CONTRACTOR shall provide all trim, attachments, and fastenings indicated or required for proper and complete installation.
- D. The WORK of this Section shall include all hardware that is not indicated in other sections, whether or not such hardware is herein specifically scheduled.
- E. The CONTRACTOR shall coordinate hardware with the WORK of other Sections. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security, and similar requirements indicated, as necessary for proper installation and function.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 08110 Steel Doors and Frames

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. International Fire Code
 - 3. California Code of Regulations, Title 24

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Commercial Standards:
 - Underwriters' Laboratories, Inc. requirements and approvals.
 - Hardware Institute (DHI) "Recommended Procedure for Processing Hardware Schedules and Templates" and "Architectural Hardware Scheduling and Format"

BHMA	Builders' Hardware Manufacturers' Association
ANSI A156.1 through A156.8	Standards for various hardware items

1.5 HARDWARE SPECIFIED ELSEWHERE

- A. Hardware for the following is indicated elsewhere:
1. Cabinetwork, including open wall shelving and locks.
 2. Signs, except as noted.
 3. Toilet accessories of all kinds including grab bars.
 4. Rough hardware.
 5. Folding partitions, except lock cylinders which are indicated herein.
 6. Sliding aluminum doors.
 7. Angle sill threshold.

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. Schedules: Submit schedule at earliest possible date prior to ordering of hardware. Organize the schedule into "Hardware Sets" with an index of doors and a heading, indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, quantity, and finish of each hardware item.
 - b. Name, part number and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of hardware set, cross referenced to indications on drawings, both on floor plans and in door schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in the schedule.
 - f. Indicate specific locations and mountings of heights of each type of hardware.
 - g. Indicate door and frame sizes and materials.
 - h. Include a list of all manufacturers used and their nearest representative, with name, address, and telephone number.
 - i. Submit manufacturer's complete technical data and installation instructions for electric and electronic hardware.

2. Templates: Where required, furnish hardware templates to each fabricator of doors, frames and other WORK where factory preparation is required for proper installation of hardware.
 3. Product Data: Submit manufacturer's catalogue cuts, finishes, etc., for CONSTRUCTION MANAGER'S review.
 4. Samples: Furnish a representative sample, in the correct finish and color, of each visible component of hardware.
- B. No hardware shall be ordered or delivered until the hardware schedule has been approved by the CONSTRUCTION MANAGER.
- 1.7 OWNER'S MANUAL
- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
1. Extended warranty for all hardware.
- 1.8 SERVICES OF MANUFACTURER
- A. Inspection, Field Adjustment, and Maintenance Instructions: Authorized hardware suppliers or manufacturer's representatives shall visit the site for not less than 1 day to provide the indicated services.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Acceptance at the Site: Individually package each unit of finish hardware, complete with proper fastening and appurtenances, clearly marked on the outside to indicate contents, item numbers, and names corresponding to those listed in the hardware schedule and specific locations in the WORK.
- B. Small miscellaneous items that would not require specific location identification, such as door stops, coat and hat hooks, and door silencers may be quantity packed if properly labeled with item numbers and other identification.
- C. Deliver hardware in manufacturer's original packages individually packaged and carefully marked for its intended opening and use. Pack complete with necessary screws, bolts, keys, instructions, and installation template, if necessary, for spotting mortising tools. Supplier shall furnish to CONTRACTOR with the delivery, a complete list of hardware clearly marked to correspond with marking on each package and with the hardware schedule. CONTRACTOR shall check the hardware upon delivery. The CONTRACTOR shall be responsible for the proper storage of all hardware until ready for installation.
- 1.10 QUALIFICATIONS
- A. Hardware Supplier: The hardware supplier shall be a direct factory contract supplier who has in his employ a certified architectural hardware consultant (AHC) who is available at all reasonable times during the course of the WORK for project hardware consultation to the CONTRACTOR.
- 1.11 EXTENDED WARRANTY
- A. The CONTRACTOR shall furnish a guarantee from the hardware supplier for all hardware work, as follows:

1. Closers: Ten years, except electronic closers, two years.
2. Exit Devices: Three years
3. All other hardware: Two years

PART 2 - PRODUCTS

2.1 GENERAL

- A. All items of hardware shall be furnished as required to complete the WORK in accordance with these Specifications and the manufacturer's instructions. Items of hardware not specified shall be provided even though inadvertently omitted from this Specification. Items shall be of equal quality and type.
- B. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, supplier shall advise the CONTRACTOR and the CONSTRUCTION MANAGER in writing as a part of the submittal process. Supplier shall also provide suggestions of suitable alternatives having as nearly as practicable, the same operation and quality as the type specified.
- C. Exit Doors: The intent of the Specifications is that exit doors shall be openable at all times, from the inside, without the use of a key or any special knowledge or effort.
- D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only such hardware which has been tested and listed by UL for the type and size of each door required, and which complies with the requirements for the door and door frame labels. Latching hardware, door closers, ball bearing hinges, and seals are required whether listed in the Hardware Schedule or not.
 1. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating "Fire Door to be Equipped with Fire Exit Hardware," and provide UL label on exit device indicating "Fire Exit Hardware."
- E. The WORK requires the CONTRACTOR to obtain each kind of hardware from only one manufacturer, although several may be indicated as offering products which comply with requirements.

2.2 KEYS AND KEYING

- A. CONTRACTOR shall provide temporary key cores and keys during construction at locations the CONTRACTOR selects. After substantial completion, the CONTRACTOR shall remove all temporary cores and furnish all permanent lock cylinders to the OWNER's designated locksmith for keying and installation by OWNER.
- B. CONTRACTOR shall provide all locks and cylinders of the same manufacturer. Each cylinder for each lockset and exit device shall have two "OO" bitted keys furnished.
- C. CONTRACTOR shall stamp all keys "Do Not Duplicate."
- D. Locks shall be interchangeable with the City's master system which uses only Best 7 pin patented key cores and shall conform to BHMA A156.

2.3 FASTENERS

- A. Furnish screws, bolts, nuts, expansion shields, shim plates, anchors and other fasteners of suitable types and sizes recommended by manufacturer and as required to install hardware securely to withstand hard usage over long life. The fasteners shall match the hardware in material and finish.
- B. All hardware, such as expansion bolts, sex bolts, toggle bolts and other approved anchorages shall be coordinated with the job and to each setting condition.
- C. Screws for items applied on gypsum board shall be sufficiently long to provide solid connection to framing and backing behind the gypsum board.
- D. Phillips head screws shall be used at exposed conditions. Machine screws shall be used at metal doors and frames.

2.4 HINGES AND PIVOTS

- A. Two hinges or pivots shall be provided for each door leaf up to and including 5 feet in height, and an additional hinge shall be added for each 2-1/2 feet or fractions thereof of additional door height.
- B. Width of hinges shall be determined by trim conditions, but shall be of sufficient size to permit door to swing 180 degrees.
- C. Ball-bearing hinges shall be furnished on all doors having door closers and/or exit devices. All ball-bearing hinges shall have flush tips.
- D. All hinges on exterior doors shall be provided with non-removable pins and security studs.
- E. Hinges shall be 630 (brush finished) stainless steel unless otherwise indicated in the finish hardware schedule.
- F. Hinges and sizes shall be as follows:

<u>Door Thickness (inches)</u>	<u>Door Width (inches)</u>	<u>Hinge Weight</u>	<u>Hinge Height (inches)</u>
1-3/8	36 and under	Reg. Wt., interior use only	3-1/2
1-3/8	37 and over	Reg. Wt., interior use only	4
1-3/4	30 and under	Reg. Wt., exterior use	4-1/2
1-3/4	30 to 39	Reg. Wt., exterior use	4-1/2
1-3/4	40 and over	Extra Hvy Wt., 4 ball bearing, exterior use	4-1/2

- G. Hinges shall be plain bearing type (regular weight) conforming to BHMA No. A 2133; ball bearing hinges (regular weight) conforming to BHMA No. A 2112 or No. A 5112; and ball bearing hinges (heavy weight) conforming to BHMA No. A 2111 or No. A 5112. Hinge manufacturers design options such as 3-knuckle hinges and concealed ball bearing hinges are acceptable. Plain hinges shall be provided with self lubricating bushings.

2.5 OVERHEAD CLOSERS

- A. All overhead closers shall be the product of one manufacturer. Closers shall have high-strength cast-iron bodies with rectangular, removable non-ferrous covers, adjustable spring power and adjustable back-check, and full rack and pinion action. Closers shall be non-handed and adjustable. Closers shall have back-check regulating screws, with separate screws for closing and latching speeds.
 - 1. Furnish sizes as recommended by manufacturer except where schedule calls for larger size.
 - a. Provide size 2 through 6 unless otherwise indicated at exterior and interior fire rated doors.
 - b. Provide size 1 through 4 at interior non-rated doors.
 - 2. Exterior doors shall have 8.5 lbs maximum pressure to open.
 - 3. Interior doors shall have 5 lbs maximum pressure to pen.
 - 4. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels above.
 - 5. Drop brackets are required at narrow head rails.
 - 6. Make labeled doors self-closing where indicated.
 - 7. Closers shall be adjusted by a factory authorized representative.
- B. Locate closers on inside of building, stairs, and rooms.
- C. Surface door closers shall be spray painted to match door hardware.
- D. Soffit shoes shall be provided where corner brackets or regular arm closers are not used and where they are necessary for proper function of the hardware.
- E. Where door closers or other items have lever or similar arms, attachment to doors shall be with sex bolts only.
- F. Closers for outswinging exterior doors shall be top-jamb-mounted and furnished with adapter plates for doors under 7 feet-6 inches in height. If necessary, closers may be mounted on drop brackets on doors above 7 feet-6 inches in height.
- G. The CONTRACTOR and its hardware supplier shall be responsible to provide the right arm for all closer applications. Arms shall be parallel with the closed door whenever possible.
- H. Closers shall be provided with sex bolts for fastening through doors, frames and transoms.

2.6 LOCKSETS AND LATCHSETS

- A. All locksets and latchsets and their component parts shall be the product of a single manufacturer and shall be mortise type with anti-friction 2-piece latchbolts with a minimum 3/4-inch-throw and 1-inch-throw dead bolts with hardened roller inserts. Locksets and latchsets at fire rated doors shall meet International Building Code and International Fire Code requirements and shall be modified as necessary. All locksets and latchsets shall be provided with satin stainless steel finish 630 (US 32D) unless otherwise indicated.

- B. The function of each lockset or latchset shall be appropriate for the use of the door to which it is attached.
- C. Hardware for aluminum entrance doors shall be as indicated in schedule. The hardware face plate design shall be coordinated with doors provided.
- D. Where knob type trim is indicated for locksets, latchsets, and privacy sets, the trim shall be cast spherical knobs of 2-inch diameter minimum, 2-1/4-inch wrought roses, screwless attached, and thru-bolted trim. The knob and rose and escutcheon mounting shall be of shank spindle assembly designs.
- E. Mortise deadlocks shall be of weight and quality comparable to locksets and latchsets specified.
- F. Lock strikes shall be 16 gauge curved steel, 1 inch deep box type construction, of sufficient length to clear trim and having curved lips to protect the trim and jambs and be so shaped as to avoid the possibility of tearing clothing.
- G. All locks shall be provided with the same cylinder and keyway for master keying. They shall be the product of the same manufacturer as the locksets unless otherwise indicated. The correct cylinders with all necessary modifications and components such as cams, collars, rings, retainers, plates, fasteners, etc., shall be provided for other specialty hardware such as exit devices, store front locksets, and sliding door locks where the indicated hardware manufacturer is different from the cylinder manufacturer.
- H. Padlocks shall be heavy duty type and shall be of same manufacturer as locksets.
- I. Provide approved fusible links at levers for labeled doors.
- J. Verify whether standard or ANSI cutouts are provided in metal frames.

2.7 EXIT DEVICES

- A. All exit devices shall be the product of one manufacturer. The design of outside trim, inside trim, and crossbar shall match. Exit devices shall be (wherever possible) constructed of stainless steel unless otherwise indicated. The finish shall be 630 (US 32D) satin finish stainless steel unless otherwise indicated. Exit devices shall be UL labeled and shall be of corrosion-resistant hardware.
- B. The exit devices shall have side-mounted crossbars unless otherwise specified. They shall be provided with stainless steel lever arms and investment-cast cases. Where bronze or aluminum lever arms are required they shall be drop-forged with pressure-cast cases.
- C. The exit devices shall be provided with stainless steel latch bolt, tailpiece, latch bolt retractor and axle, compression springs, cylinder cam, and lever arm operating stand. Tail piece shall be cadmium plated steel of not less than 3/8-inch diameter. The cylinder shall be retained in the case by a threaded bronze ring. All other interior working members shall be drop-forged bronze. The back plate shall be constructed of stainless steel or bronze. All screws, pins, socket head retaining screws, and other fasteners shall be stainless steel unless otherwise specified.

2.8 PUSH PLATES AND PULLS

- A. Push plates shall be 4-inch by 16-inch by 0.050 thick.

- B. Pulls shall be thru-bolted.
- 2.9 KICKPLATES
- A. Kickplates shall be brushed brass or brushed stainless steel, 0.050-gauge, beveled on 4 sides, and 16 inches high, except where necessary to clear a louver in which case they shall be 10 inches high. Width shall be door width less 2 inches for single doors and door width less 1-1/2 inches for pairs of doors. Furnish with machine or wood screws of brass or stainless steel to match other hardware.
- 2.10 DOOR STOPS
- A. Door stops shall be of the type indicated in the hardware schedule and shall be provided with the proper fasteners.
 - B. Stops shall be provided with machine screws and anchors at concrete and masonry locations, and toggle bolts at plaster, gypsum board, and wood locations.
 - C. Aluminum door stops shall be used with aluminum, chrome, and stainless steel finishes.
 - D. Bronze door stops shall be used with brass and bronze finishes.
 - E. Provide carpet risers at carpeted areas.
- 2.11 DOOR HOLDERS
- A. Overhead type door holders shall be concealed type of correct size for door, 90 degree openable unless 180 degree opening is indicated, and allowing for checkmating. Interior doors shall be provided with overhead stops if wall type stops cannot be used and floor stops make a tripping hazard. Finish shall be chrome plated bronze with satin finish, US 26D, unless otherwise indicated.
- 2.12 DOOR SILENCERS OR MUTES
- A. All interior hollow metal frames shall be provided with rubber silencers, three for each single door and four for pairs of doors. Omit where sound or light seals occur, or where fire-resistive rated door assemblies are indicated.
- 2.13 THRESHOLDS
- A. Thresholds shall be provided as indicated and shall have a maximum of 1/2-inch rise at entry ways. Return miters shall be provided at thresholds on floor closers.
- 2.14 WEATHERSTRIPPING AND SEALS
- A. Exterior doors (except for roll-up doors and entrance doors) shall have head, jambs, and astragals weatherstripped with not less than 5/16-inch by 5/8-inch closed cell, neoprene sponge rubber, unless otherwise indicated.
 - B. Interior doors shall have head, jambs, and astragals sealed with self-adhesive bubble configuration door seal designed against smoke, air, sound, and weather infiltration. The seals shall be fire tested and labeled as a gasketing for use on steel frames with wood or steel doors for 20-minutes C-label, 1 hour B-label, and 1-1/2-hour B-label doors.

- C. Seals: All seals shall be furnished to match adjacent frame color. Solid neoprene shall comply with ASTM D 1752. Sponge neoprene shall comply with ASTM D 1056. Other seals and sweeps shall be polyurethane. UL label shall be applied to the seals on all rated doors.

2.15 TEMPLATES

- A. Hardware indicated for metal frames shall be made to template and secured with machine screws. Templates, or physical hardware items, shall be furnished to manufacturers sufficiently in advance to avoid delay in the WORK.

2.16 REINFORCING UNITS

- A. Reinforcing required for installation of hardware in metal jambs shall be furnished by jamb manufacturer, coordinated with hardware manufacturer and provided in time to be installed and welded within jamb during fabrication.

2.17 MANUFACTURERS

- A. General: Hardware items shall be products of the following manufacturers (or equal). Cylinder cores shall be compatible and interchangeable with existing City of San Diego Metropolitan Wastewater Department operations keying systems.

<u>Description</u>	<u>Manufacturer</u>	<u>Model #</u>	<u>Other Information</u>
Floor closers	Rixson-Firemark Dor-O-Matic	27 Series 2500	
Overhead closers	P & F Corbin Russwin Sargent LCN	120 Series 2820 Series 350 Series 4040	
Locksets and Latches	Arrow Falcon Best	H Series X Series 9 K Series	
Exit Devices	Von Duprin Von Duprin Sargent Russwin Corbin Monarch	3300 Series 9900 Series 60 Series 372-LT 375-375 29 Series 18 Series	Rim Type Rim Type Rim Only, Single Doors Rim Only with Mullion
Hinges	Hager	BB1279	
Push Plates	Quality Hardware Builders Brass Wks Rockwood	40 47E 70	

Pulls	Quality Hardware Builders Brass	402 Wks	47-255-1-E
Kickplates	Builders Brass Wks Quality Hardware	37 Series 48 Series	
Door Stops (Floor Type w/Holder)	Builders Brass Wks Quality Hardware	F-823X 139	
Door Stops (Floor, Dome Type)	Builders Brass Wks Quality Hardware	F-8061X 431 ES	
Door Stops (Floor Type w/Holder)	Builders Brass Wks Quality Hardware	F-823X 139	
Door Stops (Wall Type w/Holder Expansion Bolt Mounted)	Builders Brass Wks Quality Hardware	W-141X 36	
Door Stops (Wall Type w/Holder, Flat Head Wood Screw Mounted)	Builders Brass Wks Quality Hardware	W-141X 36	
Door Bumpers (Wall Dome Type, Expansion Bolt Mounted)	Builders Brass Wks Quality Hardware	W9X W 207S	
Door Stops (Wall Base, Expansion Bolt Mounted)	Builders Brass Wks Quality Hardware	W-146 138	
Door Stops (Wall Base)	Builders Brass Wks Quality Hardware	W146 38	
Door Holders (Concealed Overhead Type)	P & F Corbin FS Type Glynn-Johnson	840 Series 1164 GJ 320 Series	
Door Holders (Surface Overhead Type)	P & F Corbin FS Type Glynn-Johnson	1865 Series 1161 GJ 90M	
Door Silencers or Mutes (Metal Frames)	Glynn-Johnson Hager	64 307D	
Weatherstripping	Pemko Mfg. Co. National Guard Products, Inc. Lero Weatherstripping Co.		
Seals for Fire Rated Doors	Pemko S88D National Guard Products, Inc.	TM 181	

PART 3 - EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall install finish hardware as required. Hardware shall be fitted prior to painting which shall be completed before final installation of hardware. Finish hardware must be neatly and properly installed and secured firmly in place in accordance with best practices as prescribed by manufacturers. All hardware must be thoroughly cleaned prior to final acceptance by OWNER.
- B. No extra cost will be allowed because of changes or corrections necessary to facilitate installation of any hardware. CONTRACTOR shall be responsible for proper fabrication of all WORK or material to receive hardware.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Installation shall conform to local governing agency security ordinances.

3.2 MOUNTING POSITIONS

- A. Heights given are centerline heights up from floor unless otherwise indicated and shall be subject to the Title 24 requirements; all similar items shall be at the same height. Heights of items not indicated shall be in accordance with recommendations of Builders Hardware Association.
 - 1. Top hinge: 5 inches from door top to top of hinge.
 - 2. Bottom hinge: 10 inches from door bottom to bottom of hinge.
 - 3. Intermediate hinges: Equally spaced between top and bottom hinges and from each other.
 - 4. Hinge mortise on door leaf: 1/4-inch to 5/16-inch from stop side of door.
 - 5. Lock: 38 inches from finished floor to center lever or knob.
 - 6. Push bar: 45 inches from bottom of door to center of bar.
 - 7. Push plate: 48 inches from bottom of door to center of plate.
 - 8. Pull plate: 42 inches from bottom of door to center of pull.
 - 9. Panic: 38-13/16 inches from finished floor to center of pad.
 - 10. Dead bolt: Not more than 72 inches from floor to operating knob or lever.
 - 11. Door stops mounted on doors: Mount near floor so as to strike base, but not to rub carpet or flooring. 2-3/4-inch backset.
 - 12. Deadlock strike: 44 inches from floor, centered.

3.3 ADJUSTMENT

- A. After installation of hardware and after air supply is turned on, qualified hardware supplier's or manufacturer's representatives of operating hardware shall inspect the installation, make adjustments and deliver instructions for maintenance and future adjustments to the OWNER.
- B. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
 - 1. Latches and bolts shall be installed to automatically engage in keepers, whether activated by closers or by manual push. In no case shall manual pressure be required to engage latch or bolt in keepers.
 - 2. Closers and hinges shall be carefully adjusted to operate the doors noiselessly and evenly and hinges shall be installed so as not to bind.
- C. Inspection: Hardware supplier shall inspect all hardware before final acceptance and include with his guarantee a statement that this has been accomplished. The supplier shall indicate that the hardware is complete and correctly installed and adjusted.

3.4 HARDWARE SCHEDULE

- A. The hardware schedule is arranged for convenience of locating hardware and does not preclude in any way the requirements that all necessary hardware shall be furnished and properly installed. Hardware not specifically called out shall be similar to that required for similar uses.
- B. The catalog numbers referred to in the hardware schedule are taken from catalogs of the manufacturers listed. They are used only to establish the quality and type of hardware to be used. Hardware equal in quality and utility will be accepted provided it has been submitted in conformance with Section 01600 and accepted as a valid substitution and provided it conforms in operation, quality, weight, size, workmanship, and finish to the products hereinafter described. All component parts of locksets shall be the product of one manufacturer.

FINISH HARDWARE SCHEDULE ABBREVIATIONS (Not Standard With Industry)

CA	=	Clear anodized BHMA 628
DBA	=	Dark bronze anodized (313)
PMD	=	Paint to match door and/or frame BHMA 600
F#	=	ANSI, hardware function number
W/SS	=	With security studs
NRP	=	Non-removable pins
DW+3	=	Door width plus 3-inches
DW-2	=	Door width less 2-inches
EB	=	Expansion bolts
TB	=	Toggle bolts
SB	=	Sex bolts
Mfr	=	Manufacturer
WS	=	Weatherstripping, 5/16-inch by 5/8inch closed cell sponge neoprene.
F/S	=	Fire seals

** END OF SECTION **

SECTION 09220 - PORTLAND CEMENT STUCCO

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement stucco.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 04232 – Reinforced Concrete Block Masonry.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. C150, Standard Specification for Portland Cement.
 - b. C206, Standard Specification for Finishing Hydrated Lime.
 - c. C897, Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters
- B. Qualifications:
 - 1. Plasterer(s) shall have minimum 10 years current experience on projects with similar scope.
 - 2. Provide references for minimum of three (3) projects with similar scope completed within the past two (2) years.
 - a. Provide amount of material applied (area), thickness and finish applied, name and phone number of contact person.
- C. Mock-Ups:
 - 1. Construct minimum 4 X 4 FT mock-up incorporating all components specified or required by Specification Section 04232 and this Specification Section, for Engineer's review and approval.
 - a. Provide separate 4 x 4 FT mock-up of ceiling and wall when applicable.
 - b. Mock-up(s) to include stepped construction showing each phase of application; finish(es) specified and each different type joint and or other accessory.
 - 2. Construct additional mock-up(s) as required until acceptable to Engineer.
 - 3. Approved mock-up(s) to serve as minimum standard of quality for actual construction.
 - 4. Maintain mock-up(s) during construction.

5. Mock-up(s) shall not be built into permanent construction.
6. Remove when directed by Engineer.

1.3 DEFINITIONS

A. Installer or Applicator:

1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
2. Installer and applicator are synonymous.

B. Stucco: Exterior plaster finish.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01300 – Contractor Submittals, for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Provide plaster manufacturer's curing recommendations.
3. Certification of plasterer's qualifications.
4. Plasterer('s) references.
5. Layout drawings showing all special detailing not indicated on the Drawings but necessary for installation.
 - a. Minimum plan scale: 1/8 IN = 1 FT.
 - b. Minimum detail scale: 1-1/2 IN = 1 FT.

B. Samples:

1. Provide samples of manufacturer's standard colors and finishes for Engineer's preliminary selection.
2. Provide two (2) 3 IN x 5 IN samples of actual stucco color and finish for Engineer's final color and finish selection/approval.

C. Miscellaneous Submittals:

1. See Specification Section 01300 – Contractor Submittals, for requirements for the mechanics and administration of the submittal process.

2. Provide stucco manufacturer's curing recommendation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 1. Portland cement finish coat:
 - a. US Gypsum Company.
 - b. Thoro System Products.

2.2 MATERIALS

- A. Portland Cement: ASTM C150, Type I.
- B. Lime: ASTM C206, Type S.
- C. Aggregate: ASTM C897.
- D. Water: Potable.

2.3 MIXES

- A. Portland Cement Finish Coat: Provide factory prepared product containing all materials required for finish coat, except water and/or aggregate.
- B. Mix base coats and finish coats in accordance with manufacturer's recommendations and in accordance with local plastering practices.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify soundness and completeness of furring, lathing and accessories.
- B. Verify all above ceiling work has been completed prior to start of work.

3.2 APPLICATION

- A. Prepare and apply stucco in accordance with manufacturer's instructions and local plastering practices.
- B. Mix each batch of stucco in quantity which can be used before it starts to set.
 1. Discard stucco which has started to set.
 2. Do not retemper.
- C. Cure in accordance with manufacturer's recommendations and as required to prevent freezing or uneven and excessive evaporation from hot dry air.
- D. Maintain minimum temperature of 55° F in spaces to be plastered for one (1) week prior to, during and after application.
 1. Provide natural or mechanical ventilation as recommended by manufacturer.
- E. Prior to plastering operation, grout door frames and other frames in openings which occur in plaster walls using specified grouting material.
- F. Apply flush with metal frames and other built-in items.
 1. Where stucco is not terminated at metal by casing beads, cut base coat free before material sets.
 2. Groove finish coat at junctures with metal.
- G. Make interior corners and angles square.
 1. Finish external corners flush with corner beads.

- H. Wherever permanent grounds are too far apart to serve as guides for rodding, provide screeds and establish true surface of screeds with rod before screeds are set.
 - 1. Keep grounds clean.
 - 2. Finish level with grounds.
- I. Apply stucco to thickness indicated on Drawings but not less than 3/4 IN.
 - 1. Use three-coat system.
 - 2. Apply at consistency required to achieve uniformity.
 - 3. Finish coat minimum 1/8 IN thick.
- J. Provide control joints where indicated on Drawings.

3.3 FIELD QUALITY CONTROL

- A. Determine most effective procedure for curing and time lapse between coats based on plaster manufacturer recommendations, climatic and job conditions.
- B. Stucco which is cracked or crazed will not be accepted.
- C. Remove and replace unacceptable stucco, including base materials if damaged during removal of defective stucco.
 - 1. Cut, patch, repair and point-up stucco as required and as directed by Engineer.
 - a. Repair cracks and indented surfaces by moistening stucco and filling with new material.
 - b. Trowel or tamp flush with adjoining surfaces.
 - c. Finish pointing-up surfaces around items which are built into or penetrate coating.
- D. Protect adjacent work from damage and soiling.

** END OF SECTION **

SECTION 09800 - PROTECTIVE COATING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes the protective coating of all indicated surfaces including surface preparation, pretreatment, coating application, touch-up, protection of surfaces not to be coated, cleanup, and all appurtenant work.
- B. Definitions:
 - 1. The term “paint”, “coatings”, or “finishes” as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, except galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.
 - 2. The term “DFT” shall mean minimum dry film thickness, without any negative tolerance.
- C. The following surfaces shall not be protective coated hereunder unless indicated.
 - 1. Concrete except in chemical(s) containment areas
 - 2. Stainless steel
 - 3. Machined surfaces
 - 4. Grease fittings
 - 5. Glass
 - 6. Equipment nameplates
 - 7. Platform gratings, stair treads, door thresholds, and other walk surfaces
- D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02630 Ductile Iron Pipe
 - 2. Section 03300 Cast-in-Place Structural Concrete
 - 3. Section 11000 Equipment General
 - 4. Section 15000 Piping Components

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. References herein to "SSPC Specifications" or "SSPC" shall mean the published standards of the Steel Structures Painting Council, 40 24th Street, 6th Floor, Pittsburgh, PA 15222.
2. References herein to "NACE" shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 281340, Houston, TX 77218-8340.

3. Commercial Standards:

ANSI A13.1	Scheme for Identification of Piping Systems
ANSI/AWWA C105	Polyethylene Encasement for Ductile Iron Pipe Systems
ANSI/AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot-Applied
ANSI/AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
ANSI/AWWA C217	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines

4. Federal Specifications:

TT-P-28	Paint, Aluminum, Heat Resisting
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1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 unless indicated otherwise.

- B. Submittals shall include the following information and be submitted at least 30 days prior to protective coating work.

1. Coating Materials List: The CONTRACTOR shall provide a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein, prior to or at the time of submittal of samples.
2. Paint Manufacturer's Catalogue: For each paint system to be used the CONTRACTOR shall submit manufacturer's catalogue containing the following data.

- a. Paint Manufacturer's data sheet for each product used, including statements on the suitability of the material for the intended use.
- b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
- c. Manufacturer's Instructions and recommendations on surface preparation, thinning, mixing, handling, applying and proper storage.
- d. Colors available for each product (where applicable).
- e. Compatibility of shop and field applied coatings (where applicable).
- f. Material safety data sheet for each product used.

C. Samples:

1. Samples of all paint, finishes, and other coating materials shall be submitted on 8.5-inch by 11-inch sheet metal. Each sample shall be completely coated over its entire surface with one protective coating material, type, and color.
2. Qualifications of Painting Subcontractor:
 - a. Copy of a valid State of California license as required for the application of coatings.
 - b. Five references which show that the painting subcontractor has demonstrated successful experience with the indicated coating systems in the recent past. Provide the name, address and telephone number of the owner of each installation. The CONTRACTOR shall obtain the references from the subcontractor and submit them to the CONSTRUCTION MANAGER.

1.6 SERVICES OF MANUFACTURER

- A. For submerged and severe service coating systems, the CONTRACTOR shall require the paint manufacturer to furnish the following services:
 1. The manufacturer's representative shall furnish at least 6 hours of on-site instruction in the proper surface preparation, use, mixing, application and curing of the coating systems.
 2. The manufacturer's representative shall personally observe the start of surface preparation, mixing, and application of the coating materials.
 3. The manufacturer's representative shall provide technical support to resolve field problems associated with manufacturer's products furnished under this Contract or the application thereof.
 4. The manufacturer shall certify that these services have been furnished, and the CONTRACTOR shall submit the certification within 7 days of completion of each paint system.

1.7 INSPECTION AND TESTING

- A. General: The CONTRACTOR shall give the CONSTRUCTION MANAGER a minimum of 3 days' advance notice of the start of any field surface preparation work or coating application work, and a minimum of 7 days' advance notice of the start of any shop surface preparation work.

- B. All such work shall be performed only in the presence of the CONSTRUCTION MANAGER, unless the CONSTRUCTION MANAGER has granted prior approval to perform such work in its absence.
- C. Inspection by the CONSTRUCTION MANAGER, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- D. Scaffolding shall be erected and moved to locations where requested by the CONSTRUCTION MANAGER to facilitate inspection. Additional illumination shall be furnished to cover all areas to be inspected.
- E. Inspection Devices: The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gauges shall be made available for the CONSTRUCTION MANAGER'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the CONSTRUCTION MANAGER.
- F. Holiday Testing: The CONTRACTOR shall holiday test all coated ferrous surfaces inside a steel reservoir, or other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested. In addition to the above the CONSTRUCTION MANAGER may test any surfaces for any number of times at no additional cost to CONTRACTOR. All defects so found shall be corrected by the CONTRACTOR at no additional cost to the OWNER.
 - 1. Coatings with Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Razor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the indicated coating thickness.
 - 2. Coatings with Thickness of 20 Mils or Less: For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Razor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.
- G. Film Thickness Testing: On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gauge such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.
- H. Surface Preparation: Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70 and TM-01-75.

1.8 WARRANTY INSPECTION

- A. A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the OWNER. The OWNER may, by written notice to the CONTRACTOR, reschedule the warranty inspection to another date within the one-year correction period, or may cancel the warranty inspection altogether. If a warranty inspection is not held, the CONTRACTOR shall not be relieved of its responsibilities under the Contract Documents.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.
- B. Paint materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Suitability: The CONTRACTOR shall use suitable coating materials as recommended by Manufacturer for the intended service.
- B. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.
- C. Colors: All colors and shades of colors of all coats of paint shall be as indicated or selected by the CONSTRUCTION MANAGER. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the CONSTRUCTION MANAGER.
- D. Substitute or "Or Equal" Products:
 - 1. To establish equality under Section 01600 – Products, Materials, Equipment, and Substitutions, the CONTRACTOR shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or-equal" material that said material meets the requirements and is equivalent or better than the listed materials in the following properties:
 - a. Quality
 - b. Durability
 - c. Resistance to abrasion and physical damage
 - d. Life expectancy
 - e. Ability to recoat in future

- f. Solids content by volume
 - g. Dry film thickness per coat
 - h. Compatibility with other coatings
 - i. Suitability for the intended service
 - j. Resistance to chemical attack
 - k. Temperature limitations in service and during application
 - l. Type and quality of recommended undercoats and topcoats
 - m. Ease of application
 - n. Ease of repairing damaged areas
 - o. Stability of colors
- E. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the name of least one successfully performing application of the proposed manufacturer's products in a project of comparable size and complexity constructed in the recent past.
- F. The cost of all testing and analyzing proposed substitute materials that may be required by the CONSTRUCTION MANAGER shall be paid by the CONTRACTOR at no additional cost to the OWNER. If the proposed substitution requires changes in the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution at no additional cost to the OWNER.

2.2 INDUSTRIAL COATING SYSTEMS

- A. Material Sources: Each of the following manufacturers is capable of supplying many of the industrial coating materials indicated herein. Where manufacturers and paint numbers are listed, it is to show the type and quality of coatings that are required. Proposed substitute materials shall be considered as indicated above. All industrial coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, water, and wastewater treatment plants.
- 1. PPG Amercoat (formerly Ameron)
 - 2. Carboline Coatings Company
 - 3. Inorganic Coatings, Inc.
 - 4. International (Courtaulds)
 - 5. Tnemec Company
- B. System 4 - Aliphatic Polyurethane: Two component aliphatic acrylic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 58 percent by volume. Primer shall be a rust inhibitive two component epoxy coating with a minimum solids content of 68 percent by volume.

1. Prime coat (DFT = 4 mils), Amercoat 385, Carboline 893, Tnemec 69, or equal.
 2. Finish coat (one or more, DFT = 3 mils), Amershield, Carboline 134 HS, Tnemec 1074, or equal.
 3. Total system DFT = 7 mils.
 4. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.
- C. System 7 - Acrylic Latex: Single component, water based acrylic latex with a fungicide additive shall have a minimum solids content of 35 percent by volume. Prime coat shall be as recommended by manufacturer. The coating material shall be available in the ANSI safety colors.
1. Prime coat (DFT = 2 mils), as recommended by manufacturer.
 2. Finish coats (2 or more, DFT = 6 mils), Amercoat 220, Carboline 3359, Tnemec 6, or equal.
 3. Total system DFT = 8 mils.
- D. System 8 - Epoxy Equipment: Two component, rust inhibitive polyamide cured epoxy coating material shall provide a recoatable finish that is available in a wide selection of colors. The coating material shall have a minimum solids content of 66 percent by volume and be resistant to service conditions of condensing moisture, splash and spillage of lubricating oils, and frequent washdown and cleaning
1. Prime coat DFT = 3 mils, Amercoat 385, Tnemec 69, or equal.
 2. Prime coat, where shop applied. (DFT = 3 mils), universal primer, Amercoat 185 HS, Tnemec 161, or equal.
 3. Finish coat (2 or more, DFT =6 mils), Amercoat 385, Tnemec 69, or equal.
 4. Total system DFT = 6 mils.
- E. System 11 - Aliphatic Polyurethane, Concrete: Two component aliphatic polyester polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering, and with a minimum solids content of 65 percent by volume. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-sealer shall be applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build epoxy coating with a minimum solids content of 70 percent by volume.
1. Prime coat (Filler-sealer), Nu-Klad 114A, Tnemec 215, or equal.
 2. Intermediate coat (DFT = 4 mils), Amerlock 400, Tnemec L69, or equal.
 3. Finish coats (2 or more, DFT = 3 mils), Amershield, Tnemec 1074, or equal.

2.3 SUBMERGED AND SEVERE SERVICE COATING SYSTEMS

- A. Materials Sources: The manufacturers' products listed in this paragraph are materials which satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. Proposed substitute products shall be considered as indicated above.
- B. System 101 - Wax-Tape: Wax-Tape coating materials and procedures shall be in accordance with ANSI/AWWA C217. Prefabricated tape shall be Trenton #1 Wax-Tape or equal. The system shall consist of a single tape layer. Total system DFT = 70 mils.
- C. System 106 - Fusion Bonded Epoxy: All ferrous piping submerged, wetted, or buried, including internal wetted surfaces of pumps and valves, shall be Fusion-Bonded Epoxy Coated inside and outside. The coating material shall be a 100 percent powder epoxy applied in accordance with the ANSI/AWWA C213 "AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines," except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed process.
 - 1. Exterior non-buried surface and buried steel pipe coating, DFT = 16 mils, Scotchkote 134 (electrostatic) or 206N (fluidized bed), or equal, applied in one coat.
 - 2. Exterior buried ductile iron pipe and fittings, DFT = 30 mils.
 - 3. Interior coating of pumps, DFT = 16 mils.
 - 4. For coating of valves, DFT = 12 mils.
 - 5. Interior coating of steel and ductile iron pipes, DFT = 30 mils.
 - 6. For field repairs, the use of a liquid epoxy will be permitted, applied in one coat to provide a DFT of 15 mils. The liquid epoxy shall be Scotchkote 312 or as recommended by the powder epoxy manufacturer.
- D. System 109 – Aromatic Polyurethane: Concrete tank bottom surfaces subject to immersion shall be two component Aromatic Polyurethane coated. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-sealer shall be applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build epoxy coating with a minimum solids content of 65 percent by volume.
 - 1. Prime coat (Filler-sealer), Nu-Klad 114A, Tnemec 215, or equal.
 - 2. Intermediate coat (DFT = 4 mils), Amerlock 400, Tnemec L69, or equal.
 - 3. Finish coat (DFT = 100 mils), Carboline Polibrid 705, Tnemec 406, or equal.

2.4 SPECIAL COATING SYSTEMS

- A. System 200 - PVC Tape: Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils.

- B. System 208 - Aluminum Metal Isolation: Two coats of a high build polyamide epoxy painting, such as Tnemec 66, or equal (8 mils). Total thickness of system DFT = 8.0 mils.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Skilled craftsmen and experienced supervision shall be used on all WORK.
- B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.
- C. All damage to surface resulting from the WORK shall be cleaned, repaired, and refinished to original condition.

3.2 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. Manufacturer's Recommendations: Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- C. Storage and Mixing: Coating materials shall be stored under the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.3 PREPARATION FOR COATING

- A. General: All surfaces to receive protective coatings shall be cleaned as indicated prior to application of coatings. The CONTRACTOR shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.
- B. Protection of Surfaces Not to be Coated: Surfaces which are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- C. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

- D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.
- E. Protection of Painted Surfaces: Cleaning and coating shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

3.4 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 - 2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
 - 3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
 - 4. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
 - 5. Commercial Blast Cleaning (SSPC-SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.
 - 6. Brush-Off Blast Cleaning (SSPC-SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust and paint which cannot be removed by a dull putty knife may remain.
 - 7. Near-White Blast Cleaning (SSPC-SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.5 METAL SURFACE PREPARATION (UNGALVANIZED)

- A. The minimum abrasive blasting surface preparation shall be as specified in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the more stringent degree of cleaning shall apply.
- B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grits.
- C. Oil, grease, welding fluxes and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 prior to blast cleaning.

- D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.
 - E. The type and size of abrasive shall be selected to produce a surface profile that meets the manufacturer's recommendation for the specific coating and service conditions. Abrasive shall not be used unless approved by the CONSTRUCTION MANAGER.
 - 1. Submerged and Severe Service
 - a. Automated blasting systems shall not be used for surfaces that will be in submerged service but are acceptable for severe service.
 - b. Abrasives for submerged and severe service coatings shall be clean, hard, sharp cutting crushed: no metallic abrasives shall be used.
 - 2. Other Services
 - a. Either automated or manual methods of blasting may be used.
 - b. Abrasives shall be clean, oil-free metallic abrasives, composed of at least 50 percent grit.
 - F. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.
 - G. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil/moisture separators which remove at least 95 percent of the contaminants.
 - H. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming or another approved method prior to painting.
 - I. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.
 - J. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.
 - K. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2, or SSPC-SP3 may be used.
 - L. Shop applied coatings of unknown composition shall be completely removed before the specified coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.
 - M. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.
- 3.6 SURFACE PREPARATION FOR GALVANIZED FERROUS METAL
- A. Galvanized ferrous metal shall be alkaline cleaned per SSPC-SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used, followed by brush-off blast cleaning per SSPC-SP7.
 - B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.7 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

- A. General: All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.
- B. Abrasive Blast Cleaning: The CONTRACTOR shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be cleaned to SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.
- C. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.
- D. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.
- E. Water Abrasive or Wet Abrasive Blast Cleaning: Where indicated or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless indicated.

3.8 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. Surface preparation shall not begin until at least 30 days after the concrete or masonry has been placed.
- B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC-SP1 before abrasive blast cleaning.
- C. Concrete, concrete block masonry surfaces and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.
- D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.
- E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.
- F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.

3.9 PLASTIC, FIBER GLASS, AND NONFERROUS METALS SURFACE PREPARATION

- A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.
- B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7.
- C. All surfaces shall be clean and dry prior to coating application.

3.10 ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. The mortar surfaces shall be cured at least 14 days before surface preparation work is started.
- B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.
- C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.11 SHOP COATING REQUIREMENTS

- A. Unless indicated otherwise, items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the indicated or approved color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires topcoating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.
- B. All items of equipment, or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.
- C. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the specified quality in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its shop drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the shop drawings for the equipment.
- D. For certain small pieces of equipment the manufacturer may have a standard coating system which is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.
- E. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before topcoated, or less time if recommended by the coating manufacturer.
- F. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

- G. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.12 APPLICATION OF COATINGS

- A. The application of protective coatings to steel substrates shall be in accordance with "Paint Application Specification No. 1, (SSPC-PA1)," Steel Structures Painting Council.
- B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the CONSTRUCTION MANAGER in advance.
- C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.
- D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.
- E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.
- F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
- G. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.
- H. Coatings shall not be applied under the following conditions:
 - 1. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.
 - 2. Dust or smoke laden atmosphere.
 - 3. Damp or humid weather.
 - 4. When the substrate or air temperature is less than 5 degrees F above the dewpoint.
 - 5. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
 - 6. When wind conditions are not calm.
- I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.
- J. Steel piping shall be abrasive blast cleaned and primed before installation.
- K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.13 CURING OF COATINGS

- A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the stringent, prior to placing the completed coating system into service.
- B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.
- C. Forced Air Ventilation of Steel Reservoirs and Enclosed Hydraulic Structures: Forced air ventilation is required for the application and curing of coatings on the interior surfaces of enclosed hydraulic structures. During application and curing periods continuously exhaust air from the lowest level of the structure using portable ducting. After all interior coating operations have been completed provide a final curing period for a minimum of 10 days, during which the forced ventilation system shall operate continuously. For additional requirements, refer to the specific coating system being used.

3.14 IDENTIFICATION OF PIPING

- A. Identification of all unburied piping, fittings, valves, pumps and equipment shall be in accordance with Section 15030 - Piping Identification Systems.
- B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per General Industry Safety Orders, Article 112 and 5194.
- C. All unburied pipe in structures and in chemical pipe trenches shall be color-code painted. Colors shall be as selected by the CONSTRUCTION MANAGER, or as indicated.

3.15 COATING SYSTEM SCHEDULES - FERROUS METALS

- A. Coating System Schedule, Ferrous Metal - Not Galvanized:

	<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane
FM-2	Ferrous surfaces of sleeve-couplings.	Solvent cleaning SSPC-SP1, followed by near-white metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-3	Buried surfaces that are not indicated to be coated elsewhere.	White metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-4	Surfaces of indoor equipment, not submerged.	Commercial blast cleaning SSPC-SP6	(8) epoxy, equipment
FM-5	Surfaces exposed to sewage.	White metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy

FM-6	Buried pipe couplings, fittings, valves, and flanged joints (where piping is ductile or cast iron), including epoxy-coated surfaces.	Removal of dirt, grease, oil	(101) Wax-Tape
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B. Coating System Schedule, Ferrous Metal - Galvanized: Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated.

Item	Surface Prep.	System No.
FMG-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1 (4) aliphatic polyurethane

3.16 COATING SYSTEM SCHEDULE, NON-FERROUS METAL, PLASTIC, FIBER GLASS

A. Where isolated non-ferrous parts are associated with equipment or piping, the CONTRACTOR shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
NFM-1	All exposed surfaces, indoors and outdoors, except those included below.	Solvent cleaned SSPC-SP1 (4) aliphatic polyurethane
NFM-2	Aluminum surfaces in contact with concrete, or with any other metal except galvanized ferrous metal.	Solvent cleaned SSPC-SP1 (208) aluminum metal isolation
NFM-3	Polyvinyl chloride plastic piping, indoors and outdoors, or in structures, not submerged.	Solvent cleaned SSPC-SP1 (7) acrylic latex
NFM-4	Buried non-ferrous metal pipe.	Removal of dirt, grease, oil (200) PVC tape

3.17 COATING SYSTEM SCHEDULE-CONCRETE

<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
C-1	All surfaces indoors and outdoors, as indicated.	Per Paragraph 3.8 (11) aliphatic polyurethane, concrete
C-2	Concrete tank bottom, submerged	Per Paragraph 3.8 (109) aromatic polyurethane

3.18 COATING SYSTEM SCHEDULE-CONCRETE BLOCK MASONRY

	<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
CBM-1	All surfaces, indoors and outdoors, as indicated.	Per Paragraph 3.10	(11) aliphatic polyurethane, concrete

** END OF SECTION **

SECTION 10210 - LOUVERS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing extruded aluminum louvers, including acoustical louvers.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 07600 Flashing and Sheet Metal
 - 2. Section 07920 Sealants and Caulking

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. AAMA 2604 Specification, Performance Requirements, and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
 - 2. AMCA 500-L Laboratory Methods of Testing Louvers for Rating
 - 3. AMCA 511 Certified Ratings Program – Product Rating Manual for Air Control Devices
 - 4. ASTM B 221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - 5. ASTM E 90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's product data including catalogue cuts.
 - 2. Manufacturer's performance data.

3. Manufacturer's installation instructions.
4. Certification that products comply with the specifications indicated.
5. Louver schedules showing sizes, types, and accessories.
6. Certified Sound Transmission Coefficients.
7. Samples of frames, blades, insulation, bird screen, accessories, finish, and color.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Louvers shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer. Protect materials and finish during handling to prevent damage.
- B. Louvers shall be stored in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Performance Ratings: AMCA licensed.
- B. Products: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. Manufacturer's Recommendation: Products shall be recommended by the manufacturer for the application indicated.

2.2 MATERIALS AND FABRICATION

- A. Drainable blades except where otherwise indicated.
- B. Continuous blade appearance.
- C. Extruded aluminum, ASTM B 221, alloy 6063T5, minimum 0.081 inch thick.
- D. Bird/Insect screen: 18-16 mesh aluminum in standard aluminum frame, removable and rewirable.
- E. Finish: Factory Fluoropolymer coating conforming to AAMA 2604, minimum 1.2 mils. Color as selected by Owner from manufacturer's standard colors.

2.3 PERFORMANCE DATA

- A. Stationary
 1. Minimum free area: 8.5 sq. ft. for a 4 ft. x 4 ft. louver.
 2. Maximum pressure drop: 0.05 inches at 500 fpm.
 3. Water penetration: 0.01 oz./sq. ft. at 875 fpm.

B. Acoustical

1. Minimum free area: 4.5 sq. ft. for a 4 ft. x 4 ft. louver.
2. Maximum pressure drop: 0.05 inches at 800 fpm.
3. Water penetration: 0.01 oz./sq. ft. at 966 fpm.
4. Acoustical performance: STC of 19 (ASTM E 90)

2.4 MANUFACTURERS

A. Products shall be manufactured by one of the following (or equal):

1. Stationary

Construction Specialties Inc.
Ruskin Manufacturing ELF375DX

2. Acoustical

Construction Specialties Inc. A8860
Ruskin Manufacturing

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Products shall be installed in accordance with the manufacturer's installation instructions.
- B. Louvers shall be set plumb and square in a true plane, and shall be securely anchored to the adjoining construction.
- C. Install flashing at sill to match louver per Section 07600, Flashing and Sheet Metal.
- D. Seal perimeter on exterior and interior per Section 07900, Sealants and Caulking.

**** END OF SECTION ****

SECTION 10400 - IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all signs and other identifying devices and all appurtenant work.

1.2 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. Uniform Sign Code

1.3 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop Drawings: Submit shop drawings for fabrication and erection of identification device. Include plans, elevations, and large scale details of sign wording and lettering layout. Show fasteners, mountings, anchorages and accessory items.
 - a. Furnish location template drawings for supported or anchored to permanent construction.
 - b. Style and colors of lettering shall be as selected by the CONSTRUCTION MANAGER from manufacturer's standards.
 - c. Full-size rubbings shall be furnished for metal plaques. Rubbing shall clearly indicate all letter styles and sizes as well as the overall outline of plaque. Additional drawings shall be provided as required to completely define anchorages, mountings and accessory items.
 - 2. Product Data: Manufacturer's technical data and installation instructions shall be submitted for each type of sign required.
 - 3. Samples: The CONTRACTOR shall submit to the CONSTRUCTION MANAGER for approval, samples of all the materials and colors he proposes to use on the WORK. The samples shall be clearly marked to show the manufacturer's name and product identification. Accepted sample units may be installed as part of the WORK, with the CONSTRUCTION MANAGER'S permission.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Wording on all identification devices shall be as per schedule.
- B. Uniformity of Manufacturer: The CONTRACTOR shall furnish products of a single manufacturer for each sign type and graphic image process indicated.

2.2 SIGNS

- A. General: Signs or warnings shall be painted. Paint materials shall be baked enamel on aluminum.
1. Signs shall conform to OSHA Standards and directions. Locations, sizes, and colors shall be as reviewed by the CONSTRUCTION MANAGER.
 2. The lettering sizes shall be 3-inch in height unless shown or specified otherwise.
 3. Each sign shall be in both English and Spanish as defined below.
- B. Non-Potable Water: The following warning sign shall be provided at all hose bibb locations where water is non-potable:

CAUTION
NON POTABLE WATER
DO NOT DRINK

PRECAUCION
AGUA NO POTABLE
NO BEBA

- C. The following sign shall be provided in all new and existing underground structures into which employees may enter.

CAUTION
VENTILATE BEFORE ENTERING

PRECAUCION
VENTILAR ANTES DE ENTRAR

2.3 METAL LETTERS AND NUMBERS

- A. Metal letters and numbers shall be provided in compliance with the requirements indicated for the manufacturing process, materials, finish, style, size and message content.
- B. Letters and numbers shall be formed by casting aluminum to produce characters with smooth, flat faces, sharp corners, precisely-formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of the characters and tap to receive threaded mounting studs.
- C. Baked Enamel Finish: Finish shall be AA-M4xC12C42R1x, manufacturer's standard non-directional mechanical finish including sanding and filing, cleaning with inhibited chemicals, conversion coating with an acid-chromate-fluoride-phosphate treatment and painting with manufacturer's standard organic thermosetting enamel system consisting of a prime coat and a finish coat.

2.4 MISCELLANEOUS LETTERS AND NUMBERS

- A. Plastic: Plastic letters shall be 4-inch Helvetica Medium lower case cut from 1/4-inch thick acrylic plastic, finished with auto paint coating of color selected by the CONSTRUCTION MANAGER.
- B. Wording: The lettering shall read as indicated. Number shall be verified before ordering.

2.5 STAFF GAUGE

- A. Gauge shall be constructed of porcelain enamel coated iron, suitable for contact with raw unscreened sewage.
- B. Gauge shall be a minimum of 3-1/2 inches wide, graduated in feet and tenths, with each foot interval numerically indicated.

2.6 MANUFACTURERS

A. Products shall be of the following manufacture and type (or equal):

1. Nameplates:

Builders Brass Works, "460 Series"
Desk and Door Nameplate Co., "Elite Sign System"
Vomar Products, Inc., "ES100 Series"

2. Metal letters:

A.R.K. Ramos
James H. Matthews and Co.
Metal Arts

3. Staff gauge:

PlantPRO, Style E

PART 3 - EXECUTION

3.1 GENERAL

- A. Identifying devices shall be installed where directed by the CONSTRUCTION MANAGER.
- B. All installations of identifying devices shall be vandal-resistant. Fasteners shall be concealed, non-corrosive fasteners appropriate for materials being fastened and as required.
- C. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
- D. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

3.2 METAL LETTERS AND NUMBERS

- A. Metal letters and numbers shall be mounted using standard fastening methods recommended by the manufacturer for the letter form, type of mounting, wall construction and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Flush Mounting: Letters shall be mounted with backs in contact with the wall surface.

3.3 STAFF GAUGE

- A. Staff gauge shall be mounted using standard fastening methods recommended by the manufacturer for the type of mounting, wall construction and condition of exposure indicated. Provide heavy paper template to locate holes for fasteners.
- B. Staff gauge shall extend from the tank bottom to the tank top, located such that it can be readily viewed from the tank manway entrance closest to the backflow pipe. Each foot interval shall be sequentially numbered.

**** END OF SECTION ****

SECTION 11000 - EQUIPMENT GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for the WORK of applicable Sections of these Specifications. Unless there are more restrictive requirements in the individual Sections, the provisions of this Section shall apply.
- B. The WORK of this Section applies to the WORK of the following Sections:
 - 1. Section 11175 Pumps, General
 - 2. Section 11209 Submersible Sump Pumps (Less than 10 HP)
 - 3. Section 11212 Vertical Non-Clog Pumps
 - 4. Section 15855 Air Handling and Moving Equipment

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01300 Contractor Submittals
 - 2. Section 01660 Equipment Testing and Startup
 - 3. Section 01680 Physical Checkout, Shop, Field, and Functional Testing
 - 4. Section 05500 Miscellaneous Metalwork
 - 5. Section 09800 Protective Coating
 - 6. Section 11002 Equipment Supports, Grouting and Installation
 - 7. Section 11005 Machine Alignment
 - 8. Section 11020 Vibration and Critical Speed Limitations
 - 9. Section 15000 Piping Components
 - 10. Section 15020 Pipe Supports
 - 11. Section 15050 Vibration Isolation
 - 12. Section 16040 Electric Motors

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. International Mechanical Code (IMC)
2. International Plumbing Code (IPC)
3. International Fire Code (IFC)
4. National Electrical Code (NEC)
5. International Building Code (IBC)

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the applicable standards of the following organizations apply to the WORK of this Section:

1. American Society for Testing and Materials (ASTM)
2. American Public Health Association (APHA)
3. American National Standards Institute (ANSI)
4. American Society of Mechanical Engineers (ASME)
5. American Water Works Association (AWWA)
6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
7. American Welding Society (AWS)
8. National Fire Protection Association (NFPA)
9. National Electrical Manufacturers Association (NEMA)
10. American Bearing Manufacturers Association (ABMA)
11. American Gear Manufacturers Association (AGMA)

B. The current editions of the following apply to the WORK of this Section:

- | | | |
|----|------------|--|
| 1. | ABMA 9 | Load Ratings and Fatigue Life for Ball Bearings |
| 2. | ABMA 11 | Load Ratings and Fatigue Life for Roller Bearings |
| 3. | ANSI B16.1 | Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250 |
| 4. | ANSI B16.5 | Pipe Flanges and Flanged Fittings |
| 5. | ANSI B46.1 | Surface Texture |
| 6. | ANSI S12.6 | Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors |

7. ANSI/ASME B1.20.1 General Purpose Pipe Threads (Inch)
8. ANSI/ASME B31.1 Power Piping
9. ANSI/AWWA D100 Welded Carbon Steel Tanks for Water Storage
10. AWWA C206 Field Welding of Steel Water Pipe
11. ASTM A 48 Specification for Gray Iron Castings
12. ASTM A 108 Specification for Steel Bar, Carbon and Alloy, Cold-Finished
13. ANSI/NFPA 70 National Electrical Code
14. MIL STD 167-2 Mechanical Vibrations of Shipboard Equipment (Reciprocating Machinery and Propulsion System and Shafting)

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 1. Manufacturer's product data including catalogue cuts.
 2. Equipment name, identification number and specification numbers.
 3. Shop drawings showing details, dimensions, anchorage details, and installation of equipment with all special fittings, appurtenances and required clearances.
 4. Shipping weights.
 5. Calculations of equipment anchorage forces and anchorage details.
 6. Certification that the single manufacturer accepts the indicated unit responsibilities.
 7. Parts list with materials of construction by ASTM reference and grade.
 8. List of at least 5 installations and telephone numbers, where identical equipment has been used.
 9. Documentation of experience of specialist who will perform torsional and vibration analysis.
 10. Torsional and lateral vibration analysis reports.

1.6 OWNER'S MANUAL

- A. In addition to the requirements of Paragraph 01300-1.5, the following shall be included in the OWNER'S MANUAL submittal in compliance with Section 01300:
 1. Manufacturer's catalog including installation instructions.
 2. Manufacturer's operating and maintenance procedures including lubricating instructions.

3. Manufacturer's certification that products comply with the indicated requirements.
4. Bearing L-10 life calculations.
5. Certification that products have been factory-tested and found to conform with the contract requirements.
6. Certification that the WORK has been field-tested and the WORK complies with the indicated requirements.
7. Equipment tolerances.
8. Electrical data including control and wiring diagrams.
9. Address and telephone number of local service representative.

1.7 SERVICES OF MANUFACTURER

- A. Inspection, Startup, and Field Adjustment: In accordance with the requirements of Sections 01660 and 01680, an authorized service representative of the manufacturer shall visit the site and witness the following:
 1. Installation of the equipment.
 2. Inspection, checking, and adjusting the equipment.
 3. Startup and field-testing for proper operation.
 4. Performing field adjustments to ensure that the equipment installation and operation comply with the Specifications.
- B. Instruction of OWNER'S Personnel:
 1. An authorized service representative of the manufacturer shall instruct the OWNER'S personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment. Training shall be specific to the models of equipment provided.
 2. The representative shall have at least one year of qualified experience in training covering the relevant subjects described in paragraph 11000-1.7B.1. A resume for the representative shall be submitted to the CONSTRUCTION MANAGER.
 3. Training shall be scheduled a minimum of 3 weeks in advance of the first session.
 4. Proposed training material and a detailed outline of each lesson shall be developed in accordance with the requirements specified in Section 01300, and submitted to the CONSTRUCTION MANAGER for review. Comments from the CONSTRUCTION MANAGER shall be incorporated into the material.
 5. Training materials shall remain with the trainees.
 6. The OWNER may videotape the training sessions for later use with the OWNER'S personnel.

- C. Local Service: The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

1.8 FACTORY INSPECTION AND TESTING

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture for equipment units 150 horsepower or larger. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors for the number of days indicated to complete such inspections or observations, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400.
- B. Product Testing: Products shall be tested at the factory for compliance with the indicated requirements. The CONTRACTOR shall provide the CONSTRUCTION MANAGER a written notification of testing dates at least 2 weeks in advance of testing, unless more advance notice is specified elsewhere.
- C. Balancing: Rotating elements of equipment, except small, commercially packaged equipment, shall be statically and dynamically balanced at the factory prior to final assembly. The CONTRACTOR shall furnish certified copies of all test results.

1.9 FIELD TESTING

- A. Testing: Products shall be field-tested for compliance with the indicated requirements.
- B. Witnesses: The OWNER and the CONSTRUCTION MANAGER (at the option of either) reserves the right to witness field tests.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer. Materials delivered onsite without an approved submittal for verification shall be rejected and payment withheld.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.
- C. Protection of Equipment: Equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment with anti-friction or sleeve bearings shall be stored in weather tight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers shall not be used to prevent accumulation of condensate in gears and bearings. Gears and bearings to be stored for extended periods shall be containerized suitable for export shipment.
- D. Investigation of Failed Products: Prior to disposal of failed products, the CONTRACTOR shall investigate the causes of failure and submit a report to the CONSTRUCTION MANAGER, who will subsequently direct the CONTRACTOR for disposal.

1.11 UNIT RESPONSIBILITY

- A. Equipment systems made up of two or more components shall be provided as a unit by the manufacturer of the driven equipment. The manufacturer of the driven equipment shall assume the unit responsibility. Unless otherwise indicated, the CONTRACTOR shall cause each system component to be furnished by the manufacturer with unit responsibility. The extent of the manufacturer’s responsibilities shall include engineering the specified equipment, preparation of all submittal materials, coordinating manufacture and procurement, compatibility and shipment of all specified components, design of all equipment supports, providing installation and testing specialists to assist the CONTRACTOR in completing the installation and commissioning the equipment, furnishing factory certified specialists to train the OWNER’s staff, and the production and submission of specified operation and maintenance manuals. The CONTRACTOR is responsible to the OWNER for performance of all systems as indicated. The CONTRACTOR shall ensure the submittal of a Certificate of Unit Responsibility signed by the manufacturer with unit responsibility.

1.12 TORSIONAL AND VIBRATION ANALYSIS

- A. Torsional Analysis: The drive train shall be free from torsional criticals which produce combined (steady plus transient torque induced) stresses exceeding 30 percent of the material’s elastic limit (but no more than 18 percent of the material’s ultimate tensile strength) at any speed from 20 percent below to 30 percent above the operating speeds required by the specified operating conditions, or during startup, shutdown or drive control transients. In accordance with MIL STD 167-2, under no circumstances shall combined torsional steady state and transient vibratory stresses exceed 4 percent of the material’s ultimate tensile strength, nor more than 50 percent of the material’s fatigue limit, whichever is less. Stress concentration factors to be used in the equation:

$$S = Scf \times (G \times D \times \Delta\Theta) / 2L$$

where:

- S = stress, psi
- Scf = stress concentration factor, dimensionless
- D = minimum shaft diameter, inches, at point of concentration
- $\Delta\Theta$ = twist in shaft between adjacent masses, radians
- L = effective length between masses, inches
- G = shear modulus of material, lb/in²

The Scf, to be applied at all the roots of all keyways and changes in shaft diameter shall be as follows:

Scf	Ratio of fillet radius to shaft diameter
4.3	0.0025
3.7	0.01
3.05	0.02
2.75	0.03
2.6	0.04
2.55	0.05 and greater

Values of Scf between data points in the table above shall be based upon a straight line interpolation.

One analysis is required for each piece of unique equipment and for each set of identical equipment assigned to the same application. This general requirement is applicable under the individual equipment specifications or the equipment type general specifications where more detailed torsional, vibration, critical speed, and/or shaft deflection analyses may be required.

The CONTRACTOR shall submit to the CONSTRUCTION MANAGER, a torsional and lateral vibration analysis of the following equipment, in accordance with Section 01300. The analysis shall be performed by a specialist who has performed, in the recent past, a torsional and lateral vibration analysis on at least one project of comparable size and complexity. The specialist shall be approved by the CONSTRUCTION MANAGER.

1. All engine drives.
2. All blowers and compressors with drives of 100 horsepower and over.
3. All vertical pumps with universal joints and extended shafts.
4. All equipment with variable speed drives, 25 horsepower and over.
5. All other equipment where indicated.

During construction and testing of all engine driven equipment and all gear driven equipment, the torsional analysis specialist shall visit the site and conduct a field torsionograph test on one randomly selected unit in each set of these equipment to verify the desktop torsional analysis. The test shall be conducted on selected accessible portions of the rotating equipment when operating throughout the full range of specified operating conditions.

- B. Field Vibration Analysis: During construction and testing of all engine driven equipment and all 100 horsepower and larger motor driven equipment operating at less than 1,200 rpm, the above mentioned torsional analysis specialist shall make at least two site visits to analyze and measure the amount of equipment vibration and make a written recommendation for keeping the vibration at a safe limit. The vibration analysis is required for each piece of rotating equipment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only products meeting the indicated requirements shall be provided.
- B. Manufacturers: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. Products: Materials shall be suitable for the intended purpose and free of defects and shall be recommended by the manufacturer for the application indicated.
- D. No Endorsement: The listing of a manufacturer shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the indicated requirements. No preference is implied by the order of listing of named manufacturers, and the listings are not intended to be comprehensive. The manufacturer listings are only an indication that the OWNER and DESIGN CONSULTANT believe that the named manufacturers are capable of producing equipment and products which will satisfy the indicated requirements.

2.2 GENERAL REQUIREMENTS

- A. Noise Level: When in operation, no piece of equipment shall exceed the OSHA noise level requirements for a one hour exposure.
- B. Service Factors: Service factors shall be applied in the selection and design of mechanical power transmission components where so indicated in individual Sections. When not indicated there, minimum service factors shall be 1.25.
- C. Welding: Except as otherwise indicated, welding shall comply with ANSI/AWWA D100 and AWWA C206 and the following:
 - 1. Composite fabricated steel assemblies which are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds and shall prevent entrance of air or moisture.
 - 2. Welding shall be by the metal-arc method or gas-shielded arc method described in the American Welding Society's "Welding Handbook" as supplemented by other AWS standards. Qualification of welders shall comply with AWS Standards.
 - 3. In assembly and during welding, the component parts shall be clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. Sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.
- D. Identification of Equipment Items: Each item of equipment shall have an indelible, legible identifying mark corresponding to the equipment number indicated.
- E. Vibration Level: Except as otherwise indicated, equipment subject to vibration shall be provided with restrained spring-type vibration isolators or pads complying with the manufacturer's written recommendations.
- F. Shop Fabrication: Shop fabrication shall be performed in accordance with the shop drawings.
- G. Tolerances: The variation in length of members without machine finished ends and which are to be framed shall not exceed 1/16-inch for members 30 feet or less and shall not exceed 1/8-inch for members over 30 feet.
- H. Machine Finish: The type of finish shall be the most suitable for the application in micro-inches complying with ANSI B46.1. The following finishes shall be used:
 - 1. Surface roughness of surfaces in sliding contact shall not exceed 63 micro-inches.
 - 2. Surface roughness shall not exceed 250 micro-inches except where a tight joint is indicated.
 - 3. Surface roughness for other mechanical parts shall not exceed 500 micro-inches.
 - 4. Surface roughness of contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall not exceed 32 micro-inches.

- I. Seismic Design: The seismic design of equipment shall be based on the horizontal peak ground acceleration indicated in the Geotechnical Report or in the IBC. Determination of seismic forces and load combinations shall follow procedures in the IBC.

2.3 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. Equipment Supports: Equipment supports, anchors, and restrainers shall be designed for static, dynamic, wind, and seismic loads. The design horizontal peak ground acceleration shall be the greater of that indicated in the Geotechnical Report or as required by the IBC. Determination of seismic forces and load combinations shall follow procedures in the IBC.
- B. Equipment Foundations: Unless otherwise indicated, equipment foundations shall conform to the requirements of Section 11002 – Equipment Supports, Grouting and Installation.

2.4 PIPE HANGERS, SUPPORTS, AND GUIDES

- A. Pipe connections to equipment shall be supported, anchored, and guided to minimize stresses and loads on equipment flanges and equipment. Supports and hangers shall comply with the requirements of Section 15020.

2.5 FLANGES AND PIPE THREADS

- A. Flanges on equipment shall comply with ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise indicated. Threaded flanges and fittings shall have standard taper pipe threads complying with ANSI/ASME B1.20.1.

2.6 COUPLINGS

- A. Flexible couplings shall be provided between the driver and the driven equipment to accommodate slight angular misalignment, parallel misalignment, end float, and to minimize shock loads. Where required for vertical shafts, 3-piece spacer couplings or universal type couplings for extended shafts shall be installed.
- B. The equipment manufacturer shall recommend the size and type of coupling required for each specific application.
- C. Taper-lock bushings may be used where indicated.
- D. Where universal type couplings are indicated, they shall be of the needle bearing type construction, equipped with commercial type grease fittings. Bearings shall be sized in accordance with ABMA 11, using a 1.25 service factor, for the same L-10 life expectancy as the driven equipment, but not less than 50,000 hours.

2.7 SHAFTING

- A. General: All shafting shall be continuous between bearings and shall be sized properly to transmit the power required. Keyways shall be provided in accordance with standard practice.
- B. Materials: Shafting materials shall be selected for the type of service and torque transmitted and the effect of corrosive gases, moisture, and fluids shall be considered. Unless otherwise specified, materials shall conform to the following:
 1. Low carbon cold-rolled steel shafting: ASTM A 108, Grade 1018.

2. Medium carbon cold-rolled shafting: ASTM A 108, Grade 1045.
 3. Corrosion-resistant shafting: Stainless steel or Monel, whichever is most suitable for the intended service.
 4. Extended shafting: carbon fiber/resin composite.
- C. Differential Settlement: Where differential settlement between the driver and the driven equipment is indicated, an extension shaft with 2 sets of universal type couplings shall be provided.

2.8 BEARINGS

- A. Bearings shall conform to the standards of the American Bearing Manufacturers Association, Inc. (ABMA).
- B. Bearing selection shall include the following criteria: fitting practice, mounting, lubrication, sealing, static rating, and housing strength.
- C. Relubricatable type bearings shall be equipped with an Alemite type hydraulic grease fitting in an accessible location.
- D. All lubricated-for-life bearings shall be factory-lubricated with the manufacturer's best recommended grease to insure maximum bearing life and best performance.
- E. Except where otherwise indicated, bearings for process equipment shall be selected for a minimum L-10 life expectancy of 50,000 hours for intermittent service and 100,000 hours for continuous service, in accordance with ABMA 9 or 11. Anti-friction bearings for pumps with discharge nozzle sizes 14 inches in diameter or greater, or pumps with a shaft diameter greater than 4 inches, shall be selected for an L-10 life expectancy of 100,000 hours in accordance with ABMA 9 or 11. Bearings for other elements in the rotating system such as motors, intermediate shaft bearings, right-angle gears, and flywheel bearings shall be selected using the same criteria as specified for the driven equipment, but not less than 50,000 hours. This requirement supersedes any specified bearing life in the detailed specification sections. Bearing selection shall be based upon the worst combination of continuous duty operating conditions specified and shall include both steady state and transient loads. Commercially manufactured appliances, and small package heating and air conditioning equipment shall be furnished with bearings with L-10 life expectancy of not less than 20,000 hours in accordance with ABMA 9 or 11. Fan bearings shall be rated in accordance with Section 15855. Calculations supporting the selection of bearing sizes shall be included in the Owner's Manual.
- F. Bearing housings shall be of cast iron or steel and the bearing mounting arrangement shall be in accordance with the published standards of the manufacturer. Split-type housings may be used.
- G. Unless otherwise indicated, sleeve-type bearings shall have a Babbitt or bronze liner.

2.9 GEARS AND GEAR DRIVES

- A. Except as otherwise indicated, gears shall be of the helical or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a minimum service factor of 1.7, a minimum L-10 bearing life of 60,000 hours at the worst combination of specified operating conditions, in accordance with ABMA 9 or 11, and a minimum efficiency of 94 percent. Worm gears shall not be used.

- B. Gear speed reducers or increasers shall be of the enclosed type, oil- or grease-lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron or heavy duty steel construction with lifting lugs and an inspection cover for each gear train. An oil level sight glass and an oil flow indicator shall be provided and installed for easy reading.
- C. Gears and gear drives as part of an equipment assembly shall be shipped fully assembled for field installation.
- D. Material selections shall comply with AGMA values and the manufacturer's recommendations. Input and output shafts shall be properly designed for the service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 positive seals to prevent oil leakage.
- E. Oil level and drain location shall be readily accessible. Oil coolers or heat exchangers with all required appurtenances shall be included where indicated.
- F. Where gear drive input or output shafts connect to couplings or sprockets, the gear drive manufacturer shall supply matching key.

2.10 V-BELT DRIVES

- A. V-belts and sheaves shall be of the best commercial grade and shall conform to ANSI, MPTA, and RMA Standards.
- B. Sheaves shall be machined from gray cast iron.
- C. Sheaves shall be statically balanced. In applications where excessive vibration is expected, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,500 fpm shall be of materials and construction recommended by the manufacturer.
- D. Sheaves shall be provided complete with taper-lock or QD bushings as required.
- E. Finish bored sheaves shall be provided complete with keyseat and set screws.
- F. Sliding motor bases shall be provided to adjust the tension of V-belts.

2.11 DRIVE GUARDS

- A. Power transmission, prime movers, machines, shaft extensions, and moving machine parts shall be guarded. Unless otherwise indicated for corrosive environment, the guards shall be constructed of minimum 10 gauge expanded, flattened steel with smooth edges and corners, galvanized after fabrication and securely fastened. Where required for lubrication or maintenance, guards shall have hinged and latched access doors.

2.12 FLEXIBLE CONNECTORS AND DUAL PIPE COUPLINGS

- A. Flexible connectors shall be installed in piping connections to engines, blowers, compressors, and other vibrating equipment in accordance with the requirements of the ANSI B31.1.
- B. Dual pipe couplings, separated by an 18-inch pipe spool unless otherwise indicated, shall be installed on the suction and discharge of all pumps - inboard of the isolation valves. Dual pipe couplings, separated by not less than two pipe diameters nor more than 5 feet, shall be installed on all piping where it exits a structure. Couplings shall be restrained where required. Dual flexible pipe joints may be used where indicated in buried pipe applications in lieu of dual pipe couplings. Flexible connectors are not permitted where dual pipe couplings are specified.

2.13 INSULATING CONNECTIONS

- A. Insulating bushings, unions, couplings, and flanges, shall comply with the requirements of Section 15000.

2.14 GASKETS AND PACKINGS

- A. Gaskets shall comply with the requirements of Section 15000.
- B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be Garlock No. 432, John Crane "Everseal," or equal.
- C. Packing around rotating shafts (other than valve stems) shall be "O"-rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer.

2.15 TOOLS AND SPARE PARTS

- A. Tools: The WORK includes one complete set of special tools recommended by the manufacturer for maintenance and repair of each separate type of equipment; tools shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.
- B. Spare Parts: All equipment shall be furnished with the manufacturers' recommended spare parts, as indicated in the individual equipment Sections.

Spare parts shall be tagged by project equipment number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with hinged wooden cover and locking hasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts." A neatly typed inventory of spare parts shall be taped to the underside of the cover.

2.16 NAMEPLATES

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in accessible locations with stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.17 OVERLOAD PROTECTION

- A. General: Where indicated, mechanical or electronic overload protection devices shall be installed on equipment.
- B. Mechanical System: The overload protection shall be a mechanical device designed to provide reliable protection in the event of excessive overload. It shall be a ball detent type designed for long term repeatability and life. It shall be infinitely adjustable by a single adjusting nut which shall be tamper proof, and incorporate a torque monitoring and control system. It shall activate an alarm set for 85 percent, and a motor cutout switch set for 100 percent of maximum continuous running torque. A visual torque indicator shall be provided and oriented so that it may be read from the walkway. The dial shall be calibrated from 0 to

100 percent of maximum continuous running torque. The design of the torque limiter should initiate the mechanical disengagement of the drive upon overload. Each unit shall be suitable for outdoor and corrosive environments with a protective finish, corrosion inhibiting lubricants and a stainless steel cover.

- C. Electronic System: Overload protection may be an Electronic Torque Monitoring Control System capable of displaying torque, rpm's, one level of overload, and two levels of overload of the drive system. It shall incorporate a time-delay for startup and a voltage monitoring and compensation circuit for up to ± 15 percent variation.

The overload device shall have an enclosure suitable for outdoor installation at temperatures of 0-70 degrees C, and relative humidity up to 95 percent. A visual torque dial shall be provided and oriented so that it can be easily read from the walkway.

The torque monitoring system shall be calibrated to include: alarm and shut down the system in the event the torque drops to 50 percent of normal running; alarm at 85 percent of maximum continuous running torque and shut down the motor at maximum continuous running torque of the equipment. The system shall be calibrated at the factory of the equipment manufacturer and it shall be capable of monitoring twice the maximum continuous running torque of the equipment.

- D. Definition: For the purpose of these Specifications, "maximum continuous running torque" shall be defined as the lesser of: the motor continuous running torque rating, the gear drive continuous running torque rating, or the driven mechanism continuous running torque rating, not exceeding a service factor of 1.0.
- E. Manufacturers: Overload protection devices shall be manufactured by the following (or equal):
 - 1. American Autogard Corporation
 - 2. Industrial Motion Control (Camco-Ferguson)

2.18 ANCHOR BOLTS, NUTS AND WASHERS

- A. Unless otherwise indicated, anchor bolts, nuts and washers for anchoring equipment to foundations and connecting bolts for equipment assemblies supported by other assemblies shall conform to the requirements of Section 05500. Unless otherwise specified, the CONTRACTOR shall provide Type 316 stainless steel anchor bolts and washers, and Type 416 stainless steel or other corrosion resistant, non-galling alloy nuts. In ferrous chloride and ferric chloride containment areas, unless otherwise specified, provide Hastelloy C or Alloy 276 anchor bolts, nuts, washers and connecting bolts.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Products and equipment shall be installed in accordance with the manufacturer's written installation instructions, the requirements of this Section, the requirements of the individual equipment specifications, and as indicated.
- B. Alignment: Journeymen millwrights shall perform alignment of equipment furnished under this Section and any referencing section. Carpenters, laborers or any other trades are specifically excluded from performing this work. In locations where such trades are not available, the CONTRACTOR shall retain the services of a firm specializing in this type of

work to perform the setting and alignment work. The CONTRACTOR shall submit the qualifications of the proposed firm to the CONSTRUCTION MANAGER for acceptance prior to performing the work. The CONSTRUCTION MANAGER shall personally witness final alignment procedures for each item of equipment as a condition precedent to beginning any work required under Section 01660. Alignment techniques shall conform to the requirements of Section 11005.

- C. Lubricants: The CONTRACTOR shall provide for each item of mechanical equipment a supply of the lubricant required for the commissioning period. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the OWNER's current lubricant supplier. The CONTRACTOR shall limit the various types of lubricants by consolidating them, with the equipment manufacturer's approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing and adjusting equipment, the CONTRACTOR shall provide the OWNER with three copies of a list showing the required lubricants, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year's operation, assuming the equipment will be operating continuously.

3.2 COUPLINGS

- A. Couplings shall be installed in accordance with the manufacturer's installation instructions.

3.3 INSULATING CONNECTIONS

- A. Insulating connections shall be installed in accordance with the manufacturer's instructions.

3.4 PIPE HANGERS, SUPPORTS, AND GUIDES

- A. Hangers, supports, and guides shall be installed in compliance with ANSI/ASME B31.1 and with Section 15020.

3.5 BOLTS AND MISCELLANEOUS METALS

- A. Bolts, including anchor bolts, and miscellaneous metals shall comply with paragraph 11000-2.20 and Section 05500. Installation of equipment anchor bolts shall comply with Section 11002.

3.6 PACKAGED EQUIPMENT

- A. When any system is provided as pre-packaged equipment, coordination shall include space and structural requirements, clearances, utility connections, signals, outputs and features required by the manufacturer including safety interlocks.

3.7 PROTECTIVE COATING

- A. Equipment shall be painted and coated in accordance with Section 09800. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.

** END OF SECTION **

SECTION 11002 - EQUIPMENT SUPPORTS, GROUTING AND INSTALLATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This Section specifies minimum requirements for equipment supports, including concrete housekeeping pads, equipment bases, supports, anchorage, and accessories with weights greater than 200 pounds. If conflict exists between this Section and requirements of individual equipment manufacturers, the more restrictive requirements shall prevail.
- B. The CONTRACTOR shall provide all supports, anchorage, and mounting of all equipment, unless otherwise specified in accordance with the manufacturer's recommendations, and requirements of industry standards. Each piece of equipment shall be anchored to resist the greater of the maximum lateral and vertical forces required by the local governing code or by the manufacturer of the equipment, whichever is greater. This force shall be considered acting at the center of gravity of the piece under consideration. No equipment shall be anchored to vertical structural elements without written approval of the CONSTRUCTION MANAGER. The CONTRACTOR shall provide all elements required to resist the calculated forces described herein or required by the equipment manufacturer. The CONTRACTOR shall provide certification that for equipment, 20 horsepower and larger, anchor bolt calculations showing adequacy of bolt sizing and anchor embedment have been performed and signed by a registered structural or civil engineer.

1.2 SPECIFICATIONS AND STANDARDS

- A. This Section contains references to the following documents. It is a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed document, the requirements of this Section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI/HI 1.3	Rotodynamic (Centrifugal) Pumps for Design and Application
ANSI/HI 1.4	Rotodynamic (Centrifugal) Pumps for Manuals Describing Installation, Operation and Maintenance
ANSI/HI 2.4	Rotodynamic (Vertical) Pumps for Manuals Describing Installation, Operation and Maintenance
API 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries

Reference	Title
API RECOMMENDED PRACTICE 686	Recommended Practice for Machinery Installation and Installation Design
ASTM C531	Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes.
ASTM C579	Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
ASTM C882	Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
ASTM C884	Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay
ASTM C1181	Compressive Creep of Chemical-Resistant Polymer Machinery Grouts
SSPC	Society for Protective Coatings Specifications, Vol. 2

1.3 SHOP DRAWINGS AND SAMPLES

- A. The following information shall be submitted in accordance with Section 01300:
1. Shop drawings for all equipment bases and anchorage details.
 2. Certification of anchor bolt calculations specified in paragraph 11002-1.1 B.
 3. Machine and equipment base installation schedule with manufacturers' anchor bolt torque requirements, as specified in paragraph 11002-2.1.
 4. Results of grout strength tests, as specified in paragraph 11002-3.2 E.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise specified, equipment and drivers shall be rigidly mounted on a common cast iron or fabricated steel baseplate or soleplate grouted into place on concrete housekeeping pads. All equipment shall be mounted on concrete housekeeping pads. Under no circumstances shall equipment supports be grouted directly to concrete slabs or floors. Bases for equipment shall be hot-dip galvanized after fabrication unless otherwise specified. Mounting pads for equipment shall have the zinc layer removed and shall be finished flat and parallel after galvanizing. Sole plates and leveling plates shall not be galvanized. Machined surfaces shall be protected with two layers of duct tape after machining and before shipment from the factory.
- B. Prior to initiating any installation efforts, the CONTRACTOR shall produce a machine base schedule containing the expected dates for setting anchor bolts, casting housekeeping pads, preparation of housekeeping pads for grouting, grouting, and final anchor bolt clamping for each item of equipment. The schedule shall list the equipment, by equipment number, and shall be accompanied by written verification of anchor bolt clamping torque from the equipment manufacturer.

- C. Installation practices shall follow the guidance presented in Chapters 4 and 5 of API Recommended Practice 686, unless superseded by more restrictive requirements of these specifications or manufacturer requirements.

2.2 CONCRETE HOUSEKEEPING PADS

- A. Concrete housekeeping pads for equipment and floor penetrations shall be at least 2 inches larger in plan than the steel or cast base and not less than 6 inches above the finished floor elevation, and shall be shaped to drain liquids away from the base. Housekeeping pad details shall follow the requirements set forth on PUD Standard Detail M-114A unless superseded by more restrictive requirements of these specifications or the requirements of the equipment manufacturer. All conduits, piping connections, drains, etc., serving the equipment, shall be enclosed by the concrete pad. Unless otherwise specified, no conduits, piping connections, drains, etc., will be accepted which rise directly from the floor.

2.3 EQUIPMENT BASES

A. General

1. Unless otherwise specified, mounting bases for equipment 20 horsepower and larger shall be a minimum of 1 inch thick. All bases shall have edges bearing on the grout surface rounded to a radius of not less than 2 inches to avoid producing stress risers on the grouted foundation. Grout pouring holes shall be provided in all bases and all bases shall have grout release holes. Except where vibration isolation systems are specified, all bases shall be grouted as specified in this Section. Internal stiffeners shall be provided and shall be designed to allow free flow of grout from one section of the base to another. The minimum acceptable opening in cross-bracing and stiffeners shall be 2 inches high by 6 inches in length. All welds shall be continuous and free from skips, blow holes, laps and pockets.
2. Equipment bases for horizontal pumps shall conform to the requirements of this Section, ANSI/HI 1.3.4, API 610 (paragraph 3.3), and shall provide common support for the pump and motor (and flywheel, if one is specified). In the event of conflict, the requirements of this Section shall govern. Eight positioning jackscrews shall be provided for all drivers and flywheels (if specified) for all horizontal pump baseplates. All bases for horizontal pumps shall be equipped with jackscrews for positioning and leveling the base prior to grouting.
3. Mounting holes for anchor bolts in the bases shall be drilled and not burned out and they shall not be open slots. All mounting studs shall be Type 316 stainless steel. Anchor bolts shall be as specified under paragraph 11002-2.6. A non-seize or non-galling compound shall be used on all threads.
4. Mounting pads for equipment shall be machined after all welding and stress relieving and shall be coplanar to 0.002 inch in all directions. Mounting pads shall extend not less than 1 inch on all sides beyond the position for the equipment.
5. Equipment bases - for vertical volute-type pumps weighing more than 2000 pounds - shall be soleplates or leveling boxes under individual feet or support brackets integral with the volute casting. Direct mounting of the volute on housekeeping pads will not be permitted.
6. Sole plates, mounting blocks and baseplates weighing more than 1000 pounds shall be leveled with jackscrews incorporated into the fabrication. Jackscrews shall be located in thickened pads or otherwise in sufficient metal to provide ease in adjusting level.

7. The seismic design of equipment bases shall conform to the requirements of paragraph 11000-2.2J.

B. Type I Bases

1. Type I bases shall be structural steel bases with thickened steel pads for doweling. The bases shall be rectangular in shape for equipment other than centrifugal refrigeration machines and pump bases, which may be "T" or "L" shaped to accommodate the equipment drive and accessories. Pump bases for split case pumps shall include supports for suction and discharge base ells, if required by the specified configuration. Perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Terminations requiring connections to the base shall be nuts welded to the bottom side of the base and plugged with cork, plastic plugs or grease, or acorn nuts. Grout holes shall be provided for the bases of all equipment where vibration isolation is not specified.

C. Type IV Bases

1. Type IV bases shall be cast iron. Cast iron bases located within buildings do not require galvanizing but shall be sealed in accordance with the requirements for bleeding surfaces specified in Section 09800 prior to grouting. Terminations requiring connections to the base shall be nuts welded to the bottom side of the base and plugged with cork, plastic plugs or grease, or acorn nuts. In no case shall the fastener terminate only into the metal base.

D. Sole Plates

2. Where sole plates are provided, the underside shall be scribed with the words "THIS SIDE DOWN" using welding rod material prior to milling the equipment mating surface flat to a tolerance of not less than 0.002/foot in all directions. Sole plates shall be designed to be installed in the housekeeping curbs shown.

2.4 GROUT FOR EQUIPMENT BASES

A. Epoxy Grout

1. Unless otherwise specified, grout for equipment bases shall be non-shrinking epoxy grout conforming to the following requirements:

Test	Result
ASTM C531	Shrinkage shall be less than 0.080% and thermal expansion less than 17×10^{-6} in/in/°F
ASTM C579	Strength shall be a minimum of 12,000 psi in 7 days when tested by method B, modified.
ASTM C882	Bond strength to Portland concrete shall be greater than 2000 PSI
ASTM C884	Epoxy grout shall pass the thermal compatibility test when overlaid on Portland cement concrete
ASTM C1181	Creep of the epoxy grout shall be less than 0.005 in/in with the test at 70°F and 140°F with a load of 400 psi

3. The vehicle shall be a two-component (liquid and hardener) system designed to yield the above characteristics when combined with the manufacturer's recommended aggregate system. The grout shall be suitable for supporting precision machinery

subject to high impact and shock loading in industrial environments while exposed to elevated temperature as high as 150 degrees F, with a load of 1200 psi. Aggregate for equipment base grout shall be as furnished by the manufacturer of the epoxy grout mix.

B. Cementitious Grout

1. Cementitious grout for use with equipment supports for equipment rated 5 horsepower and smaller or weighing less than 1000 pounds, whichever is less, shall be non-shrink grout as specified in Section 03315 - Grout. Procedures for leveling and clamping equipment shall be as specified in this Section.

2.5 EPOXY PRIMER

- A. The epoxy primer shall be a lead free, chrome free, rust inhibitive, two-component epoxy primer specifically designed for use on metal substrates and in conjunction with epoxy grout. The epoxy primer shall be a product of the epoxy grout manufacturer.

2.6 ANCHOR BOLTS

- A. Anchor bolts shall be as specified in paragraph 11000-2.20, set in PVC sleeves. Sleeves shall allow a free length projection of not less than fifteen bolt diameters above the concrete required to develop the strength of the bolt. Projection above the nut on the baseplate or soleplate shall be no more than 3/4 inch. Anchor bolts shall be located not less than 6 anchor bolt diameters from the foundation edge in all directions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Pumps shall be installed in accordance with this Section and ANSI/HI 1.4 and ANSI/HI 2.4. Grouting of equipment bases shall take place prior to connecting any field piping or electrical and instrumentation systems. Unless the CONSTRUCTION MANAGER accepts an alternate installation procedure in writing, baseplates shall be grouted with the equipment removed.
- B. Equipment that is not mounted on vibration isolators shall be anchored directly to the supporting floor system. In addition to the anchorage, all such equipment shall be internally designed so that all static and moving parts are anchored to the supporting framework to resist the all imposed forces. All forces shall be transmitted to the base in order to be anchored as required.
- C. Connecting piping with flexible connections and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system without imposing strain on the equipment connections. Where the equipment manufacturer requires a rigid connection between the machine and connecting piping systems (generally, this will be higher discharge head pumps), the flexible coupling shown may be deleted and the CONTRACTOR shall install the equipment in the following manner:
 1. The equipment housekeeping pad shall be prepared as specified under paragraph 11002-3.2 B.
 2. The baseplate, soleplate or leveling blocks supporting the equipment shall be installed, leveled, and grouted in place as specified.

3. The equipment shall be installed, aligned and doweled in place as specified.
 4. The piping shall be installed and aligned to the equipment connections and the field piping connections without welding on the joints for one section of pipe between the equipment connection and the field piping and all valving. All flanged joints shall be bolted up and pressure tested.
 5. All piping shall be fully supported by supports designed to accept their full weight.
 6. The final sections of pipe shall be aligned with the equipment and field connections without the use of jacks, chain falls or other devices to force it into alignment.
 7. The final piping joints shall be welded only after the previous steps have been completed and accepted by the CONSTRUCTION MANAGER.
- D. Conduit and piping for future equipment shall be capped flush with the floor or concrete pad in such a manner to allow future connection.
- E. The CONTRACTOR shall coordinate location of electrical conduit and piping penetrations within the concrete pad and equipment base. All penetrations shall stub-up on the same side of the equipment as required for connection to the equipment. Equipment drains shall be located as required for drainage from equipment.
- F. Prior to commencing equipment installation work, the CONTRACTOR shall cause the manufacturer of the epoxy grout to be used for equipment installation to conduct a training school for the workmen to be using the product. The school shall be not less than 4 hours in length and shall cover all aspects of using the products from mixing to application. This requirement, however, shall not be construed as relieving the CONTRACTOR of overall responsibility for this portion of the work.

3.2 INSTALLATION

A. Anchor Bolts

1. Prior to concrete placement, anchor bolts shall be accurately set according to the manufacturer's foundation drawings and firmly secured to prevent shifting during concrete placement. Drilled in anchor bolts will not be accepted. The bolts shall be embedded in the structural concrete to develop the full strength of the bolt. Concrete in housekeeping pads cannot be used for this purpose. All anchor bolts shall be dimensionally checked against the foundation drawings for proper length, diameter, thread length, thread projection, etc., by a representative of the equipment manufacturer prior to placing concrete. Prior to placing concrete for the housekeeping pad, plastic sleeves shall be placed around each bolt to provide for minor adjustment of bolt position prior to grouting. Sleeves shall be filled with a pliable, nonbonding material such as silicon rubber or wax to prevent contact between the concrete or grout and the anchor bolt. Bolt threads and projections in the sleeves (refer to paragraph 11002-2.6) above the structural slab shall be protected in the sleeve by heavily greasing or waxing the threads and shank with paste wax and wrapping with plastic sheeting. The protective wrapping shall be firmly secured with tie wires. The protective wrapping shall be removed prior to placing the grout.
2. The equipment manufacturer shall recommend the size of the anchor bolts for the equipment and shall also furnish the recommended tightening torque for the nuts; however, the minimum size bolt shall be 3/4 inch for equipment rated 20 to 100

horsepower, 1 inch for equipment rated over 100 to 300 horsepower and 1-1/4 inches for 300 to 500 horsepower. Anchor bolts for equipment rated over 500 horsepower shall be as recommended by the manufacturer of the equipment and as approved by the CONSTRUCTION MANAGER.

B. Concrete Housekeeping Pad Preparation:

1. After the concrete is fully cured (sample cylinders, as specified in Section 03300 – Cast-in-Place Structural Concrete, shall be taken and tested for all housekeeping pads supporting equipment weighing more than 1000 pounds), the housekeeping pad shall be chipped approximately 3/4 inch to 1 inch to remove all laitance and defective or weak concrete. A light duty, hand held pneumatic chipper with a chisel type tool shall be used for chipping the foundation. Abrasive blast, bush-hammer, jack hammers with sharp chisels or needle gun preparation of concrete surfaces to be grouted are not acceptable. The amount of concrete removed shall be such that the final baseplate or soleplate elevation results in not less than 3 inches of grout between the surface of the housekeeping pad and lower baseplate flange or the underside of the soleplate.
2. All edges shall be chamfered 2 to 4 inches at a 45-degree angle. All dust, dirt, chips, oil, water, and any other contaminants shall be removed and cover the foundation shall be covered with protective plastic sheeting. The grout contact surface on the housekeeping pad shall be coated with one coat (not more than 5 mils) of catalyzed epoxy resin.

C. Equipment Bases and Soleplates

1. All surfaces of equipment bases and soleplates to be in contact with epoxy grout shall be cleaned to SP-6 and shall be primed with epoxy primer within 8 hours of cleaning.

D. Leveling and Shimming

1. All machinery shall be mounted and leveled by millwrights. All equipment bases and equipment shall be leveled against steel surfaces. Use of other materials for leveling purposes is strictly and specifically prohibited. Unless otherwise specified, baseplates, mounting blocks and soleplates weighing less than 1000 pounds shall be leveled on stainless steel blocks 4 inches square and 1-1/2 inches thick with a hole drilled in the center for the anchor bolt, placed under the base at every anchor bolt. Leveling shall be by use of mounting blocks machined flat on all horizontal surfaces and measuring not less than 4 inches wide horizontally and shims that shall extend not less than three inches beyond the base of the equipment. Mounting blocks shall be coated with a light oil just prior to beginning the leveling and grouting work. Using precut stainless steel shims coated with a light oil between the base and the steel blocks at the anchor bolts, the CONTRACTOR shall level the equipment baseplates, soleplates or mounting blocks against the anchor bolt nuts (finger tight only) to a maximum tolerance of 0.0005 in./ft or as otherwise required by the equipment manufacturer, if more stringent. Mounting surfaces for equipment shall be coplanar within 0.002 inch in any direction. The shims shall be placed so the tabs on the shims are easily accessible. A minimum of four shims per anchor bolt shall be used. The total shim thickness at each anchor bolt shall be at least 0.015 inch. Leveling shall be against anchor bolts prior to final grouting.
2. The CONTRACTOR shall level the equipment against the anchor bolt nuts to a maximum tolerance of 0.002 in./ft or as otherwise required by the equipment manufacturer, if more stringent. Leveling equipment shall be precision surveying equipment. Machinists' spirit levels will not be permitted for leveling purposes for any base plate or equipment foundation with a plan dimension greater than 4 feet.

3. Leveling nuts may be used for mounting equipment weighing less than 500 pounds. The CONTRACTOR shall level the equipment against the anchor bolt nuts to a maximum tolerance of 0.0005 in./ft or as otherwise required by the equipment manufacturer, if more stringent. Anchor bolt nuts shall be only finger tight during the leveling process. Wedges will not be allowed and under no circumstances shall shims be used as permanent support under baseplates, soleplates or leveling plates.

E. Grouting:

1. Grout forms shall be built of minimum of 3/4-inch thick waterproof plywood and shall be securely braced (minimum brace size shall be 2 inches x 4 inches). Forms shall provide a minimum of 2-inch hydrostatic head above the final elevation of the grout to assist in flow during installation.
2. Forms must be coated with three coats of paste wax on all areas that will come in contact with the grout to prevent the grout from bonding to the forms. Forms shall be waxed before assembly to prevent accidental application of wax to surfaces where the grout is to bond. Before any forms are installed, all concrete surfaces that will contact epoxy grout shall be free from any foreign material, such as oil, sand, water, grease, etc. Forms shall be liquid-tight. Any open spaces or cracks in forms, or at the joint between forms and the foundation, shall be sealed off, using sealant. All outside vertical and horizontal edges of the grout shall have 45-degree chamfers. Blockouts shall be provided at all shimming and leveling nut positions to allow removal of shimming equipment after the grout has cured. Jackscrews shall be coated with a light oil or other acceptable bond-breaking compound.
1. The 45-degree chamfer strip shall be located at the final elevation of the grout. The final elevation of the grout on baseplates with exposed I-beam or C-channel supports shall be at the top of the lower support flange. The top of the grout, on baseplates with solid sides and soleplates, shall be 1.0 inch above the bottom of the baseplate or the underside of the soleplate. The grout's final elevation shall not be so high as to bond the anchor bolt nut and washer.
4. The epoxy resin and hardener shall be mixed in accordance with the grout manufacturer's recommendations. Aggregate shall be slowly added to the mixer one bag at a time. The grout should be mixed only long enough to wet out all the aggregate. Grout shall be placed at the center of one end of the baseplate or soleplate and worked toward the ends in such a manner as to force the air out from beneath the baseplate or soleplate and out the vent holes, to eliminate voids. The grout shall be placed in a manner that avoids air entrapment using a head box to pour grout into the grout holes. When the head box is moved to the next grout hole, a 6-inch high standpipe shall be placed over the grout hole and filled with grout. The CONTRACTOR shall exercise care to never allow the grout to fall below the baseplate level once the grout has made contact with the baseplate. Grout placement shall be continuous until all portions of the space beneath the baseplate or soleplate have been filled. Subsequent batches of grout shall be prepared so as to be ready when the preceding batch has been placed. Under no circumstances shall the grouting operation be halted because of lack of grout mix. After the entire baseplate is full, 6-inch high standpipes shall be maintained over each grout hole, to continue purging of air. When the grout has started to take an initial set (determined by a noticeable increase in temperature and no flow of grout at the vent holes) the standpipes shall be removed and excess grout cleaned from all surfaces.

5. A grout sample shall be taken for each piece of equipment to be grouted. The sample shall be placed in a cylinder of sufficient size to yield three 2-inch x 2-inch x 2-inch test samples. The samples shall be tagged with the equipment number and ambient temperature at the time of placement. The samples shall be tested in accordance with the manufacturer's recommendations. Once the epoxy grout cylinder has been completely filled, it shall be placed next to the foundation of the equipment being grouted and allowed to cure for 48 hours. After 48 hours, the test cylinder shall be tested in accordance with the grout manufacturer's recommendations by an independent testing laboratory. The results shall be reported directly to the CONSTRUCTION MANAGER. Forms shall be removed only after the grout has cured sufficiently and upon specific permission from the CONSTRUCTION MANAGER.

F. Completion

1. Upon acceptance by the CONSTRUCTION MANAGER and the equipment manufacturer's representative after the grout has reached sufficient strength, the shims shall be removed, and leveling nuts or jack screws backed off to allow the grout to fully support the equipment base, leveling block or soleplate. Removal of extended shimming material (direct mounted baseplates weighing 1000 pounds or less) shall be by sledge hammer, taking care not to damage the grout. Once shims have been removed, or jackscrews backed off, the anchor bolts shall be torqued, using calibrated indicating torque wrenches, to develop the full clamping force required by the equipment manufacturer. Anchor bolts shall be torqued in increments of not more than 25 percent of final value in an alternating pattern to avoid stress concentration on the grout surface. Pockets for access to shims, or leveling nuts shall be filled with grout mix and pointed after the anchor bolts have been torqued to final values.

**** END OF SECTION ****

SECTION 11005 - MACHINE ALIGNMENT

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This Section specifies requirements for alignment of mechanical and HVAC equipment weighing 1000 pounds or more furnished or modified under this contract. Equipment with drivers 5 horsepower and less are specifically exempted from the requirements of this Section. This Section also includes requirements for alignment software and equipment to be furnished to the OWNER on commissioning of the project.

1.2 QUALITY ASSURANCE:

- A. General: All equipment shall be aligned using laser alignment equipment to the tolerances specified by the subject equipment manufacturer or the criteria specified in this Section, whichever is more stringent.
- B. Alignment Criteria: Unless otherwise specified by more stringent manufacturers' requirements, all mechanical equipment affected by this specification shall be aligned to the following criteria:

Speed, rpm, maximum	Couplings		Spacer Shafts Offset, mils/ inch of shaft length
	Offset (mils)	Angularity (mils/inch)	
600 and less	5.0	1.0	1.8
900	6.0	0.7	1.2
1200	2.5	0.5	0.9
1800	2.0	0.3	0.6
3600	1.0	0.2	0.3
7200	0.5	0.1	0.15

- Notes: (1) Soft foot shall be not more than 2.0 mils for any speed.
- (2) Separately mounted equipment connected by offset universal joints are exempted from the offset and angularity requirements, but all units must be installed and leveled as specified in this Section.

C. Alignment Equipment

1. Alignment equipment used to perform the work required under this Section shall employ laser alignment techniques to achieve the required tolerances. The equipment shall be computer based and shall be compatible with Windows® based spreadsheets and databases. The equipment shall employ a hand-held field computer using a graphic interface to determine actual alignment and necessary corrective action to bring equipment into required tolerance. The computer shall be powered by rechargeable NiCad batteries and shall be capable of storing up to 1000 machine measurement sets, complete with labels, graphics and comments. The link between field measurement instruments and the computer shall be through infrared transmission. Cable link-dependent equipment will not be acceptable. External interface between the field computer and other processors shall be by RS-232C serial cable ports.

2. The laser emitter shall be Class 2 type, FDA 21 CFR 1000 and 1040 compliant, powered by lithium ion batteries. The laser shall operate on a 670 nm wavelength and shall have a beam, divergence of less than 0.3 microradians at a power of not more than 1 microwatt. The laser receiver shall have 5 axis capability with a resolution of 0.04 mil offset and 10 micro radians angularity.

1.3 SERVICES OF MANUFACTURER

A. Equipment Instruction

1. CONTRACTOR shall arrange for an authorized service representative of the manufacturer to provide instruction of the equipment to the OWNER’s personnel in accordance with Section 01300 - Contractor Submittals.

1.4 SPECIFICATIONS AND STANDARDS

- B. This Section contains references to the following documents. They are a part of this Section and any referencing section as specified and modified. In the event of conflict between the requirements of this Section or any referencing section and those of the listed documents, the requirements of this Section or the referencing section shall prevail.
- C. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
<u>Shaft Alignment Handbook</u>	Shaft Alignment Handbook, second edition, John Piotrowski, Marcel Decker Inc.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Laser alignment equipment shall be Rotalign® Pro as manufactured by Ludeca, Inc., of Miami, Florida, or equal.

2.2 PRODUCTS TO BE FURNISHED TO OWNER:

- A. The following shall be furnished to the OWNER upon completion of all alignment work for the project or appropriate portion thereof and prior to substantial completion of the project or portion thereof:
 1. One complete Rotalign® Pro equipment setup, including aluminum carrying case, transmitter, receiver, equipment mounting clamps, cable, spare batteries, hand-held computer and Rotalign® Pro Commander PC ALI 3.592SET computer software for use in records computer, or the equivalent complete setup as accepted for the project.

2. All alignment records, in both hard copy and in computer memory. The hard copy shall be signed and dated by the technician performing the alignment work and shall be witnessed by the CONSTRUCTION MANAGER.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. After machine base grouting as specified under Section 11002 – Equipment Supports, Grouting and Installation, all machines mounted on baseplates or sole plates specified above shall be aligned as specified under this Section. Machines supported on integral feet or support pads shall be leveled, grouted and aligned in the following order: driven machine; intermediate bearings or machines; and driver. All machines shall be aligned without any connections to piping, electrical and instrumentation systems. Upon completion of all field connections, alignment shall be rechecked to demonstrate no change. If change has occurred, the CONTRACTOR shall eliminate any external forces affecting machine alignment and repeat the alignment process. All machine alignment parameters shall be rechecked after the equipment has been brought to operating temperature by operation at specified conditions. Where required by other sections in these Contract Documents, factory authorized installation technicians representing the equipment manufacturer shall witness final alignment work. All alignment work shall be independently checked using the shaft and coupling spool method described in Shaft Alignment Handbook. After completion of all alignment work and acceptance in writing by factory installation technicians, all machines shall be doweled in place using tapered stainless steel dowels. **Alignment work shall be performed by journeyman millwrights skilled in this type of work under the supervision of a technician trained in the use of the laser alignment by the manufacturer of the alignment equipment. The use of laborers, carpenters or apprentices for this work shall not be acceptable.** All final results of the alignment work shall be subject to inspection and verification by the CONSTRUCTION MANAGER.

**** END OF SECTION ****

SECTION 11020 - VIBRATION AND CRITICAL SPEED LIMITATIONS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This Section specifies vibration and critical speed limitations for rotating mechanical equipment. Factory and/or field testing and vibration measurements shall be taken when specified in the individual equipment specification sections.

1.2 VIBRATION LIMITATIONS

- A. General: Vibration frequencies shall span the range from 5.0 to 5000 Hz. Where specified, measurements shall be obtained while the installed equipment is operating within the specified speed range.

B. Centrifugal

1. Machines with Sleeve Bearings: Unless otherwise specified, centrifugal machines with sleeve bearing shafts shall not exhibit unfiltered RMS readings for vibration displacement in excess of the following:

Shaft speed range, rpm	Displacement, peak to peak, mils
Up to 900	3.5
901-1800	3.0
1801-3000	2.5
3001-4500	2.0
Above 4500	1.6

2. Displacement measurements shall be taken radially on the shaft at two points at each bearing, except for well pumps which shall be measured at top of motor. Measuring points shall be 90 degrees apart.

1. Machines with Antifriction Bearings: Unless otherwise specified, centrifugal machines with antifriction bearing shafts shall not exhibit unfiltered RMS readings for vibration velocity in excess of 0.12 inch per second. Velocity measurements shall be taken on one point of each bearing housing.

1.3 CRITICAL SPEED REQUIREMENTS

- A. Unless otherwise specified, rotating mechanical equipment shall not exhibit critical speeds within the specified range of operating speeds. Critical speeds for equipment with rigid rotor systems shall be at least 20 percent greater than maximum operating speed. Critical speeds for equipment with flexible shaft-rotor systems shall be at least 15 percent below minimum operating speed and 20 percent above maximum operating speed.

1.4 SHOP DRAWINGS AND SAMPLES

A. The following information shall be submitted in accordance with Section 01300:

1. Manufacturer's certified data showing location of critical speeds in relation to operating speeds.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

**** END OF SECTION ****

SECTION 11175 - PUMPS, GENERAL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for pumps and pumping appurtenances and providing special tools and spare parts.
- B. The WORK also includes coordination of design, assembly, testing and installation.
- C. The WORK of this Section applies to the WORK of the following Sections:
 - 1. Section 11209 Submersible Sump Pumps (Less than 10 HP)
 - 2. Section 11212 Vertical Non-Clog Pumps

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 01400 Quality Control
 - 3. Section 11000 Equipment, General Provisions
 - 4. Section 11002 Equipment Supports, Grouting and Installation
 - 5. Section 11005 Machine Alignment
 - 6. Section 11020 Vibration and Critical Speed Limitations
 - 7. Section 16040 Electrical Motors

1.3 SPECIFICATIONS AND STANDARDS

- A. Specifications and standards shall comply with Section 11000 – Equipment General Provisions, and the following:
 - 1. AISC Steel Construction Manual
 - 2. AISI 1045 Steel
 - 3. ANSI/ASME B73.1 Specifications for Horizontal End Suction Centrifugal Pumps for Chemical Process
 - 4. ANSI/ASME B73.2 Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process
 - 5. ANSI/HI 1.1-1.6 Centrifugal Pumps

6. ANSI/HI 9.1-9.5 Pumps - General Guidelines
7. ANSI/HI 9.6.1 Centrifugal and Vertical Pumps for NPSH Margin
8. ANSI/HI 9.6.3 Centrifugal/Vertical Pumps Allowable Operating Region
9. ANSI/HI 9.6.4 Centrifugal and Vertical Pumps. Vibration Measurements and Allowable Values.
10. ANSI/HI 9.8 Pump Intake Design Standard
11. ANSI/IEEE 112 Test Procedure for Polyphase Induction Motors and Generators
12. ANSI/IEEE 115 Test Procedure for Synchronous Machines
13. ASME Code ASME Boiler and Pressure Vessel Code
14. ASTM A 53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
15. ASTM A 128 Steel Castings, Austenitic Manganese
16. ASTM A 216 Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
17. ASTM A 217 Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
18. ASTM A 276 Stainless Steel Bars and Shapes
19. ASTM A 278 Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650E F (350EC)
20. ASTM A 283 Low and Intermediate Tensile Strength Carbon Steel Plates
21. ASTM A 322 Steel Bars, Alloy, Standard Grades
22. ASTM A 395 Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
23. ASTM A 470 Vacuum-Treated Carbon and Alloy Steel Forgings for Turbine Rotors and Shafts
24. ASTM A 536 Ductile Iron Castings
25. ASTM A 571 Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low Temperature Service
26. ASTM A 576 Steel Bars, Carbon, Hot-Wrought, Special Quality
27. ASTM A 743 Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
28. ASTM A 744 Castings, Iron Chromium-Nickel, Corrosion Resistant, for Severe Service

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| 29. | ASTM B 62 | Composition Bronze or Ounce Metal Castings |
| 30. | ASTM B 148 | Aluminum Bronze Sand Castings |
| 31. | ASTM B 505 | Copper Alloy Continuous Castings |
| 32. | ASTM B 584 | Copper Alloy Sand Castings for General Applications |
| 33. | ASTM E 448 | Standard Practice for Scleroscope Hardness Testing of Metallic Materials |
| 34. | AWS-B3.0 | Welding Procedures and Performance Qualifications |
| 35. | AWS-D1.1 | Structural Welding Code--Steel |
| 36. | Hydraulic Institute Standards | (See applicable ANSI/HI Standard) |
| 37. | ISO 9001 | Quality Systems |
| 38. | ISO 10816 | Mechanical Vibration--Evaluation of Machine Vibration by Measurement on Non-rotating Parts - Part 1: General Guidelines, Annex B, Table B.1. Zone A, Class I, II or III, as applicable. For the purposes of this specification, Annex B of ISO 10816, Part 1 shall form a part of this specification and ISO 10816, Part 1. |
| 39. | NEMA MG1 | Motors and Generators |
| 40. | UL 674 | Motors and Generators, Electric, for Use in Hazardous Locations, Class I, Groups C and D, Class II, Groups E, F and G |

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section – 11000, Equipment General Provisions, and the material listed in the detailed specification, the following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. At least one successfully operating installation of comparable size and complexity (including no cavitation, damaging vibration or shaft damage within the first three years of operation) designed and installed in the recent past by the proposed pump manufacturer, with address and telephone numbers.
 2. A Certificate of Unit Responsibility Assignment signed by officers of both the CONTRACTOR and the pump manufacturer corporations, attesting to the assignment of responsibility in accordance with these Contract Documents. ***No other submittal material will be reviewed until the certificate has been received and found to be in conformance with these requirements.***
 3. A copy of this specification section and the referencing section and all other applicable specification sections governing the pump, drive and motor, supports and specified appurtenances. The specification copies shall be complete with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (Y) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore requested by the CONTRACTOR, each

deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. ***Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.***

4. A copy of the contract document control diagrams and process and instrumentation diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "***no changes required***". ***Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.***
5. Documentation of certification in accordance with ISO 9001 as specified under paragraph 11175-2.1A.
6. Predicted pump performance curves for each condition point specified showing head, power, efficiency, and NPSH required on the ordinate plotted against capacity (in gpm) on the abscissa. Pump inlet, bowl, column and discharge head losses for column pumps shall be shown as separate curves. Curves for variable speed pumps shall be provided at 100-rpm intervals between the minimum and maximum speeds required to achieve the specified operating conditions. Manufacturer's recommended operating range for stable operation and prevention of surge, cavitation and vibration. Under no circumstances shall the manufacturer's recommended operating range be less than that required to meet the pump operating conditions specified.
7. NPSHR margin calculations performed in accordance with paragraph 11175-1.9G.2 or 3 as applicable and including the information required under paragraph 11175-1.9G.1.
8. Motor submittal information as specified in paragraph 16040-1.5. In addition, this information shall include certified calculations for motor rotor and frame reed frequencies, as specified under paragraph 11175-1.9H.
9. Complete description and sketch of proposed test setup for factory test if a factory test is required by the terms of these specifications, at least 10 weeks in advance of the proposed test date. Submittal material shall include sample calculations and proposed test log format. Submittal shall be in accordance with paragraph 11175-1.7C.6.
10. Information required under Section 11020 – Vibration and Critical Speed Limitations.
11. Drawings showing general dimensions and confirming the size of pumps, motors, drives, flywheels, and specified appurtenances; piping connections; construction details of equipment; wiring diagrams; and weight of equipment.
12. Drive unit support calculations and data if the drive is separately supported and if the analysis under the requirements of paragraph 11175-1.10 is required by the terms of these specifications.
13. Qualifications of the design professional performing the mass elastic design analyses specified under paragraph 11175-1.10 if the subject analysis is required by the terms of these specifications.

14. Critical speed calculations and mass elastic systems analyses for pumps as specified in paragraphs 11175-1.9C or 11175-1.10, if the subject analyses are required by the terms of these specifications.
15. Manufacturer's design and calculations for intermediate shafting, if intermediate shafting is required. Show shaft lengths, location of bearing supports, and shaft critical speed.
16. Shaft deflection calculations to demonstrate compliance with paragraph 11175-1.10 if shaft deflection calculations are required by the terms of these specifications.
17. Calculations justifying the dimensions of flywheels.
18. Details of the pump and drive unit foundation, including type, size, number, and arrangement of anchor bolts, dimensional drawings of the sole and baseplates, and all other information required under Section 11002 – Equipment Supports, Grouting and Installation.
19. If factory tests are required by the terms of these specifications, certification of satisfactory testing of each unit as specified. The certified material shall include copies of test logs and resulting performance curves at least four weeks prior to shipping the units from the factory. Manufacturer's reports on hydrostatic tests, including calibration test results on all instruments used to conduct the factory hydrostatic and performance tests.
20. Results of motor rotor, frame and assembly bump tests, certified as specified under paragraph 11175-1.9H, along with the design professional's supplementary report as specified under paragraph 11175-1.10B.
21. Vibration measurement results as specified in paragraph 11175-3.5.

1.5 OWNER'S MANUAL

- A. In addition to the requirements of Section 11000, the following shall be included in the OWNER'S MANUAL submittal in compliance with Section 01300:
 1. Manufacturer's written guarantee that pumping equipment operates with efficiencies, heads and flow ranges indicated and meets vibration and critical speed limitations indicated.
 2. Drive unit support calculations and data if the drive is separately supported and if the analysis under the requirements of paragraph 11175-1.10 is required by the terms of these specifications.
 3. Critical speed calculations and mass elastic systems analyses for pumps as specified in paragraphs 11175-1.9C or 11175-1.10, if the subject analyses are required by the terms of these specifications.
 4. Shaft deflection calculations to demonstrate compliance with paragraph 11175-1.10 if shaft deflection calculations are required by the terms of these specifications.
 5. Calculations justifying the dimensions of flywheels.
 6. Performance guarantee as specified in paragraph 11175-1.7C if a Performance Guarantee has been specified.

7. Balance logs for pumps with nozzles sizes 6 inches in diameter and greater, certified, signed and notarized in accordance with paragraph 11175-2.7.
8. If factory tests are required by the terms of these specifications, certified copies of test logs and resulting performance curves. Manufacturer's reports on hydrostatic tests, including calibration test results on all instruments used to conduct the factory hydrostatic and performance tests.
9. Vibration measurement results as specified in paragraph 11175-3.5.

1.6 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000 – Equipment General Provisions, this Section, and the detailed pump specifications.

1.7 FACTORY TESTING

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors and the ENGINEER for the number of days indicated to complete such inspections or observations, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors or ENGINEER. The CONTRACTOR shall comply with the requirements of Section 01400 – Quality Control.
- B. Performance Curves: Centrifugal pumps shall have a continuously rising curve toward the shut-off head and in no case shall the required horsepower at any point on the performance curve exceed the rated horsepower of the motor or engine. The allowable operating region for all centrifugal and axial flow pumps shall comply with the requirements of paragraph 11175-1.9.
- C. Performance Confirmation: Pumps, drives, and motors shall be factory-tested to confirm specified requirements in accordance with the applicable ANSI/HI Pump Standards Test Code for Centrifugal, Vertical, Rotary, and Reciprocating Pumps, and test data shall be recorded. Tests shall be performed on all pumps and motors of sizes 25 horsepower and larger. Prototype model tests will not be acceptable.
 1. Test data shall include the following:
 - a. Hydrostatic test results
 - b. Hydraulic test results with, unless otherwise specified, a minimum of 10 readings between shutoff head and 25 percent above design capacity.
 - c. Certified pump curves showing head/flow, horsepower, efficiency and NPSHR curves.
 - d. Certification that the pump horsepower demand will not exceed the rated motor horsepower beyond a 1.0 service rating at any point on the curve.
 - e. Motor test results
 - f. NPSH margin test results, if NPSH margin tests are required

2. **Factory Tests of Motors:** All pump motors of sizes 25 horsepower and larger, shall be assembled, tested, and certified at the factory and the working clearances checked to insure that all parts are properly fitted. The tests shall comply with ANSI/IEEE 112 and ANSI/IEEE 115 standards, including heat, running and efficiency tests.
3. **Hydrostatic Tests:** All pressure sustaining parts shall be subjected to factory hydrostatic tests. Hydrostatic tests for centrifugal and axial flow pumps shall conform to the requirements of ANSI/HI.
4. **Performance Guarantee:** Unless specified otherwise, pump performance, including NPSHR for centrifugal and axial flow pumps, shall be guaranteed by the pump manufacturer to the most restrictive tolerances set forth in the applicable ANSI/HI Standard. The guarantee shall be in writing, shall be signed by an officer of the manufacturing corporation and shall be notarized. Under no circumstances shall deviations from specified operating conditions, though allowed by the referenced standards, result in overload of the driver furnished with the equipment, nor shall such deviations result in power requirements greater than the driver's nameplate rating.
5. **Factory Witnessed Tests:** Unless otherwise specified, pumps, variable speed drives (if any), and motors, for pumping units 100 horsepower and larger, shall be factory tested as complete, assembled units and witnessed by representatives of the CONSTRUCTION MANAGER, of the ENGINEER and of the OWNER.
6. The CONTRACTOR shall submit a sketch of the proposed witnessed test setup, along with a description of the proposed testing procedure to the CONSTRUCTION MANAGER for acceptance at least 10 weeks in advance of the proposed test date. No tests shall be performed until the test procedure meets with the CONSTRUCTION MANAGER's approval. In addition, the CONTRACTOR shall furnish the CONSTRUCTION MANAGER with at least 4 weeks advance written notice of the date and location of the witnessed performance tests.
7. **Witnessed Tests:** Witnessed pump performance tests shall be in accordance with the applicable ANSI/HI test standard. NPSHR tests shall also be performed for centrifugal and axial flow pumps to confirm the data used to establish NPSHA margin as specified in paragraph 11175-1.9G. NPSHR tests for column type (axial flow and vertical turbine) pumps shall be performed using the method described for Figure 2.6.3 or Figure 2.6.4 in ANSI/HI 2.6. All NPSHR tests shall extend from 10 percent to 120 percent of Best Efficiency Flow at full speed, or to not less than 10 percent (in terms of flow) past the flow at Operating Condition B, whichever is greater. Not less than ten data points shall be developed during the test. Failure to achieve guaranteed performance (capacity and head, efficiency or NPSHR) shall be cause for rejection. Tolerances shall be the most restrictive set forth in the applicable standard. All test procedures shall be in strict conformance with the referenced standards, except prediction of performance of a trimmed impeller from test data of the larger impeller will not be permitted. If trimming is required, the pump shall be retested. Under no circumstances shall deviations from specified operating conditions, though allowed by the referenced standards, result in overload of the driver furnished with the equipment, nor shall such deviations result in power requirements greater than the driver's nameplate rating.
8. **Non-Witnessed Tests:** Where non-witnessed tests are permitted, centrifugal and axial flow pumps shall be tested in accordance with ANSI/HI 1.6 or 2.6, as applicable. Not less than ten data points shall be developed during the test. NPSHR tests shall also be performed to confirm the data used to establish NPSHA margin as specified in paragraph 11175-1.9G. NPSHR tests for column type (axial flow and vertical turbine) pumps shall be performed using the method described for Figure 2.6.3 or Figure 2.6.4

in ANSI/HI 2.6. All NPSHR tests shall extend from 10 percent to 120 percent of Best Efficiency Flow at full speed, or to not less than 10 percent (in terms of flow) past the flow at Operating Condition B, whichever is greater. Failure to achieve guaranteed performance (capacity and head, efficiency or NPSHR) shall be cause for rejection. Tolerances and restrictions shall be as set forth above for witnessed tests. The CONTRACTOR shall furnish the CONSTRUCTION MANAGER with not less than two weeks' advance written notice of the date and place of the non-witnessed tests.

9. In the event of failure of any pump to meet any of the specified requirements or efficiencies, the CONTRACTOR shall make all necessary modifications, repairs, or replacements to conform to the requirements of the Contract Documents and such pump shall be retested at no additional cost to the OWNER, until found satisfactory.
10. All test results (data sheets, test logs and generated performance curves) shall be signed and certified correct by an officer of the manufacturing corporation and shall be notarized.
11. Upon completion of testing, curves shall be produced showing pump performance (head, efficiency, NPSHR (if applicable), and power required versus capacity) at full speed and predicted performance at speeds required to meet all other indicated operating conditions. The test results shall be certified and notarized as noted above and submitted to the CONSTRUCTION MANAGER. The pumps shall not be shipped until authorized, in writing, by the CONSTRUCTION MANAGER. Final acceptance of the equipment will depend on satisfactory operation after installation.

1.8 FIELD TESTS

- A. All pumping units shall be field tested after installation to demonstrate proper operation, without excessive noise, vibration, cavitation, and overheating of bearings. The field testing shall be performed in the presence of the CONSTRUCTION MANAGER, the ENGINEER and an experienced field representative of the manufacturer of the equipment, who shall certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation and shall witness the following:
 1. Startup, checking, and operation of the equipment over the entire speed range. For pumps smaller than 50 horsepower without variable speed drives, the vibration shall be within the limits specified in Section 11020 and the vibration shall be recorded at a minimum of 4 pumping conditions which have been reviewed by the CONSTRUCTION MANAGER. Vibration requirements for pumps 50 horsepower and larger and all pumps with variable speed drives are specified in paragraph 11175-3.5.
 2. Pump performance shall be documented by obtaining concurrent readings, showing motor voltage, amperage, pump suction head, and pump discharge head, for at least 4 pumping conditions at the respective pump rpm. Each power lead to the motor shall be checked for proper current balance.
 3. Determination of bearing temperatures by a contact-type thermometer. A running time of at least 20 minutes shall be maintained for this test, unless liquid volume available is insufficient for a complete test.
 4. Ensure that electrical and instrumentation testing complies with Division 16 Sections. Additional field testing requirements are specified in Section 11000, Part 1, and may be specified in the individual equipment specifications.

1.9 DESIGN REQUIREMENTS FOR CENTRIFUGAL AND AXIAL FLOW PUMPING EQUIPMENT

- A. General: Provisions and requirements contained in this paragraph (1.9) apply specifically to centrifugal and axial flow pumps, both vertical and horizontal, commonly falling into the generic types covered by ANSI/HI 1.1 through 1.6 and 2.1 through 2.6. More restrictive requirements, where found in individual pump specifications, shall supersede requirements of this paragraph. This paragraph does not apply, except by specific reference, to positive displacement pumps of any type.

Centrifugal and axial flow pumping equipment shall conform to the requirements of ANSI/HI. All components in the rotating elements in the drive train, including equipment supports and supports for rotating elements, shall be selected and designed to function without damage or disassembly at reverse rotational speeds up to 150 percent of maximum operational speed during flow reversals through the pump. The complete pumping unit shall operate without overload on any component at any point along the pump's entire full-speed operating curve. Pumps required by virtue of the specified operating conditions to operate against a closed or throttled valve for any period of time exceeding five seconds, shall be furnished with drivers sized to operate continuously at the power requirement for that condition even though the power requirements at the rated condition may be less.

- B. Pump Selection: Pumps shall be selected to place all specified continuous duty operating conditions within the manufacturer's Allowable Operating Range as defined in ANSI/HI 9.6.3. Unless otherwise specified in individual pump specifications, rated conditions and all other continuous duty full speed operating conditions specified in the detailed pump specifications shall fall within the manufacturer's Preferred Operating Range as defined in ANSI/HI 9.6.3.

Pumping equipment shall be suitable for the operating modes described in the detailed pump specifications and other relevant portions of the Contract Documents.

All pumps shall be designed in accordance with applicable portions of ANSI/HI 1.1 - 1.6, 2.1 - 2.6 and ANSI/HI 9.1 - 9.6 and the requirements of this Section. The pumps shall be specifically designed to pump the fluids described in the detailed pump specifications and shall operate without clogging or fouling caused by material in the pumped fluid at any operating condition within the range of service specified.

The pumps shall operate without cavitation or damaging vibration over the entire specified range of flow and head conditions and shall be specifically selected for NPSHR characteristics conforming to the requirements of paragraph 11175-1.9G.

Unless otherwise indicated, the pump head capacity curves shall slope in one continuous curve within the specified operating conditions. No points of reverse slope inflection capable of causing unstable operation will be permitted within the specified zone of continuous duty operation. Pumps with head/capacity curves as described in paragraph 9.6.3.3.12 of ANSI/HI 9.6.3 are specifically prohibited if these characteristics will cause unstable operation within the specified range of operating conditions and where startup/shutdown conditions entail operation against a slow opening/closing valve.

- C. Critical Speeds and Natural Frequencies: Unless otherwise specified for variable speed pumping equipment or for custom engineered pumping equipment, the complete pumping unit, including all related frames, supports, enclosures, and casings, shall be free from dangerous critical speeds from 20 percent below to 30 percent above the operating speeds required to achieve the performance characteristics specified.

The logarithmic decrement for each damped natural frequency within this range shall be greater than +0.3.

Unless otherwise specified, the CONTRACTOR shall furnish documentation under paragraph 11175-1.4 demonstrating compliance with this requirement for all pumping equipment with discharge nozzle sizes 6 inches in diameter and greater.

- D. Impeller Clearances and Keyways: The radial clearance between the tip of the impeller vane and diffuser or volute vanes shall be not less than 3 percent and 6 percent, respectively, of impeller diameter. The ratio of liquid channel widths (diffuser or volute/impeller) shall be not less than 1.15 nor more than 1.3 for diffuser pumps and 1.4 - 1.5 for volute-type pumps.

Impeller keyways for multistage diffuser-type pumps shall be cut at differing positions on the impeller shaft to avoid multiple simultaneous vane passing pulses.

E. Component Design Criteria

1. General: Unless otherwise indicated, combined stresses in steel frames and supports shall not exceed those permitted by the AISC Manual of Steel Construction. Combined stresses in cast, forged, rolled or fabricated pressure retaining components, frames and supports shall not exceed that allowed for the given material in Section VIII, Division 1 of the ASME Code. Design pressures for pressure-retaining parts shall be not less than twice the pump's shutoff head at the manufacturer's listed maximum operating speed.

The term "combined stresses" in this paragraph (1.9) shall mean the sum of all operating stresses, including stresses induced by dynamic and static forces as developed via the analysis procedures stipulated in this section. Dynamic forces shall include both steady state and transient stresses induced by operating conditions.

2. Anchorage: Unless otherwise indicated, anchor bolts for vertical volute-type and vertical axial flow pumps shall be designed to restrain twice the forces developed by operation of the pump at maximum speed against a closed valve with no restraint at the pump inlet and discharge flanges.

Bases for horizontal pumps shall be designed in accordance with paragraph 11175-2.5, and shall provide common support for the pump and motor (and flywheel, if one is specified).

All vertical (column type) pumps with unit weights (including drive, if supported by the pump) weighing more than 1,000 pounds and all volute type pumps with nozzle sizes 16 inches in diameter and greater and all separately supported motors shall be supported on a sole plate or steel high ring base provided by the pump manufacturer. Sole plates shall be designed in accordance with paragraph 11175-2.6.

Anchor bolts and connecting bolts for all assemblies supported by other assemblies furnished under this Section or sections referencing this Section, shall be designed in accordance with the requirements of this Section, Section 11000, and the individual pump specifications. Anchor bolts, nuts and washers shall comply with paragraph 11175-2.2.

3. Torsional and Combined Shaft Stresses: The pump rotor shall be free from torsional criticals and shall comply with all stress requirements indicated in paragraph 11000-1.12A. Additional requirements are indicated in paragraph 11000-1.12.

4. Shaft Deflection: Pump shafts on volute type pumps shall be designed to provide sufficient stiffness to operate without distortion or damaging vibration throughout the range of service specified. Shaft deflection at the face (impeller side) of the shaft seal shall be limited to no more than 1.5 mils at any continuous operating condition within the zone described by the specified continuous duty operating conditions. Deflection at the shaft seal shall be calculated using the relationship set forth in paragraph 11175-1.10D.3.
 5. Bearings: Unless otherwise specified, anti-friction bearings shall be selected for an L-10 life expectancy in accordance with the requirements specified in paragraph 11000-2.8. Radial loads shall be calculated in accordance with the provisions set forth in paragraph 11175-1.10.
- F. Rotor and Critical Speed Analysis and System Design: Requirements for the rotor and critical speed analysis and system design are specified in paragraph 11175-1.10.
- G. Net Positive Suction Head Required Limitations:
1. General: Pumps furnished under this section and sections referencing this section shall be selected for NPSHR (Net Positive Suction Head Required) characteristics using the suction energy methodology set forth in ANSI/HI 9.6.1. NPSHR characteristics for the candidate pump shall be based upon documented test data not more than five years old, performed on a pump not more than two nominal pump diameters larger or smaller than the proposed pump with an impeller of the same geometry as that proposed for the pump to be used for the subject application, and operating at the same speed as the pump for the proposed application. The CONTRACTOR shall document the basis for NPSH characteristics as set forth in this paragraph.

Individual restrictions shall apply to NPSH margin as set forth below, depending upon the type of pumping equipment and the fluid to be pumped. The detailed specification sections provide NPSHA (Net Positive Suction Head Available or wet well elevation) information for anticipated operating conditions for each application. This information is generally referenced to a specific elevation, stated in terms of project datum. It shall be the CONTRACTOR's responsibility to adjust the NPSHA information to the elevation of the pump impeller eye for the specific pump model and size proposed for the application. NPSHR, as used in the following paragraphs, shall mean the NPSHR at the impeller eye, determined in accordance with ANSI/HI 1.6 or 2.6, as applicable for the proposed pump. The CONTRACTOR shall document the method used to determine NPSHR for the proposed pump and justifying compliance with the NPSH margin limitations established under this paragraph in material submitted under paragraph 11175-1.4. The documentation shall include justification of the NPSHR tests used to develop NPSHR characteristics, including the following:

- a. Date, test procedure, and test logs of original NPSHR information used to project requirements for pump selected for the application.
- b. Test pump size, impeller diameter, impeller model, eye diameter, and speed.
- c. Calculations projecting NPSHR test information to NPSHR curve information for pump proposed for the application.
- d. Calculations demonstrating compliance with the NPSH margin requirements established in this paragraph.

The CONTRACTOR, using suction energy rules in selecting pumps proposed for each application, shall apply criteria set forth in the individual paragraphs below. Percentages stated below shall apply to pump capacity on the selected pump's head/capacity curve at the speed required to achieve the specified operating condition.

The CONTRACTOR shall submit the manufacturer's suction energy calculations justifying the proposed pumps selections with the material required under paragraph 11175-1.4.

2. Pumps Used for Solids Bearing Liquids: The following restrictions shall apply to pumps specified for wastewater, stormwater, primary effluent, return mixed liquor, RAS, and trickling filter service:
 - a. A minimum NPSHA/NPSHR margin ratio of 1.3 shall apply at any operating condition within 85 percent and 115 percent of the best efficiency capacity. The minimum acceptable NPSHA/NPSHR margin ratio at any other locations on the pump's head/capacity curve shall be 1.8.
 - b. Notwithstanding item a above, the manufacturer shall use the methodology in ANSI/HI 9.6.1 to determine the proposed pump's suction energy. In determining the proposed pump's suction energy, the inlet nozzle size shall be increased by two nozzle sizes to account for impeller design considerations. In employing the suction energy method, the minimum NPSHA/NPSHR ratio shall be not less than that recommended in ANSI/HI 9.6.1 or item a., above, whichever is greater. For submersible and wet pit pumps, suction nozzle size shall be the impeller eye diameter of the proposed pump.
 - c. If the proposed pump's suction energy, as determined in item b, falls into the "high" or "very high" region, as determined from Figure 3 in ANSI/HI 9.6.1, the minimum acceptable NPSHA/NPSHR margin ratios shall be 1.5 and 2.0, respectively.
- H. Motor Selection: Unless otherwise specified, pumps shall be electric motor driven. Electric motors shall conform to the requirements set forth for heavy duty motors in Section 16040 or shall be as specified in the detailed pump specification. All motors shall be selected to be non-overloading at any operating point along the pump's full speed operating curve, including all points located beyond specified operating conditions. Motors furnished with pumps specified for operation at variable speed shall be inverter duty types conforming to the requirements of Section 16040 and shall be compatible with the variable speed equipment furnished with the pump.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Pumping equipment shall comply with this Section, the detailed pump specification, and Section 11000. In addition, the pump manufacturer and the pump manufacturing site shall be certified under ISO 9001. Evidence of the required certifications shall be included with the initial submittal under paragraph 11175-1.4.
- B. Combinations of Equipment: Pumping equipment shall be new and shall incorporate all necessary mechanisms, couplings, electric motor and drives, shafts, appurtenances, and mounting.

- C. Tools: Tools shall comply with Section 11000 and shall include one pressure grease gun for each type of grease required for pumps and motors.
- D. Spare Parts: Spare parts shall include for each pump one complete sets of seals, packing, gaskets, nuts, bolts, washers, wear rings, lantern ring removal tools, and a set of spare bearings as well as all parts indicated in the detailed pump specifications.
- E. Nameplates: Nameplates shall comply with Section 11000 and shall indicate rated head and flow, impeller size and pump speed. Flywheel nameplates shall include manufacturer, serial number, model, weight, and moment of inertia.

2.2 MATERIALS

- A. General: Materials used in the pumping equipment shall be suitable for the intended application and shall be free from defects. Materials of construction specified under the individual pump sections take precedence. Materials of construction not specified in the individual pump sections shall conform to the requirements listed below.
 1. Cast Iron: Close-grained gray cast iron conforming to ASTM A 48, with 2 to 3 percent nickel added to the cast iron for raw sewage, wastewater and sludge applications. Pressure class shall be suitable for the application but shall be not less than Class 30 for pumps 4-inch and larger.
 2. Ductile Iron (where indicated): ASTM A 395.
 3. Pressure Casings, Inner Casing Parts such as Bowls, Diffusers and Diaphragms, and Impellers: Cast iron conforming to the requirements of ASTM A278 and paragraph 2.2.A.1 above.
 4. Stainless Steel Pump Impellers (where indicated): Cast Type 316 stainless steel conforming to ASTM A744, Grade CF-8M.
 5. Bronze Pump Impellers (where indicated): ASTM B 62 or ASTM B 584.
 6. Pump Shafts: Stainless steel, Type 316 unless higher strength is required.
 7. All shaft sleeves for packed boxes, fretting seals and interstage seals shall be Type 316 stainless steel conforming to ASTM A743.
 8. Miscellaneous Stainless Steel Parts: Type 316 except Type 304 in septic environments.
 9. Internal Fastener Parts of All Types in Wetted Areas: Type 316 stainless steel conforming to ASTM A743.
 10. Discharge Heads and Suction Cans: Carbon steel conforming to the requirements of ASTM A36.
 11. Anchor Bolts, Nuts and Washers: Type 316 stainless steel.
 12. Coating of Wetted Interior of Pump and Impeller: Fusion Bonded Epoxy per Section 09800.
- B. Not used.

- C. Wearing Rings: Unless otherwise specified, centrifugal and axial flow pumps shall be fitted with both stationary and rotating wearing rings. Wearing rings shall be of hard faced Type 316 stainless steel and shall conform to the requirements of ASTM A743. Provisions shall be made for adjustment of wearing ring clearance via adjusting screws and shims in the back head design. L-form wearing rings are not acceptable for wastewater, sewage, stormwater, thickener overflow, mixed sludge, digester circulation, digested sludge, waste activated sludge, return activated sludge or primary effluent pumping service. Wearing rings shall be the axial type with a wear allowance of 0.25 inches minimum. Minimum wearing ring hardness on the rotating ring shall be 350 (BHN), with the stationary ring not less than 100 hardness points greater.
- D. Spacer Coupling: Horizontal pump and electric motor shall be connected with a flexible coupling which will not transmit backlash. The coupling shall be selected to provide sufficient gap between the pump and motor or flywheel shafts to allow complete withdrawal and removal of the pump backhead, frame and rotor without disturbing the motor or flywheel when the coupling is removed. Couplings shall comply with paragraph 11000-2.6.
- E. Protective Coatings: Pumps shall be protected with coatings as specified in Section 09800, unless otherwise specified in the individual equipment specifications.

2.3 ACCESSORIES

- A. Pressure Gauges: Pressure gauges shall be installed at pump suction and discharge lines except sump pumps and hot water circulating pumps. Pressure gauges shall comply with Section 15034 and shall be mounted at a location selected to minimize the effect of vibrations, either wall mounted or on floor stands.
- B. Pump Suctions: Compound gauges shall be installed at pump suction and where subject to shock or vibrations, the pressure gauges shall be wall-mounted or attached to Type 316 stainless steel channel floor stands located where they will not impede pump maintenance access and connected to the pump by means of flexible connectors. The pump suction elbow shall be equipped with a cleanout access plate.
- C. Local Control Panels: The NEMA rating of local control panels shall comply with the area designations of Division 16 Sections, unless indicated otherwise.
- D. Lifting Eyes: Pumps and nozzles shall be provided with lifting eyes to permit removal and/or disassembly.
- E. Air Release: Provide a manual air release valve on the pump with 3/4 -inch Type 316 stainless steel ball valve and piping.

2.4 PUMP REQUIREMENTS

- A. Pumps shall comply with the following:
 1. Lubrication: Except as otherwise indicated, line shaft bearings of vertical turbine mixed flow, and propeller pumps shall be utility water-lubricated and deep-well pumps and pumps with enclosed line shafts shall have fresh water- or oil-lubricated bearings and seals.
 2. Handholes: Handholes on pump casings shall be designed to follow the contours of the casing to avoid any obstructions in the water passage.

3. Umbrellas: For column pumps, the inlet wet well design is based upon the geometric relationships described in ANSI/HI 9.8 and assume a bell intake velocity of 5.5 fps. If the bell intake velocity for a proposed pump will exceed 5.5 fps, the CONTRACTOR shall require the pump manufacturer to furnish an umbrella fitted to the pump inlet bell that will effectively reduce the intake velocity to 5.5 fps, at no additional cost to the OWNER.
4. Drains: Gland seals, air valves, and cooling water drains, and drains from variable speed drive equipment shall be piped to the nearest floor drain, with galvanized steel pipe or copper tube; an air separation complying with the International Plumbing Code shall be provided.
5. Grease Lubrication: Unless otherwise specified, all vertical propeller, mixed-flow, and turbine pumps, (other than deep well pumps), shall be equipped with a stainless steel tube designed for lubrication of bottom bearing.
6. Stuffing Boxes: Where shaft packing is indicated, stuffing boxes shall be tapped to permit introduction of seal liquid and shall hold a minimum of five rows of packing. Stuffing boxes shall be face attached. Stuffing box and shaft shall be suitable for field installation, without machining or other modifications, of the mechanical seal indicated for the applicable pump and operating conditions.

Unless otherwise indicated, lantern rings shall be bronze, packing shall be die-molded packing rings of non-asbestos material suitable for the intended service and as recommended by the manufacturer, and glands shall be bronze, two piece split construction. Lantern rings shall be of two-piece construction and shall be provided with tapped holes to facilitate removal. Lantern rings shall be drilled and tapped 1/4 NC-20. Threaded lantern ring removal tools shall be provided with spare parts for each pump. Seals shall be flushed with utility water cleaned by means of a solids separator, or with process water. Except as otherwise indicated, the packing material shall be interlaced Teflon braiding, containing 50 percent ultra fine graphite impregnation complying with the following:

Shaft speeds	-	up to 2500 fpm
Temperature	-	up to 500 degrees F
pH range	-	1 to 14

7. Mechanical Seals: Shafts for pumps specified with mechanical seals shall be furnished with no reduction in size through the seal area. Hard/hard faces shall be used. The seal design must be such that the dynamic o-ring moves towards a clean surface as the face wears and the springs are not in the fluid pumped to avoid fouling. The cartridge seal shall be a single balanced design capable of 400 psig service with o-ring secondary seals. Cartridge seal shall be AES CURC. Materials shall be silicon carbide against tungsten carbide faces. Mechanical seals shall be cooled internally without the use of product water. The pump/impeller shall be designed to provide positive pressure above atmospheric to the stuffing box area to allow seal flush to function. Install a high pressure hose from the stuffing box to the suction side of the pump for air venting and for seal flush water return. Material of construction shall be stainless steel. For vertical (not vertical turbine) pumps an automated air vent shall be installed to vent the stuffing box of air.

- B. Bearing Temperatures: Where possible, the bearing temperature at the worst loading condition and ambient temperature shall not exceed 150 degrees F. Where this is not possible, all exposed bearings shall be effectively shielded with permanent metal safety guards to prevent accidental contact by operators.

2.5 SOLE PLATES FOR VERTICAL CENTRIFUGAL AND AXIAL FLOW PUMPS

- A. Sole plates for vertical column type pumps and separately mounted vertical pumps, shall be designed to be installed on the concrete foundation curbs shown and shall be milled flat to within 0.002-inch per foot in all directions on the face mating with the pump support. Prior to milling, sole plates shall have the words “THIS SIDE DOWN” permanently affixed to the underside using welding rod material. Unless otherwise specified, sole plates shall comply with Section 11002.

2.6 BASEPLATES AND DRIVE UNIT SUPPORTS

- A. Baseplates for horizontal pumps shall be fabricated and finished in accordance with paragraph 3.3, API 610. All baseplates shall be designed for grouting on the housekeeping pads specified.
- B. Drive unit supports for separately mounted vertical pump drives shall be of fabricated steel, ASTM A36. Drive unit supports shall be designed to span an opening in the floor sufficient to allow removal for the complete pump. Rolled steel beams shall be provided to stiffen the support and a fabricated steel drive unit support pedestal with a plate milled flat within two light bands shall be provided to mate with the drive enclosure. The support shall be designed to be supported on a sole plate embedded in a housekeeping pad at the edges of the floor opening or as indicated. Other details for the drive unit support shall be as indicated.
- C. Unless otherwise specified, base plates and drive unit supports shall comply with Section 11002 – Equipment Supports, Grouting and Installation.

2.7 BALANCE

- A. Balancing for centrifugal and axial flow pumps with nozzle sizes 6 inches in diameter and greater shall conform to the requirements set forth in API 610, paragraph 2.8.4.1. All balance logs, certified correct and signed by an officer of the manufacturing corporation and notarized, shall be included in the Owner’s Manual.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall comply with Section 11000, the requirements of this Section, and the requirements of the detailed pump specifications. Equipment with pump nozzle sizes 12 inches in diameter and greater shall be installed under the presence of a factory authorized installation specialist or specialists. Under no circumstances shall any installation procedures take place without the installation specialists present. Equipment and anchor bolt installation procedures shall conform to the requirements of Section 11002.

3.2 SOLE PLATES

- A. Sole plates, if provided as required by this Section, where required by the equipment manufacturer’s recommendation, or any section referencing this section, shall be leveled in the presence of a factory authorized installation specialist to a maximum tolerance of 0.002-inches/foot in all directions. Where the equipment manufacturer requires more stringent tolerances, those tolerances shall prevail.

3.3 ALIGNMENT

- A. Equipment furnished under this Section and any referencing section shall be aligned as specified in Section 11005.

3.4 TESTING

- A. Field testing shall be performed as specified in Part 1 of this Section. Testing also shall conform to the requirements of paragraph 11000-1.7A.

3.5 VIBRATION

- A. Vibration of installed pumps shall be measured in accordance with ISO 10816 for all pumps with variable speed drives and pumps with shaft power requirements 50 horsepower and greater. An independent testing laboratory specializing in this work, retained by the CONTRACTOR but acceptable to the CONSTRUCTION MANAGER, shall perform the measurements and shall submit the results directly to the CONSTRUCTION MANAGER. RMS vibration velocity on any component when the pump is operating at any specified continuous duty operating condition shall not exceed the limits established for the appropriate machine by Tables 2-5 and 2-6 in API 610. Vibration limits for pumps used for wastewater, grit, and sludge service shall be 150 percent of that established in the referenced tables. For all other installed pumps, vibration at the specified continuous duty operating conditions shall be measured by the independent testing laboratory noted above, and shall not exceed the limits specified in Section 11020 – Vibration and Critical Speed Limitations. Vibration measurement results shall be included in the Owner’s Manual.

3.6 TRAINING

- A. Training shall conform to the requirements of paragraph 11000-1.7B and the individual equipment specifications. The training session for maintenance personnel shall include complete field and shop disassembly and subsequent reassembly of one complete pumping unit selected by the CONSTRUCTION MANAGER.

** END OF SECTION **

SECTION 11209 - SUBMERSIBLE SUMP PUMPS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing submersible non-clog centrifugal sump pumps with motors, flanges, cables, lifting chains and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 11175 Pumps, General

PART 2 - PRODUCTS

2.1 GENERAL

- A. **Selection:** Pumps shall be selected so that rated operation lies within 5% (based on capacity) of maximum efficiency.

2.2 ENVIRONMENTAL CONDITIONS

- A. Pumps and motors shall be recommended by the manufacturers for the service indicated and shall be submerged continuously and operated while submerged. The pumped fluid temperature shall range from 40° F to 80° F.

2.3 MATERIALS

- A. Pump materials shall comply with the following:

<u>Component</u>	<u>Material</u>
Pump and motor	Cast iron, ASTM A48
Casing discharge	Cast iron, ASTM A48
Impeller	Cast iron, ASTM A48
Exposed nuts and bolts	Stainless steel, ASTM A276 Type 304
Shaft	Stainless steel, ASTM A276 Type 303
All wetted parts of pump	Epoxy coated according to Section 09800

2.4 EQUIPMENT

- A. Impellers: Impellers shall be statically and dynamically balanced and designed to be non-clog with ability to pass 2-inch solids and to pass stringy material.
- B. Bearings: Bearings shall be heavy-duty permanently oil lubricated ball bearings. Bearings for pumps 3-inch diameter discharge and larger shall be designed for an L-10 life of 20,000 hours heavy-duty service without additional lubrication.

- C. Pump and Motor Casing: Casings shall be constructed of corrosion resistant cast iron with bottom inlet and shall be designed to allow removal of all rotating parts from the motor end of the pumps. Mating surfaces where watertight sealing is required shall be machined and fitted with nitrile O-rings. Except as otherwise indicated, pump volute shall have vertical discharge.
- D. Mechanical Seals: Pumps shall be provided with tandem carbon vs. ceramic faced upper and silicon carbide vs. silicon carbide lower mechanical seals.
- E. Motor: Motor shall be designed to be non-overloading over the entire pump curve. Motor housings shall be of submersible construction with the windings operating in a sealed environment. Motors shall be either air-cooled or dielectric oil filled with built-in automatic reset overload protection. Motors shall comply with the requirements of Section 16040.
- F. Cable: Pump motors and detector cables shall be suitable for submersible pump applications. Power for motors shall be carried by a heavy-duty, flexible, water resistant, plastic covered, portable cable, sealed at the motor bell and of sufficient length to connect to the junction box or the plug outlet where indicated. The cable entry shall prevent water from leaking into the motor due to capillary action even if cable is cut or damaged.
- G. Moisture Protection: Two moisture sensing probes shall be located between the mechanical seals to detect any influx of conductive fluid and signal outer seal failure.
- H. Lifting Chain: A 5 feet stainless steel (Type 304) lifting chain with bracket shall be provided for each pump.

2.5 CONTROLS

- A. The CONTRACTOR shall provide a complete control system housed in a cabinet with hinged, gasketed door and mounting brackets or pedestal and all necessary components to provide the following functions:
 1. Magnetic starter
 2. Circuit breaker
 3. Hand-off-automatic switch
 4. Pilot light
 5. High water alarm with contact and bell
 6. Moisture intrusion alarm with contact and bell
 7. Alarm reset switch
 8. Mercury level control switches with sealed cables and stainless steel wall bracket
 9. Electric alternator (one, only)
 10. Low water level cutoff
 11. Lag pump automatic starter when lead pump fails

2.6 TOOLS AND SPARE PARTS

- A. Tools: The WORK includes special tools necessary for maintenance and repair; tools shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.
- B. Spare Parts: The following spare parts shall be provided for each pump:
 - 1. 2 sets all gaskets and O-rings
 - 2. 2 sets all bearings

Spare parts shall be packaged and boxes as indicated in Section 11000.

2.7 PUMP SCHEDULE

- A. Pumps shall comply with the following:

<u>Equipment Number</u>	<u>Rated Capacity, gpm</u>	<u>Design Head, Feet</u>	<u>Max. Speed, rpm</u>	<u>Voltage & Phase</u>	<u>Max. Horse-Power</u>	<u>Discharge Pipe Size, Inches</u>	<u>Max. Sphere Passage Size, Inches</u>
SPS-1 & -2	50	30	3600	240/480 - 3	1.0	2	2

2.8 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):
 - 1. Crane Barnes, Model 2SEV with Versatrol Controls
 - 2. Goulds Pumps, Inc., Model 2WD with CentriPro Controls

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall comply with Section 11175 – Pumps, General.

**** END OF SECTION ****

SECTION 11212 - VERTICAL NON-CLOG PUMPS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. General: The WORK of this Section includes providing vertical non-clog centrifugal pumps for pumping fluids containing sewage solids, with vertical constant speed electric motors, shafts, couplings, and all appurtenant work. Equipment furnished under this Section shall conform to the requirements of this Section and the Related Sections.
- B. Type: Pumps shall be the vertical dry pit bottom-suction volute-casing type. Impellers shall be enclosed non-clog Francis or mixed-flow configuration with two or three vanes designed specifically to pump unscreened wastewater with stringy organic solids and grit. The pumps shall be designed so that the impeller, back head and pump shaft can be removed without disturbing the connecting piping, casing, or motor.
- C. Unit Responsibility: The CONTRACTOR shall cause the equipment specified under this Section to be furnished by the pump manufacturer, as provided in Section 11000. The CONTRACTOR shall furnish a Certificate of Unit Responsibility Assignment as provided in Section 11175.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment, General Requirements
 - 2. Section 11002 Equipment Supports, Grouting and Installation
 - 3. Section 11175 Pumps, General
 - 4. Section 16040 Electric Motors
 - 5. Section 16900 Controls and Instrumentation

1.3 SPECIFICATIONS AND STANDARDS

- A. Specifications and standards shall comply with Sections 11000 – Equipment General Provisions, and 11175 – Pumps, General. Where this Section is silent on any subject, item or equipment, the requirements of Section 11175 – Pumps, General, shall govern.

1.4 SERVICES OF MANUFACTURER

- A. Services of the manufacturer shall be provided in accordance with Section 11175 – Pumps, General, and as follows:
 - 1. Inspection, Startup and Field Adjustment: An authorized service representative of the manufacturer shall visit the site for not less than one day to check the installation, supervise start-up, and supervise testing and adjustment of pumps.

2. Instruction of OWNER'S Personnel: The authorized service representative shall instruct the OWNER'S personnel in the skills required for each Trade Group indicated and the duration indicated. This includes all aspects of pump operation and maintenance, including step-by-step troubleshooting procedures with necessary test equipment. Instruction shall include, but not be limited to, review of operation and maintenance manual; installation and removal of pumps, motors and shafts; service and replacement of bearings; service and flushing of seal water system; replacement and service of seals; daily maintenance requirements; and long-term maintenance provisions. Instruction of the OWNER'S personnel shall be conducted separate from the start-up and testing activities. Each of the OWNER'S Trade Groups will be instructed individually, and no more than six hours will be scheduled in one day. Durations of instruction are:

<u>Trade Group</u>	<u>Class Hours</u>	<u>Field Hours</u>
Electricians	3	3
Electronics Technicians	3	3
Operations	3	3
Plant Maint. Technicians	3	3

1.5 SHOP DRAWINGS AND SAMPLES

- A. Submittal requirements shall be as set forth in Sections 01300, 11000 and 11175.

1.6 OWNER'S MANUAL

- A. OWNER'S MANUAL requirements shall be as set forth in Sections 01300 – Contractor Submittals, 11000 – Equipment General Provisions, and 11175 – Pumps, General.

1.7 FACTORY TESTS:

- A. Each pump shall be factory tested in accordance with the requirements established in Section 11175 – Pumps, General, and shall be a witnessed test.

1.8 PUMPED FLUID AND OPERATING CONDITIONS:

- A. Pumped Fluid: The fluid to be pumped is raw municipal wastewater and is anticipated to range between 64 and 78 degrees F and contain up to 300 mg/l of solids consisting of stringy material, rags, plastics, wood, tramp iron, grit and organic material with small quantities of petroleum products and animal fats and greases. Owing to the presence of grit, the fluid is expected to be somewhat abrasive.
- B. Installation Environment: The pumps will be installed in a dry pit and obtain the fluid to be pumped via the indicated piping connected to a trench type wet well.
- C. System Operation: The pump will be operated by the control system specified in Section 16160 that will start the pump.

1.9 PERFORMANCE CRITERIA:

- A. Performance of pumps furnished under this Section shall be guaranteed under the terms of paragraph 11175-1.7C. Field vibration shall be measured in accordance with requirements specified in Section 11175. Non-conforming pumps will be rejected.

1.10 FIELD TESTS:

- A. Each pump shall be field tested in accordance with the requirements established in Section 11175 – Pumps, General. In addition, each pump shall be operated under normal operating conditions for a period of at least seven days to ensure proper installation and operation.

PART 2 - PRODUCTS

2.1 SPS 84 (Three total: two pumps, motors and drive shafts installed, one spare pump, motor and shaft).

A. Operating Conditions:

1. Condition A: Maximum Head Operation (C=110) (See Notes a and d):

Capacity, gpm - 1225
Total head, feet - 257

2. Condition B: Minimum Head Operation (C=140) (See Notes b and d):

Capacity, gpm - from pump H/Q curve (approx. 1400 gpm)
Total head, feet - 250

3. Condition C: Operation versus System Curve using C=130 (See Notes c and d):

Capacity, gpm - from pump H/Q curve (approx. 1340 gpm)
Total head, feet - 252

NOTES:

- a. *Condition A shall be taken as the rated, continuous-duty operating condition with the pump operating **against maximum anticipated system head**. Performance at the rated condition shall be guaranteed in accordance with Section 11175. **Condition A shall be used for pump selection**. Condition A has been selected to obtain the rated pumping capacity for the installation. It is not intended that the pumps be selected for maximum efficiency at Condition A. Pumps furnished under this Section shall be selected to achieve Condition A performance, but also operate continuously without objectionable vibration or cavitation at the head specified under Conditions B and C. Condition A shall be located in the Allowable Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.*
- b. *Condition B head is presented to indicate operating conditions when the pump is operating alone **at minimum anticipated system head**, assuming a hypothetical head-capacity curve. Pumps with head-capacity curves steeper than that assumed will produce less flow at lower head. The reverse will occur with pumps having a shallower head-capacity curve. **Condition B shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.***
- c. *Condition C is presented to indicate operating conditions with a system Hazen-Williams headloss coefficient of C=130. Condition C shall be located within the Allowable Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.*

- d. *Total head in the above tabulation is the algebraic difference between the discharge head and suction head as defined in ANSI/HI 1.1 B 1.6. Net positive suction head available (NPSHA) in the above tabulation is referred to the pump inlet piping at centerline elevation (project datum) as shown and is calculated in accordance ANSI/HI 1.3 for average barometric pressure and maximum temperature conditions. NPSHA at the pump impeller eye can be determined by adjusting the given value by proposed pump dimensions and the indicated requirements for pump installation details. An allowance of five feet has been included for the presence of volatile constituents in the pumped fluid. Required NPSHA margin shall be as specified in Section 11175.*

B. Design Requirements:

1. Minimum solid sphere capable of passing through pump (in. dia.) - 3
2. Min pump efficiency at maxspeed, (percent) - 64
3. Max pump speed (rpm) - 1,790
4. Min motor size (hp) - 150
5. Max motor speed (rpm) - 1,800
6. Min flywheel moment of inertia (lb-ft²) - 600

C. Pump Dimensions:

1. Min size of suction flange (in) - 5
2. Min size of discharge flange (in) - 4
3. Flange rating (psi) – 250 (Class 150)

2.2 PUMP REQUIREMENTS

- A. General: Construction of vertical non-clog pumps shall conform to the requirements set forth in Section 11175, except as described in the following paragraphs. The pumps shall be provided with suitable lifting hooks and a hoist sling, if required, so that each pump can be removed in one piece.
- B. Materials:
 1. Seal - Mechanical seal per Section 11175 – Pumps, General.
- C. Drive: Vertical, heavy-duty, electric motor suitable for 3-phase, 60-Hz ac power supply, in accordance with Section 16040 – Electric Motors. The motor shall be connected to the pump by an extension shaft and be mounted on the flywheel enclosure in the dry well motor room.
- D. Equipment Features:
 1. Impeller and Casing: The impeller shall be an enclosed non-clog Francis or mixed-flow configuration with two or three vanes and front and rear shrouds. Semi-open impellers will not be allowed. The leading edges of the impeller vanes and casing cutwater shall be smooth and rounded and configured to avoid accumulation of stringy materials and to pass solids. Impeller passages shall be designed specifically to pass solids found in unscreened municipal wastewater and to avoid cavitation. Vane overlap shall be

minimized to permit efficient release of solids to the volute passages. All water passages shall be smooth and free from hollows, cracks, pin holes and projections. The impeller shall be firmly keyed to the shaft and held firmly in place by a threaded, cast stainless steel locknut designed to prevent stringy material from catching on it. Impeller shall be designed to provide positive pressure above atmospheric to the stuffing box area. Provide fusion bonded epoxy coating on impeller, interior of bowl and all water passages.

2. Pump Casing Support: The pump casing shall be designed to be supported on fabricated steel support frames. Details of the mounting system shall conform to the requirements of Section 11002 – Equipment Supports, Grouting and Installation
3. Backhead: The backhead shall be self-centering and shall permit back pullout. All horizontal surfaces in the backhead shall be sloped to the drain connection.
4. Pump Frame: The frame shall be designed to distribute forces from the bearing housings into the casing. Openings in the frame shall be provided to permit access to the seal. The connection between the backhead and frame shall have self-centering and registering fits. Tubular bearing frames will not be permitted. A tapped drain connection shall be provided to permit field connection to an external drain. The seal box shall be drilled and tapped for seal flushing.

2.3 INTERMEDIATE SHAFTING

- A. Furnish intermediate extension drive shafts equipped with universal flexible couplings to connect motors with pumps.
- B. Provide with a slip-spline joint at the pump end, permitting the removal of pump rotating assembly without removing shafting or suction or discharge piping.
- C. Provide shafting and bearing designed for continuous 24-hour duty for the entire speed range indicated and specified.
- D. Provide bearings for a minimum B-10 life of 50,000 hours at full driver horsepower and maximum speed.
- E. Securely key companion flanges on pump and motor shafts to shafts.
- F. Material:
 1. Steel.
 2. Manufactured utilizing a composite torque tube designed and fabricated using the filament winding process. Metallic shafts are not acceptable.
 - a. Tube materials: Graphite and/or B class fibers in an epoxy resin matrix. The resin shall be corrosion resistant epoxy thermoset plastic. The tube's outer surface shall contain a resin rich thermoplastic layer to provide resistance to impact damage. No holes shall be allowed between the end fitting stub and the tube inner surface.
 - b. Metal-composite connection: Compression fit and provide torsional strength that is higher than the strength of the composite torque tube. Adhesive or riveted joints are not acceptable.

- G. Provide the tube diameter sized to avoid all first and secondary critical speeds throughout the running speed range. In addition, shafting shall avoid any torsional natural frequency.
 - 1. Submit calculations, for information only, verifying both lateral and torsional critical speeds for the entire rotating assembly including motor, shafting and pump.
 - 2. Dynamically balance shafting to ½ ounce-inch per of shafting to ½ ounce-inch per of shaft weight per end. Units shall be balanced at maximum RPM specified and indicated. Shafting sections shall be match marked to maintain balance after onsite installation.
- H. Shafting manufacturer shall have at least five similar applications currently in operation for a minimum of 3 years.
- I. Provide full height Type 316 stainless steel safety guards. Safety guards must be equipped with a full height hinged access door to permit the shaft to be swung out of the way for pump disassembly. Guard shall be of sufficient strength to contain a swinging, broken rotating drive shaft.
 - 1. Hardware: Type 316 stainless steel.
- J. Furnish all steady bearings and supports required for extended shaft applications.
- K. Provide lubrication system for shafting which permits greasing from accessible locations.

2.4 FLYWHEEL ASSEMBLIES

- A. Flywheel assembly shall have an individual moment of inertia great enough that the total combined moment of inertia for the complete rotating assembly of components of the motor/pump set, including entrained water, pump rotor, shafting, couplings, and motor rotor, add up to the total moment of inertia specified.
- B. The flywheel shall consist of cast or fabricated steel weight in the form of a torus with supporting struts, keyed and locked on a shaft supported by bearings at each end of the shaft. If cast construction is used, the struts and weight shall be cast as a unit. If the weight is to be fabricated steel, it shall be machined from a single billet to the diameter and shape required. All flywheels shall be stress relieved after balancing. The size of the weight and the distance of the torus centroid from the center of the shaft shall be sufficient to achieve the overall rotating moment of inertia specified for the pump rotating system. Cantilevered designs employing only one set of bearings are not permitted. Bearings shall be selected in accordance with ABMA 9 or 11 for an L-10 life of not less than 100,000 hours. Input and output bearings shall be held in place by rigid fabricated steel struts. The entire rotating assembly shall be balanced in accordance with Sections 11000, Equipment General Provisions, and 11005, Machine Alignment, and shall be furnished with a fabricated steel enclosure designed to provide protection against accidental entry of tools or other objects and to provide enclosure protection in accordance with OSHA requirements.
- C. The flywheel enclosure shall have an outside width of at least that of the motor, but not greater than 150 percent of the motor's width. The housing shall match the quality of the motor enclosure and shall be equipped with at least two lifting eyes. A mounting pad shall be located on the upper portion of the flywheel housing to permit installation of vibration detector. The flywheel bearing housing shall be supported independently by a rigid frame to maintain alignment.

- D. Vertical flywheel assemblies supporting the electric motor shall have a frame designed to support the weight of the motor in accordance with the design requirements of this section. The flywheel assembly shall be extended to carry a support plate which shall be rabbetted to provide self-aligning features with the motor base. The frame extension shall have access openings to permit assembly/disassembly of the motor output shaft coupling.

2.5 MANUFACTURERS

- A. Pursuant to the limitations described in paragraph 11000-2.1.D, candidate pump manufacturers include Yeomans Chicago, Fairbanks Morse, Flowserve, Morris, and ITT Flygt A-C, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Pumping equipment shall be installed in accordance with approved procedures submitted with the shop drawings and as indicated.
- B. General installation requirements shall be as indicated in Section 11175 – Pumps, General.

**** END OF SECTION ****

SECTION 11290 - HYDRAULIC GATES, GENERAL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing flap gates, slide and stop gates, sluice and shear gates with operators and accessories.
- B. The WORK also requires that one manufacturer accept responsibility for furnishing all gates of each type as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibility for each type of gate shall manufacture all gates of that type.
- D. The WORK of this Section applies to the WORK of the following Sections:
 - 1. Section 11291 Flap Gates
 - 2. Section 11293 Sluice and Shear Gates

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions

1.3 SPECIFICATIONS AND STANDARDS

- A. Specifications and standards shall comply with Section 11000 and shall include the following:
 - 1. ANSI/AWWA C560 Cast Iron Slide Gates
 - 2. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
 - 3. ASTM A 276 Specifications for Stainless Steel Bars and Shapes
 - 4. ASTM F 593 Specification for Stainless Steel Bolts, Hex Cap Screws and Studs
 - 5. ASTM F 594 Specification for Stainless Steel Nuts
 - 6. ASTM B 21 Specification for Naval Brass Rod, Bar and Shapes
 - 7. ASTM B 98 Specification for Copper-Silicone Alloy Rod, Bar and Shapes
 - 8. ASTM B 584 Specification for Copper Alloy Sand Castings for General Applications

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000 – Equipment General Provisions, the following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer’s installation instructions.
 - 2. Schedule of gates indicating gate identification and location.

1.5 OWNER'S MANUAL

- A. In addition to the requirements of Section 11000 – Equipment General Provisions, the following shall be submitted in compliance with Section 01300 – Contractor Submittals.
 - 1. Manufacturer's installation instructions.
 - 2. List of special tools.
 - 3. Schedule of gates indicating gate identification and location.
 - 4. Certification by CONTRACTOR and manufacturer that products comply with the indicated requirements.

1.6 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000 – Equipment General Provisions when listed in specific gates sections.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Hydraulic gates and their components shall comply with Section 11000 – Equipment General Provisions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall comply with the manufacturer’s installation instructions, Section 11000 – Equipment General Provisions, this Section, and the requirements of the individual gates sections.

**** END OF SECTION ****

SECTION 11291 - FLAP GATES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing flap gates with wall thimbles, bracing, mountings, gaskets, sealants, and coatings.
- B. The WORK also requires that one manufacturer accept responsibility for furnishing all gates as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibility shall manufacture all the flap gates.

PART 2 - PRODUCTS

2.1 FLAP GATES

- A. Design: Flap gates and frames shall be fabricated of cast iron with fully-adjustable top pivot points and bronze sealing surfaces. Gate frames shall be designed with flat backs for attachment to wall thimbles, except as otherwise indicated. Hinges, hinge pins and fasteners shall be Type 316 stainless steel.
- B. Wall Thimbles: Except as otherwise indicated, flap gates shall be mounted against wall thimbles with Type 316 stainless steel bolts and sealant or gaskets. Thimbles shall be of the cast iron F-pattern type designed to match the thickness of the walls in which installed. Thimbles and gates shall have matching bolt hole dimensions.
- C. Epoxy Coating: Ferrous parts of the gates, frames, and wetted parts of thimbles shall be epoxy-coated complying with Section 09800 – Protective Coating.
- D. Sealant: The elastomeric sealant shall be as manufactured by the following (or equal):
 - 1. Sika
- E. Grout: Gates mounted on concrete walls without wall thimbles shall be installed with one-inch of non-shrink grout between the wall and the gate flange. The anchor bolts and nuts shall be of Type 316 stainless steel.

2.2 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):
 - 1. Hydro Gate Corp., Model 50C
 - 2. Rodney Hunt Company, Series FV-AC

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Flap gates shall be installed in accordance with the manufacturer's written instructions and as indicated.
- B. Prior to setting each gate, a 1/8-inch thick layer of mastic grade polysulfide elastomeric sealant shall be applied to the back of the gate frame. After setting the gate, the nuts shall be run down on the anchor bolts far enough to make them snug and to cause the rubber sealant to begin to ooze out but without causing stress in the frame. Excess sealant at the edges shall be removed. The sealant shall be allowed to cure for at least 7 days, after which the anchor bolt nuts shall be tightened to their final positions. If gaskets are installed, they shall be installed over the studs in one piece, or dovetailed, and cemented with a liquid-type gasket material.

** END OF SECTION **

SECTION 11293 - SLUICE AND SHEAR GATES

PART 1 - GENERAL

1.1_ WORK OF THIS SECTION

- A. The WORK of this Section includes providing sluice and shear gates, where indicated, with operators, frames, wall thimbles, bracing, mountings and coatings.
- B. The WORK requires that one manufacturer accept responsibility for furnishing all gates of one type as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibility for a certain type of gate shall manufacture all gates of that type.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11290 Hydraulic Gates, General
 - 2. Section 15101 Valve and Gate Operators

1.3 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11290 – Hydraulic Gates, General, the following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's certification that frames and slides have been tested and withstand the maximum heads indicated.

PART 2 - PRODUCTS

2.1 SLUICE GATES

- A. General: Gates shall be new and of current manufacture and they shall be adequately braced to prevent warping and bending under the intended usage. Gates shall be furnished with an electric motor-operated floor-stand mounted except as otherwise indicated and shall have 2:1 gear ratio. Gates shall comply with ANSI/AWWA C560, except as otherwise indicated.
- B. Coating: Gates, wall thimbles, and accessories shall be epoxy-coated complying with Section 09800 – Protective Coating. Machined surfaces shall be protected during sandblasting and coating.
- C. Frames and Slides: Gate frames and slides shall be manufactured of cast iron. Slides and frames shall have machined seating faces, and the maximum clearance between seating surfaces, with the slide in the closed position, shall be 0.004 inches. Sufficient adjustable wedging shall be included to ensure proper watertightness complying with ANSI/AWWA C560. Seating faces shall be of Naval bronze complying with ASTM B21 and fasteners, anchor bolts, studs, and adjusting screws shall be stainless steel complying with Section 05500 – Miscellaneous Metalwork. Operating nuts shall be of bronze conforming to ASTM B 584.

- D. Stems: Stems shall be of Type 316 stainless steel conforming to ASTM A 276 and shall be provided with adjustable bronze bushed stem guides designed to ensure that the L/R ratio of the stem does not exceed 200.
- E. Operating Mechanism:
 - 1. General: Operators shall be weatherproof, equipped with stem covers, and shall be mounted on cast-iron or fabricated steel pedestals. The pedestal shall have base or bracket area designed to distribute the load to the supporting concrete structure. The center line of the operator shall be approximately 3 feet above the base of the pedestal. Sluice gate hoist heads shall be cast iron. The operating nut shall be of solid bronze conforming to ASTM B 584. Roller or ball bearings shall be included for thrust. Bearings and stem shall be provided with a lubrication system. Clockwise movement of the handwheel shall close the gate.
 - 2. Electric Motor Operators: Electric motor operators shall be provided, where indicated, as per recommendations of the gate manufacturer and in accordance with the provisions of Section 15101.
- F. Wall Thimbles: Except as otherwise indicated, sluice gates shall be provided with cast iron, F-pattern, wall thimbles to match the thickness of the walls in which they are installed. These thimbles shall be supplied by the manufacturer of the gates, and they shall fit the bolt dimensions of the gates. All studs shall be of stainless steel Type 316 complying with Section 05500 – Miscellaneous Metalwork.
- G. Sealant: The sealant shall be a Butyl Rubber Acetate mastic as recommended by the manufacturer of the gates.
- H. Grout: Gates mounted against concrete walls without wall thimbles shall be installed with one inch of non-shrink grout between the wall and the gate flange. The anchor bolts and nuts shall be of Type 316 stainless steel.

2.2 SHEAR GATES

- A. Construction: Shear gates shall be constructed with cast iron and include bronze seat and disc rings, and flanged frame equipped with a minimum 3-ft handle with wall hook. Ferrous parts of the gate and frame shall be shop coated with epoxy complying with Section 09800 – Protective Coating. Mounting hardware, if required, shall be stainless steel Type 316 complying with Section 05500 – Miscellaneous Metalwork.

2.3 MANUFACTURERS

- A. Gates shall be manufactured by one of the following (or equal):
 - 1. Sluice Gates:
 - Rodney Hunt;
 - Hydro Gate Corp.;
 - Waterman Industries.
 - 2. Shear Gates:
 - Mueller,
 - Waterman

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall comply with the manufacturer's written instructions and as indicated.
- B. Prior to setting each gate, a 1/8-inch thick layer of mastic grade polysulfide elastomeric sealant shall be applied to the back of the gate frame. After setting the gate, the nuts shall be run down on the anchor bolts far enough to make them snug and to cause the rubber sealant to begin to ooze out but without stress on to the frame. Excess sealant at the edges shall be removed. The sealant shall be allowed to cure for at least 7 days, after which the anchor bolt nuts shall be tightened to their final positions. If gaskets are being used, they shall be installed over the studs in one piece, or dovetailed and cemented with a liquid-type gasket material.

3.2 FIELD TESTING

- A. Sluice gates shall be tested for leakage in accordance with the provisions of ANSI/AWWA C560. Leakage allowance for gates shall not exceed 0.1 gpm/ft of seating perimeter under 20 feet of seating head, and 0.2 gpm/ft under 20 feet of unseating head.
- B. If leakage exceeds the indicated criteria, modifications and corrections shall be made under the supervision of manufacturer's representative at no additional cost to the OWNER.

**** END OF SECTION ****

SECTION 14600 - HOISTS AND CRANES, GENERAL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for hoists and cranes.
- B. The WORK of this Section applies to the WORK of the following Sections:
 - 1. Section 14630 Bridge Cranes
 - 2. Section 14635 Jib Cranes
 - 3. Section 14640 Mobile Lifting Cranes
- C. The WORK requires that one manufacturer accept responsibility for furnishing the WORK as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- D. The WORK additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the major components of the equipment.
- E. The WORK also includes coordination of design, assembly, testing and installation.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 05120 Structural Steel
 - 2. Section 11000 Equipment, General Provisions

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
 - 2. AGMA American Gear Manufacturers Association
 - 3. ANSI B30.11 Monorails and Underhung Cranes – Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
 - 4. ANSI B30.16 Overhead Hoists (Underhung)
 - 5. ASTM A 36 Specification for Carbon Structural Steel
 - 6. CMAA Crane Manufacturer's Association of America
 - 7. NEMA National Electrical Manufacturers Association

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000 – Equipment General Provisions, the following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop drawings indicating electrical requirements, weights, loads, dimensions and clearances.

1.5 OWNER'S MANUAL

- A. In addition to the requirements of Section 11000 – Equipment General Provisions, the following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Certification by CONTRACTOR and manufacturer that equipment complies with the indicated requirements.

1.6 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000 – Equipment General Provisions, when listed in specific hoists and cranes sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Equipment shall be manufactured by one of the following (or equal):
 - 1. Abell-Howe Company (Columbus McKinnon)
 - 2. ACCO Babcock, Inc., (Wright)
 - 3. TC/American
 - 4. Gorbelt Cleveland Tramrail
 - 5. Lift Tech International, Inc.
 - 6. Yale (Columbus McKinnon)
 - 7. Thern, Inc., (Cal South Equipment Co.)
 - 8. B.E. Wallace Products Corporation
 - 9. OTC (SPX Corporation)
 - 10. Spanco Inc.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Hoists and cranes shall be installed in accordance with the manufacturer's installation instructions, Section 11000 – Equipment General Provisions, this Section, and the requirements of the individual hoists and cranes sections.

3.2 FIELD TESTING

- A. The CONTRACTOR shall field test all hoists and cranes to verify their rated load-carrying capacity.

**** END OF SECTION ****

SECTION 14630 - BRIDGE CRANES

PART 1 - GENERAL

1.1_ WORK OF THIS SECTION

- A. The WORK of this Section includes providing electrically operated bridge cranes of the low headroom type, designed for travel in both directions and mounted on structural sections.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 14600 Hoists and Cranes, General

1.3 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall comply with Section 14600 – Hoists and Cranes, General. The authorized manufacturer's representative shall visit the site for not less than one day.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. **Requirement:** The bridge crane system shall be controlled from a pendant pushbutton station and shall include safety devices and overload protection. The power supply shall be from enclosed, UL-approved conductor bar systems. The rails shall be standard I-beams, or fabricated steel sections anchored to the structure as indicated and as required by the IBC for seismic loads. The track deflection shall not exceed 1/800 of the span, or 1-1/4 inches, whichever is less. The crane system, except the tracks, shall be the product of a crane manufacturer regularly engaged in the manufacture of such equipment.

- B. **Site Conditions:** The bridge crane shall comply with the following:

Equipment No.	BC-1
Location	Motor Room
Atmosphere	Indoors

- C. **Design Criteria:** The bridge crane system shall comply with the following:

Equipment No.	BC-1
Type of Crane	Underhung
Type of Bridge	Single beam
Capacity (tons)	3
Maximum lift (feet)	40

Length of track (feet)	24
Length of bridge (feet)	14
Span between tracks (feet)	12
Speed Control	Single Speed
Lifting Speed (fpm)	15
Trolley Speed (fpm)	65
Bridge Speed (fpm)	65
Hoist Motor (hp)	4
Trolley Motor (hp)	0.5
Bridge Motor (hp)	0.5
Power Supply (V-ph-Hz)	480-3-60

2.2 FABRICATION

- A. Hook and Wire Rope: The lifting hook shall be fabricated of drop-forged, heat-treated steel and shall include 360-degree swivel on a shielded roller thrust bearing with safety spring latch. The wire ropes shall be fabricated of plow steel with steel center complete and shall include swaged fittings.
- B. Hoist and Drive: The hoisting drum shall be deep grooved flanged drum with at least 2 full turns of rope remaining on the drum at the lowest hook position and shall include heavy-duty pre-lubricated sealed bearings. The drum shall be driven by a helical gear reducer with external spur drum gear enclosed in an oil-tight housing. The housing motor shall be a standard, 30-minute duty-motor, 1750 rpm, with NEMA-type shaft extension. The hoisting mechanism shall include dc magnet-actuated disc motor brake with hook drift. The motor shall be rated at minimum of 150 percent of full load torque, with gravity type upper and lower hook limit switch, and an overload cut-off switch designed to interrupt the raising circuit.
- C. Trolley Assembly: The trolley assembly shall be a underhung type. The trolley assembly shall be supported by trolley wheels with tapered tread surfaces hardened to 375 to 425 Brinell. Each wheel shall be supported on tapered roller bearings suitable to take radial and thrust loads. The wheel mounting shall be designed so that axles and wheels can be removed without affecting alignment. The wheel tread shall be smooth, true, and uniform within 0.010-inch tread diameter on all wheels.
- D. Trolley Drive: The trolley shall be driven by a 30-minute-duty-cycle rated motor with oil-tight gear reducer conforming to NEMA Specifications. The motor shall include cushion start and controller designed for smooth travel and load control. The driver shall provide synchronous drive from gear reducer to both drive wheels. The trolley drive shall include integrally mounted spring set and an electrically-released drag brake.
- E. Crane Bridge Assembly: The crane bridge assembly shall be a single beam over-riding or top-running double beam center-drive type. The bridge beam shall be designed in accordance with the specifications of the Crane Manufacturers Association of America. It shall be fabricated of standard structural shapes complying with AISC Specifications. At full load,

the beam shall be designed to limit the deflection to 1/600 of the span, but not to exceed 1-1/4-inch maximum deflection. An ASCE rail shall be provided on top of the beam securely fastened in place to maintain center distance. Provision shall be made to prevent creeping of bridge rails by means of positive stops at the ends of the rails. Crane shall be reinforced with outrigger to provide squareness with end truck, adequate lateral stiffness with a minimum lateral moment of inertia of 1/20 that of the vertical beam. Outrigger shall be designed to support squaring shaft and the crane drive motor and gear reducer assembly.

- F. End Trucks: The end trucks shall be traversed by stable assembly of structural shapes welded together to provide proper wheel and bearing alignment. The end truck wheel base shall be minimum of 1/7 of the crane span. One wheel of each end truck shall be geared and meshed with the pinion mounted on the crane squaring shaft. The crane and trucks shall contain diaphragm members welded to truck frames to maintain alignment and distribute truck loads on inner and outer truck members. The truck shall be designed so that, in case of a wheel axle or wheel failure, the drop of the load will be limited to one inch. The end trucks shall be fastened to the bridge beams with bolts to ensure alignment.
- G. Crane Wheels: Crane wheels shall have tread surfaces hardened to 375 to 425 Brinell. Treads shall be tapered to provide proper running alignment. Each wheel shall be supported on tapered roller bearings mounted on stationary axles, designed for radial and thrust loads. The wheels shall be lubricated at the factory with a sodium base grease, and shall include adequate reservoir of lubricant to eliminate the need for field lubrication. Wheel axles must have mounting nuts for bearing adjustment. Wheel mounting shall be designed so that axles and wheels can be removed without disturbing alignment. Wheel treads shall be smooth, true, and uniform within 0.01-inch tread diameter on all wheels.
- H. Crane Drive: The crane drive motor shall be totally enclosed, 30-minute cycle rated. The motor shall be integral with a fully enclosed oil splash lubricated gear reduction. The motor, the drive shaft, and the gear reduction shafts shall be supported by permanently lubricated precision ball or roller bearings. The drive shaft shall provide synchronous drive from the gear reduction to both end trucks. The crane drive shall include integrally-mounted spring set electrically released dc rectified disc brake.
- I. Drive Shaft: The drive shaft of the crane shall be supported on lubricated, precision, ball-bearing pillow blocks on 10-ft maximum centers. Pillow blocks shall be lubricated through pressure grease fittings. The crane drive shaft shall be steel and designed to limit torsional shaft stress to 6,000 psi. Maximum torsional twist angle in the drive shaft shall not exceed one degree of the wheel rotation under maximum rated load.
- J. Bearing Life: Bearings in crane wheels and bearings supporting the drive and gear reduction shafts shall be designed for 5,000 hrs L-10 bearing life minimum.
- K. Gearing: Gears shall be cut from solid blanks with 20-degree pressure angle involute shape for high strength and shall comply with AGMA specifications for load ratings. Gears operating at higher than 20 fpm pitch line speed shall be fully enclosed in oil-tight housings and lubricated by splash principle. Gear teeth shall have ductile cores and be surface hardened to RC40 minimum. The gear shall provide for a minimum service of 4,000 hr.
- L. Bridge Stops: The bridge shall be provided with bumpers capable of stopping the crane (not including the lifted load) at a rate of deceleration not to exceed 3 fps² when traveling in either direction at 20 percent of rated speed. The bumpers shall have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40 percent of the rated load speed. Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the crane wheel.

- M. Runway Beams and Rails: The runway beams and rails shall comply with the indicated requirements. The rails shall be an ASCE type securely fastened into the runway beams. The runway beams shall be designed from an ASTM A36 structural steel shape and shall have a maximum deflection not to exceed 1/800 of the span. The beams shall be equipped with stops on both ends capable of withstanding the impact of the fully loaded crane at 50 percent of rated speed, and shall be field-adjustable. Necessary column supports or clamps, hanger rods, bolts, and fittings shall be provided.
- N. Electrical Controls: Electrical controls shall be single-speed or multiple-speed as recommended by the manufacturer. Bridge control shall include a mainline magnetic contactor, manually-operated fused mainline disconnect with lock-out provisions, branch circuit fuses, reversing bridge control, and transformer with fused secondary. Bridge control shall be mounted on bridge in an enclosure, NEMA rated in accordance with the area designations of Section 16050, actuated from a pendant pushbutton station suspended from movable trolley, by means of a retractable cable to permit operation at 4 feet above all floor levels. Motors shall include cushion start.
- O. Conductor and Wirings: The runway shall be provided with enclosed conductor base electrification. The bridge shall have a rigid truck festoon type electrification. Other wiring of the crane shall be in rigid or flexible conduit and in accordance with National Electrical Code and complying with Fire Underwriters specifications. When a crane is shipped knocked down, the wiring shall terminate in terminal boxes and the wire end shall be provided with permanent marking tags.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Bridge cranes shall be installed in accordance with Section 14600.

**** END OF SECTION ****

SECTION 14635 - JIB CRANES

PART 1 - GENERAL

1.1_ WORK OF THIS SECTION

- A. The WORK of this Section includes providing wall mounted, cantilever type jib crane with chain operated hoist.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 14600 Hoists and Cranes, General

1.3 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall comply with Section 14600. The authorized manufacturer's representative shall visit the site for not less than one day.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Site Conditions: The jib crane shall comply with the following:

Equipment No.	JC-1
Location	Pump Room
Atmosphere	Indoors

- B. Design Criteria: The jib crane assembly shall comply with the following:

Equipment No.	JC-1
Type of Hoist	Underhung
Capacity (tons)	1
Maximum lift (feet)	10
Length of jib (feet)	8

2.2 FABRICATION

- A. Hook: The lifting hook shall be fabricated of drop-forged, heat-treated steel and shall include 360-degree swivel on a shielded roller thrust bearing with safety spring latch.
- B. Hoist: The hoist shall be a heavy duty, low headroom, hand chain hoist of the capacity listed above. It shall be a high speed, spur gear, aluminum alloy unit, equipped with load limiters for automatic overload protection, with fully enclosed brake and safety hook. The hand chain shall reach to 4 feet above floor.

- C. Trolley: The hoist shall be suspended from a geared hand chain trolley of the same capacity as the hoist. The trolley shall have steel side plates, a strong, forged yoke, and four wheels to fit the I-beam. The hand chain shall reach to 4 feet above floor.
- D. Bearings: Bearings shall be anti-friction type, lifetime pre-lubricated and sealed.
- E. Crane: Jib crane shall provide minimum coverage of 180 degrees rotation. Crane shall be of cantilever design with a minimum of two wall supports. Crane pivot fittings shall have bronze bushings and bronze thrust washers. The rails shall be an ASCE type. The rails shall be equipped with stops on both ends capable of withstanding the impact of the fully loaded hoist.

2.3 MANUFACTURERS

- A. Jib cranes shall be supplied by one of the following (or equal):
 - 1. Gorbel WC200
 - 2. Spanco Series 300

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Jib cranes shall be installed in accordance with Section 14600.

** END OF SECTION **

SECTION 14640 – MOBILE LIFTING CRANES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing hydraulic operated mobile lifting crane , complete and operable, having adjustable reach and height, suitable for conveyance of equipment out of the pump station building.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 14600 Hoists and Cranes, General

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Requirement: The crane shall be capable of passing through the motor room double door while transporting a station pump, motor or other equipment.

- B. Site Conditions: The crane shall comply with the following:

Equipment No.	MLC-1
Location	Motor Room
Atmosphere	Indoors/Outdoors

- C. Design Criteria: The crane shall comply with the following:

Equipment No.	MLC-1
Type of Crane	Wheeled
Capacity (tons)	3
Maximum lift (feet)	11

2.2 FABRICATION

- A. The lifting hook shall be fabricated of drop-forged, heat-treated steel and shall include 360-degree swivel on a shielded roller thrust bearing with safety spring latch. Crane shall have a two-speed hydraulic hand pump, retractable legs, adjustable boom height and a steering dolly with floor lock.

2.3 MANUFACTURERS

- A. Mobile lift cranes shall be supplied by one of the following (or equal):
 - 1. OTC Model 1813

PART 3 – EXECUTION (Not Used)

** END OF SECTION **

SECTION 15000 - PIPING COMPONENTS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing fittings, hangers, supports, anchors, expansion joints, flexible connectors, insulation, lining and coating, testing, disinfection, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 05500 Miscellaneous Metalwork
 - 2. Section 09800 Protective Coating
 - 3. Section 11000 Equipment General Provisions
 - 4. Section 15010 Mill Piping - Exposed and Buried
 - 5. Section 15020 Pipe Supports

1.3 CODES

- A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:
 - 1. International Mechanical Code
 - 2. International Plumbing Code
 - 3. International Fire Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following applies to the WORK of this Section:
 - 1. ANSI/ASME B1.20.1 Pipe Threads, General Purpose (inch)
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings
 - 3. ANSI/ASME B31.1 Power Piping
 - 4. ANSI/AWWA C111 Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - 5. ANSI/AWWA C150 Thickness Design for Ductile Iron Pipe

6. ANSI/AWWA C153 Ductile Iron Compact Fittings for Water Service
7. ANSI/AWWA C207 Steel Pipe Flanges for Water Works Service, Sizes 4 in. Through 144 in.
8. ANSI/AWWA C213 Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
9. ANSI/AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In Through 12 In, for Water Distribution
10. ANSI/AWS B2.1 Specification for Welding Procedure and Performance Qualification
11. ASTM A 123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
12. ASTM A 536 Ductile Iron Castings
13. ASTM D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
14. ASTM D 2000 Classification System for Rubber Products in Automotive Applications

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 1. Shop drawings showing dimensions and details of pipe joints, fittings, fitting specials, valves and appurtenances.
 2. Detailed layout, spool, or fabrication drawings showing pipe spools, spacers, adapters, connectors, fittings, and pipe supports.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:
 1. Manufacturer's product data.
 2. Manufacturer's installation instructions.
 3. Manufacturer's certification of compliance.
 4. Statement from the pipe fabricator certifying that all pipe will be fabricated subject to a Quality Control Program.
 5. Outline of Quality Control Program.

1.7 INSPECTION, TESTING AND WELDING

- A. Inspection: Products shall be inspected at the manufacturer's plant.

- B. Tests: Materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.
- C. Welding Requirements: Welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS B2.1. Welding procedures shall be required for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- D. Welder Qualifications: Welding shall be performed by skilled operators who have had adequate experience in the methods and materials to be used and have been qualified under the provisions of ANSI/AWS B2.1 by an independent approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.

1.8 FACTORY TESTING

- A. Product Testing: Products shall be tested at the factory for compliance with the indicated requirements.
- B. Witnesses: The OWNER and the CONSTRUCTION MANAGER (at the option of either) reserves the right to witness factory tests.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Miscellaneous Small Pipes: Miscellaneous small pipes and fittings shall comply with Section 15010.
- B. Pipe Supports: Pipes shall be properly supported in accordance with Section 15020.
- C. Coating: Pipes above ground or in structures shall be field-painted in accordance with Section 09800.
- D. Pressure Rating: Except as otherwise indicated, piping systems shall be designed for 150 percent of the maximum indicated pressure.
- E. Grooved Piping Systems: Grooved couplings on buried piping must be bonded. Grooved fittings, couplings, and valves shall be from the same manufacturer.

2.2 PIPE FLANGES

- A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-lb class. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall be attached to the pipe in accordance with ANSI/AWWA C207.

- B. Blind Flanges: Blind flanges shall comply with ANSI/AWWA C207. Blind flanges for pipe sizes 12 inches and larger shall include lifting eyes in form of welded or screwed eye bolts.
- C. Flange Coating: Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- D. Flange Bolts: Bolts and nuts shall comply with Section 05500. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs may be used only on valve flange connections where space restrictions preclude the use of regular bolts.
- E. Insulating Flanges: Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.
- F. Insulating Flange Sets: Insulating flange sets shall be provided where indicated and shall consist of insulating gaskets, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall comply with ASTM A 325. Insulating gaskets shall be full-face.
- G. Flange Gaskets: Gaskets for flanged joints shall be full-face, 1/16-inch thick sheets of virgin graded teflon, suitable for temperatures to 550 degrees F, a pH of 0 to 14, and pressures to 1400 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

2.3 THREADED INSULATING CONNECTIONS

- A. General: Threaded insulating bushings, unions, and couplings shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are indicated.
- B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties suitable for the service and loading conditions indicated.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

- A. General: Cast mechanical-type couplings shall be provided where shown. Bolts and nuts shall conform to Section 05500. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized in accordance with the coupling manufacturer's recommendations. The wall thickness of all grooved piping shall conform with the coupling manufacturer's recommendations suitable for the highest pressure indicated.

2.5 SLEEVE-TYPE COUPLINGS

- A. Construction: Sleeve-type couplings shall be installed where indicated and shall include Type 316 stainless steel bolts, without pipe stop, and shall be sized to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to Section 05500. Buried sleeve-type couplings shall be fusion bonded epoxy-coated at the factory. Flanged couplings installed within dry wells shall be restrained with threaded type 316 stainless steel restraining rods connecting across adjacent flanges to prevent lateral movement.

- B. Pipe Preparation: The ends of the pipe, where indicated, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.
- C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer. The rubber in the gasket shall comply with the following:
1. Color - Jet Black
 2. Surface - Non-blooming
 3. Durometer Hardness - 74 ± 5
 4. Tensile Strength - 1000 psi Minimum
 5. Elongation - 175 percent Minimum

The gaskets shall resist deterioration caused by impurities normally found in water or wastewater. Gaskets shall comply with ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as otherwise indicated. Gaskets shall be compatible with the piping service and fluid utilized.

- D. Insulating Couplings: Where insulating couplings are indicated, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to insulate coupling metal parts from the pipe.
- E. Restrained Joints
1. Harnesses for flexible sleeve type couplings shall be in accordance with the requirements of the appropriate reference standards and standard practices.
 2. Mechanical and Push-On Joints: Restraints shall be provided where shown and may be provided in lieu of concrete thrust blocks.
 - a. Mechanical joint restraint mechanisms shall consist of individually activated multiple gripping devices which incorporate breakoff actuating units and permanent nuts for future disassembly. Pressure ratings shall be:
 - (1) Ductile Iron Pipe:
 - (a) 3 to 6 inch diameter: 350 psi (2:1 safety factor)
 - (b) 18 to 48 inch diameter: 250 psi (2:1 safety factor)
 - (2) PVC Pipe:
 - (a) 3 to 36 inch diameter: full pressure rating or pressure class of pipe (2.5:1 safety factor)

- b. Push-on joints for steel pipes shall be in accordance with the appropriate reference standards and standard practice.
- c. Restrained push-on joints for all other pipe materials shall be comprised of two rings with connecting rods. The restraint ring shall be on the spigot, and a plain or slit bell ring shall be on the bell. Pressure ratings shall be:
 - (1) Ductile Iron Pipe:
 - (a) 3 to 16 inch diameter: 350 psi (2:1 safety factor)
 - (b) 18 to 48 inch diameter: 250 psi (2:1 safety factor)
 - (2) PVC Pipe:
 - (a) 3 to 10 inch diameter: 305 psi (2:1 safety factor)
 - (b) 12 inch diameter: 305 psi (2:1 safety factor)
 - (c) 14 to 16 inch diameter: 235 psi (2:1 safety factor)
 - (d) 18 to 30 inch diameter: 165 psi (2:1 safety factor)
 - (e) 36 inch diameter: 125 psi (2:1 safety factor)
 - (3) Dimensions of push-on bell restraints shall be compatible with ANSI/AWWA C150 and C900 for ductile iron or PVC pipe, respectively.
- d. Restraint glands shall be of ductile iron conforming to ASTM A 536. Dimensions of the glands shall be compatible with standard mechanical joint bell and tee head bolts conforming to ANSI/AWWA C111 and C153, respectively.
- e. Bolts and nuts shall conform to Section 05500 – Miscellaneous Metalwork.

2.6 FLEXIBLE CONNECTORS

- A. Flexible connectors shall be provided in all piping connections to engines, blowers, compressors, vibrating equipment, and where indicated. Flexible connectors for service temperatures up to 180 degrees F shall be flanged reinforced neoprene or butyl rubber spools, rated for working pressures of 40 to 150 psi or reinforced flanged rubberized duck, as best suited for the application. For temperatures above 180 degrees F, flexible connectors shall be flanged braided Type 316 stainless steel spools with inner corrugated stainless steel hose rated for minimum 150 psi working pressure unless indicated otherwise. Connectors shall be minimum of 9 inches face to face between flanges. Material selection shall be proposed by the manufacturer based on the application. Provide Type 316 stainless steel retaining rods for all installations.

2.7 EXPANSION JOINTS

- A. Linear Expansion Only: Use expansion loops, bellows-type expansion joints, or sliding type expansion joints of ductile iron, stainless steel, monel, or rubber.
- B. Linear, Angular, and Lateral Movement: Use flexible expansion joints consisting of expansion sleeve and ball-and-socket joints in a single unit. Each unit shall be capable of minimum 15 degrees angular motion in any direction, and the expansion sleeve shall be

capable of minimum 4 inches of linear travel. Joints shall be suitable for the pressure and temperature application and be ductile iron conforming to ANSI/AWWA C153. All surfaces containing pressure and sealing surfaces shall be coated with minimum 15 mils of fusion bonded epoxy conforming to ANSI/AWWA C213.

2.8 PIPE THREADS

- A. Pipe threads shall comply with ANSI/ASME B1.20.

2.9 AIR AND GAS TRAPS

- A. Air and gas pipes shall be sloped to low points, provided with drip legs, strainers and traps. The traps shall be piped to the nearest drain. Air and gas traps shall be 150-lb iron body float type with copper or stainless steel float. Bracket, lever, and pins shall be of stainless steel.

2.10 MANUFACTURERS

- A. Manufacturers: Products of the type or model (if any) indicated shall be manufactured by one of the following (or equal):

- 1. Insulating Flanges:

- JM Red Devil, Type E
 - Maloney Pipeline Products Co. (Calpico)
 - PSI Products GmbH

- 2. Flange Gaskets:

- John Crane, Style 2160
 - Garlock, Style 3000

- 3. Steel Pipe Couplings:

- Victaulic Style 41 or 44 (banded)
 - Victaulic Style 77 or 07 (grooved)

- 4. Ductile Iron Pipe Couplings:

- Victaulic Style 31

- 5. Couplings for PVC Pipe:

- Victaulic Style 775
 - Dresser

- 6. Sleeve-Type Couplings:

- Dresser, Style 38
 - Ford Meter Box Co., Inc., Style FC1 or FC3
 - Smith-Blair, Style 411

- 7. Air and Gas Traps:

- Armstrong International
 - Spirax Sarco, Inc.

8. Mechanical Joint Restraints:

EBA Iron, Inc.

9. Flexible Expansion Joints:

EBA Iron, Inc.

PART 3 - EXECUTION

3.1 GENERAL

- A. Pipes, fittings, and appurtenances shall be installed in accordance with the manufacturer's installation instructions.
- B. Threaded pipe ends and joints shall be epoxy coated in compliance with Section 09800.

**** END OF SECTION ****

SECTION 15010 - MILL PIPING - EXPOSED AND BURIED

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing small steel pipe, stainless steel pipe and tubing, red brass pipe, copper pipe and tubing, and solvent-welded PVC pipe, with fittings, gaskets, bolts, insulating connections, and other specialties required for an operable piping system.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15000 Piping Components

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- 1. ANSI/ASME B16.3 Malleable Iron Threaded Fittings, Classes 150 and 300
- 2. ANSI/ASME B16.4 Gray Iron Threaded Fittings, Class 125 and 250
- 3. ANSI B16.5 Pipe Flanges and Flanged Fittings
- 4. ANSI B16.11 Forged Steel Fittings, Socket-Welding and Threaded
- 5. ANSI B16.12 Cast-Iron Threaded Drainage Fittings
- 6. ANSI/ASME B16.15 Cast Copper Alloy Threaded Fittings, Classes 125 and 250
- 7. ANSI B16.21 Nonmetallic Flat Gaskets for Pipe Flanges
- 8. ANSI B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- 9. ANSI/ASME B16.24 Cast Copper Alloy Pipe Flanges and Flanged Fittings
- 10. ASTM A 53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- 11. ASTM A 105 Specification for Carbon Steel Forgings for Piping Components
- 12. ASTM A 106 Specification for Seamless Carbon Steel Pipe for High Temperature Service
- 13. ASTM A 269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

- | | |
|-----------------|---|
| 14. ASTM A 312 | Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes |
| 15. ASTM B 42 | Specification for Seamless Copper Pipe, Standard Sizes |
| 16. ASTM B 43 | Specification for Seamless Red Brass Pipe, Standard Sizes |
| 17. ASTM B 62 | Specification for Composition Bronze or Ounce Metal Castings |
| 18. ASTM B 88 | Specifications for Seamless Copper Water Tube |
| 19. ASTM D 1785 | Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 |

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's product specifications and performance information.

PART 2 - PRODUCTS

2.1 SMALL STEEL PIPE

- A. Unless otherwise indicated, galvanized steel pipe and black steel pipe in sizes 6 inches in diameter and smaller shall conform to the requirements of ASTM A 53 and ASTM A 106 and shall be Schedule 40 or 80 as indicated. Fittings for galvanized steel pipe shall be of galvanized malleable iron, with NPT or grooved ends as indicated. Black pipe may have welded joints, with standard or extra strong welded fittings unless otherwise indicated in the Piping Schedule.

2.2 STAINLESS STEEL PIPE

- A. Unless otherwise indicated, stainless steel pipe shall be Type 316 Schedule 40 threaded pipe conforming to ASTM A 312 with stainless steel threaded fittings, or with stainless steel welded fittings, where indicated. Lightweight stainless steel pipe shall be Type 316 Schedule 10 pipe conforming to ASTM A 312, with stainless steel welding fittings.

2.3 STAINLESS STEEL TUBING

- A. Stainless steel tubing shall be made of Type 316 L stainless steel to the requirements of ASTM A 269, of minimum 1/4-inch inside diameter, or as indicated, for the test pressure required. The fittings shall be swage ferrule design of Type 316 L stainless steel, of the double acting ferrule design, providing both a primary seal and a secondary bearing force. Flare bite or compression type fittings are not acceptable.

2.4 RED BRASS PIPE

- A. Brass pipe shall conform to the requirements of ASTM B 43. Fittings shall be of bronze conforming to the requirements of ASTM B 62 with threaded ends, conforming to ANSI/ASME B16.15.

2.5 COPPER PIPE

- A. Copper pipe shall be hard drawn, to the requirements of ASTM B 42, with regular or extra strong wall thickness, as required for the test pressure. Copper pipe shall have screwed ends for NPT fittings, or brazed joints. The fittings shall be threaded cast bronze fittings to the requirements of ANSI/ASME B16.15, class 125 or 250, as required, or flanged cast copper alloy fittings to the requirements of ANSI/ASME B16.24, with 150 lbs rating, or as required.

2.6 COPPER TUBING

- A. Copper tubing shall conform to the requirements of ASTM B 88 and shall be Type K, soft temper for buried tubing and hard drawn for above-ground application. Fittings shall be soldered or sweated on and shall be of wrought copper conforming to ANSI B16.22. Soldered joints shall contain 95-percent tin and 5-percent antimony. For oxygen service, joints shall be made with silver solder. No solders or fluxes containing more than 0.2 percent of lead shall be used.

2.7 POLYVINYL CHLORIDE PRESSURE PIPE, SOLVENT-WELDED

- A. Polyvinyl chloride pressure pipe shall be made from all new rigid unplasticized polyvinyl chloride and shall be Normal Impact Class 12454-B, Schedule 80, conforming to ASTM D 1785, unless otherwise indicated. Elbows and tees shall be of the same material as the pipe. Joint design shall be for solvent-welded construction.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Mill piping shall be installed in accordance with the manufacturer's installation instructions.
- B. Small Steel Pipe: Buried galvanized or black steel pipe shall be coated in accordance with Section 09800 or with an extruded high density polyethylene coating with minimum thickness of 35 mils.
- C. Plastic Pipe: Pipe joints shall be solvent-welded in accordance with the manufacturer's instructions. Expansion joints or pipe bends shall be installed to absorb pipe expansion over a temperature range of 100 degrees F, unless otherwise indicated. Care shall be taken to provide sufficient supports, anchors, and guides, to eliminate stress on the piping.

**** END OF SECTION ****

SECTION 15020 - PIPE SUPPORTS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing pipe supports, hangers, guides, and anchors.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 05500 Miscellaneous Metalwork
 - 2. Section 09800 Protective Coating
 - 3. Section 15000 Piping Components

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/ASME B31.1 Power Piping
 - 2. ANSI/MSS SP-58 Standard Pipe Support Components

1.4 SHOP DRAWINGS AND SAMPLES

- A. Submittals shall comply with Section 01300 – Contractor Submittals, and Section 15000 – Piping Components, and shall include:
 - 1. Shop drawings of pipe supports including details of concrete inserts.
 - 2. Structural design calculations.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. General: Piping systems including connections to equipment shall be properly supported to prevent deflection and stresses. Supports shall comply with ANSI/ASME B31.1, except as otherwise indicated.
- B. ANSI/MSS Types: Except as otherwise indicated, pipe support components shall comply with the types in ANSI/MSS SP-58.
- C. Support Spacing: Supports for horizontal piping shall be properly spaced. Except as otherwise indicated, pipe support spacing shall comply with the following:
 - 1. Support Spacing for Schedule 40 & 80 Steel Pipe:

Pipe Size inches	Max. Span feet
1/2	6
3/4 & 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 & 10	19
12 & 14	23
16 & 18	25
20 & Above	30

2. Support Spacing for Copper Tubing:

Tube Size inches	Max. Span feet
1/2 to 1-1/2	6
2 to 4	10
6 & Above	12

3. Support Spacing for Schedule 80 PVC Pipe:

Pipe Size inches	Max Span (@ 100 degrees F) feet
1/2	4
3/4	4
1	5
1-1/4	5
1-1/2	5
2	6
3	7
4	8
6	10
8	11
10	12
12	13

4. Support Spacing for Schedule 80 Polypropylene Pipe:

Pipe Size inches	Max Span (@ 100 degrees F) feet
1/2	3
3/4	3
1	3
1-1/4	4
1-1/2	4
2	4
3	5
4	6
6	7
8	8
10	8
12	9

5. Support Spacing for Fiberglass Reinforced Plastic Pipe:

Pipe Size inches	Max. Span (@ 100 degrees F) feet
2	8
3	10
4	11
6	12
8	13
10	14
12	15
14	16
16	17
18 & Above	18

6. Support Spacing for Ductile Iron Pipe:

Pipe Size	Max. Span
All Sizes	2 Supports per length or 10 feet (One of the 2 supports located at joint)

7. Variances: For temperatures other than ambient temperatures and for other piping materials or wall thicknesses, the above spacings shall be modified in accordance with the pipe manufacturer's recommendations.

8. Additional Supports: Additional supports complying with ANSI B31.1 shall be provided at critical elbows, valves, gauges, and meters.

D. Pipe Hangers: Pipe hangers shall be capable of supporting the pipe, shall allow for free expansion and contraction of the piping, and shall prevent excessive stress on equipment. Hangers shall have a means of vertical adjustment after erection. Hangers shall be designed so that they cannot become disengaged by any movement of the pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading, only.

E. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is indicated, suitable linkage shall be provided to permit movement. Where horizontal pipe movement is greater than 1/2-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from minimum to maximum temperature, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

F. Spring-Type Hangers: Spring-type pipe hangers shall be provided for piping where vibration or vertical expansion and contraction is indicated, (engine exhausts and similar piping). Spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions indicated. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. Supports shall be designed for a maximum variation of 25 percent for the total travel resulting from thermal movement.

- G. Thermal Expansion: Wherever expansion and contraction of piping is indicated, a sufficient number of expansion loops or joints shall be provided, with rolling or sliding supports, anchors, guides, pivots, and restraints. They shall permit the piping to expand and contract freely in directions away from the anchored points and shall be structurally suitable to withstand all loads imposed.
- H. Heat Transmission: Supports, hangers, anchors, and guides shall be designed and insulated so that excessive heat shall not be transmitted to the structure or to other equipment.
- I. Riser Supports: Risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.
- J. Freestanding Piping: Free-standing pipe connections to equipment, including chemical feeders and pumps, shall be firmly attached to fabricated steel frames made of angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps installed to secure piping.
- K. Submerged Supports: Submerged piping shall be supported with hangers, brackets, clips, or fabricated supports and stainless steel anchors complying with Section 05500.
- L. Point Loads: Meters, valves, heavy equipment, and other point loads on PVC, fiberglass, and other plastic pipes, shall be supported on both sides according to manufacturer's recommendations to avoid pipe stresses. Supports on plastic and fiberglass piping shall be equipped with extra wide pipe saddles or galvanized steel shields.
- M. Noise Reduction: To reduce transmission of noise in piping systems, copper tubes shall be wrapped with a 2-inch wide strip of rubber fabric at each pipe support, bracket, clip, and hanger.
- N. Structural Design: Pipe supports, anchors, and restrainers shall be designed for static, dynamic, wind, and seismic loads. The horizontal seismic design force shall be the greater of that indicated in the project Geotechnical Report or the requirement of the IBC.

2.2 COATING

- A. Galvanizing: Fabricated pipe products, except stainless steel or non-ferrous supports, shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM 123.
- B. Other Coatings: Other than stainless steel or non-ferrous supports, supports shall be coated in accordance with Section 09800.

2.3 MANUFACTURERS

- A. Pipe supports shall be manufactured by one of the following (or approved equal):
 1. Basic-PSA
 2. Bergen-Power Pipe Supports, Inc.
 3. ITT-Grinnell Corp.
 4. NPS Industries, Inc.
 5. Powerstrut
 6. Unistrut

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Pipe supports, hangers, brackets, anchors, guides, and inserts shall be installed in accordance with the manufacturer's installation instructions and ANSI/ASME B31.1.
- B. Appearance: Supports and hangers shall be installed to produce an orderly, neat piping system. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings as possible and without interference with other work.

**** END OF SECTION ****

SECTION 15030 - PIPING IDENTIFICATION SYSTEMS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing identification devices for all piping and valves using color bands, lettering, flow direction arrows, and related permanent identification devices, and all appurtenant works. The WORK of this Section also includes providing identification devices for all hazardous materials storage and conveyance facilities.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 09800 Protective Coating
 - 2. Section 10400 Identifying Devices
 - 3. Divisions 2, 11, 13, 15 Piping, Valves, and Appurtenances, as applicable

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI A13.1 Scheme for the Identification of Piping Systems
 - 2. ANSI Z535.1 Safety Color Code
 - 3. MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests
 - 4. NFPA Guide to Hazardous Materials
 - 5. NFPA 704 Hazard Identification System
 - 6. 29CFR 1910.106 Flammable and Combustible Liquids (OSHA)
 - 7. 29CFR 1910.145 Specification for Accident Prevention Signs and Tags (OSHA)
 - 8. 29CFR 1910.1200 Hazard Communication (OSHA)

1.4 CODES

- A. The WORK of this Section shall comply with the following codes in the California Code of Regulations (CCR):
 - 1. CCR, Title 8, § 537 Piping Systems Valving and Labeling (Cal-OSHA)

2. CCR, Title 8, § 3321 Identification of Piping (Cal-OSHA)
3. CCR, Title 8, § 5194 Hazard Communication (Cal-OSHA)

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 1. Samples of all types of identification devices to be used in the WORK.
 2. A list of suggested wording for all valve tags.

PART 2 - PRODUCTS

2.1 IDENTIFICATION OF EXPOSED PIPING

- A. Identification of all exposed interior and exterior pipe, including pipe in accessible ceiling spaces, pipe trenches, pipe chases, vaults and valve boxes, shall be accomplished by complete color coded painting of all visible pipe and its insulation in accordance with Section 09800 and providing marker lettering and color banding as indicated. Stainless steel pipe shall be color coded utilizing bands at 20 feet intervals as specified for identification of hazardous substance conveyance facilities in CCR, Title 8, Section 3321. Certain pipe indicated in paragraph 3.5 also shall be color coded utilizing bands at 20 feet intervals as specified for identification of hazardous substance conveyance facilities in CCR, Title 8, Section 3321.
- B. Each pipe identification shall consist of a printed pipe marker identifying the name of the pipe and a flow arrow to indicate direction(s) of flow in the pipe. All markers shall be preprinted. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Fasteners shall be non-metallic. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C. Markers shall withstand a continuous operating temperature range of minus 40 degrees F to 180 degrees F. Plastic coding markers shall not be the individual letter type, but shall be manufactured and applied in one continuous length of plastic.
- C. Marker and letter sizes shall conform to ANSI A13.1 except as otherwise indicated for hazardous materials identification. Directional arrows shall be the same size as the lettering.
- D. Except as otherwise indicated for hazardous materials identification, markers shall be white with black letters and directional arrows, except for pipes painted white, on which markers shall be blue with white letters.
- E. Pipelines which convey hazardous materials and hazardous materials storage facilities shall be labeled in full conformance with the Cal-OSHA and Federal OSHA regulatory standards, and the guidelines provided in NFPA 704. As a minimum, pipeline identification shall include the chemical name and an appropriate hazard warning using words, pictures, symbols, or a combination thereof to identify flammability, health and reactivity. Placards may be used for hazard warnings, if affixed to the pipes.

2.2 IDENTIFICATION OF EXPOSED VALVES AND SHORT PIPE LENGTHS

- A. Identifying devices for valves, and the sections of pipe that are too short to be identified with preprinted markers, and arrows, shall be plastic tags.

- B. Plastic tags shall be engraved. The minimum tag thickness shall be 1/6-inch; the minimum size of 2-1/2-inch by 2-1/2-inch with 5/32-inch diameter top holes. Color shall be white with black lettering. Minimum lettering height shall be 1/4-inch. All tags shall be designed to be firmly attached to the valves or short pipes or to the structure immediately adjacent to such valves or short pipes.

2.3 LOCATION MARKING OF BURIED PIPES

- A. Identification of buried electrical conduits shall be a 6-inch wide green polyethylene tape imprinted "CAUTION - ELECTRIC UTILITIES BELOW".

2.4 EXISTING IDENTIFICATION SYSTEMS

- A. In installations where existing piping identification systems have been established, the CONTRACTOR shall continue to use the existing system for pipes which convey non-hazardous materials. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the indicated system. The objective is to fully identify all new piping, valves, and appurtenances to the level indicated herein.

2.5 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by the following (or approved equal):
 1. W.H. Brady Co.
 2. Seton Nameplate Corp.

PART 3 - EXECUTION

3.1 GENERAL

- A. All markers and identification tags shall be installed in accordance with the manufacturer's printed instructions, and shall be neat and uniform in appearance. All such tags or markers shall be readily visible from all normal working locations.

3.2 VALVE TAGS

- A. Valve tags shall be attached to the valve or structure by means of self-locking plastic or nylon ties.
- B. Wording on the valve tags shall include both the valve number and a description of the exact function of each valve, e.g., "DHWR-BALANCING," "CLS THROTTLING", "RAS-PUMP SHUT-OFF," etc.

3.3 EXPOSED PIPE IDENTIFICATION

- A. Each exposed pipe shall be identified at intervals of 20 feet, and at least one time in each room. Piping shall also be identified at a point approximately within 2 feet of all turns, ells, valves, and on the upstream side of all distribution fittings or branches. Sections of pipe that are too short to be identified with lettered markers, and directional arrows shall be tagged and identified similar to valves.
- B. Pipe identification shall consist of two to four elements: color coating and/ or banding of the pipe, a lettered marker with a directional arrow; and a hazard warning for pipelines which convey hazardous materials.

3.4 BURIED PIPE

- A. Caution tape for the systems listed in paragraph 2.3A shall be located 2 to 3 feet above the top of the pipe.

3.5 EXPOSED PIPE IDENTIFICATION SCHEDULE

- A. Application of the pipe identification systems shall conform to the following color codes. Marker lettering shall conform to that listed under "Function and Identification."

Fluid Abbr viation	Function & Identification	Identification Color	Remarks Suggested Tnemec Color or Equal
B	Bioxide	Yellow	Safety Yellow
D	Drain	Brown	Banyonbark AC12 (dark brown)
EE	Engine Exhaust	Yellow	Safety Yellow
FA	Foul Air	Off-White	Barbados PA24
NG	Natural Gas	Yellow	Safety Yellow
PRW	Process Water (air-gapped potable)	Light Blue	Clear Sky EN17
PW	Potable Water	White	
RS	Raw Sewage	Grey	Grey IN05
SPD	Sump Pump Discharge	Brown	Banyonbark AC12 (dark brown)
VD	Ventilation Ductwork	Off-White	Barbados PA24

3.6 COLOR IDENTIFICATION FOR EQUIPMENT AND ASSOCIATED PIPING

- A. The paint scheme for other equipment and associated piping shall conform to the following color codes.

Equipment Type	Color
Pumps (Service Pumps)	OSHA Safety Blue
Piping (Service Pump Related)	OSHA Safety Red
Drive Shaft Guard Cage	OSHA Safety Red
General Hazardous Equipment, Valves	OSHA Safety Red
Overhead Crane Rail/Lifting Hook, Davit	OSHA Safety Yellow with Black Striping
General Warning - Equipment	OSHA Safety Yellow
Outside Parking Post	OSHA Safety Yellow with Reflectors
Electrical Conduit	Dark Green
Generator	Manufacturer's Yellow

** END OF SECTION **

SECTION 15034 - GAUGES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing pressure and vacuum gauges, including fittings, snubbers, connections, gaskets, supports, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions
 - 2. Section 15100 Valves, General

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Plumbing Code

PART 2 - PRODUCTS

2.1 PRESSURE AND VACUUM GAUGES

- A. General: Pressure gauges shall be installed on discharge connections to pumps; on discharge connections from blowers and compressors; at each side of pressure reducing valves; and where otherwise indicated. Compound gauges shall be installed on pump suction connections. Vacuum gauges and compound gauges, where indicated, shall be installed on vacuum pumps.
- B. Gauge Construction: Gauges shall have Type 316 stainless steel movement and stainless steel or alloy case. Except as otherwise indicated, gauges shall have a 3-1/2-inch dial, 1/4-inch threaded connection, a Type 316 stainless steel snubber adapter, and a shut-off valve. Gauges shall be calibrated to read with an accuracy of ± 1 percent to 150 percent of the indicated pressure. Gauges shall be vibration and shock resistant. Gauges on liquid service should have cases filled with glycerin. Gauges shall have a safety blow-out relief.
- C. Diaphragm Seal: Gauges attached to systems containing chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids, shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices, and comply with the following:
 - 1. For sewage, sludge, liquids containing solids, pulsating flow:

Seals shall be fabricated with Type 316 stainless steel, with stainless steel diaphragm for pressures over 15 psig, and elastomer diaphragm for pressures of 15 psig and below with Type 316 stainless steel nuts and bolts, fill connection and valved flush port size 1/4-inch NPT, capable of disassembly without loss of filler fluid.

D. Schedule

<u>Location</u>	<u>Pressure Gauge Range</u>
Pump suction	30 in Hg - 15 psig
Pump Discharge	0-200 psig

2.2 ACCESSORIES

- A. General: Provide the specified accessories for all compound, pressure and vacuum gauges.
- B. Each gauge shall be provided with the following accessories:
1. Piping - Type 316 stainless steel and high-pressure rated flexible hose.
 2. Valves - 1-inch stainless steel ball valves.
 3. Air release fitting.
 4. Diaphragm seal and pulsation dampener.

2.3 MANUFACTURERS

A. Pressure and Vacuum Gauges

1. Pressure and vacuum gauges shall be manufactured by:

Ashcroft Industrial Instruments (Dresser)
U.S. Gauge (Ametek)
2. Diaphragm seals shall of the following manufacture and model (or approved equal):
 - a. Stainless steel diaphragm seals and elastomer diaphragm seals for sewage, sludge and liquids containing solids.

Ashcroft, Model 101/301
Marsh/Marshalltown
U.S. Gauge (Ametek)
3. Snubbers shall be manufactured by one of the following (or approved equal):

Cajon Company (Swagelok)
Weksler Instruments, Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Gauges shall be installed in accordance with the manufacturer's installation instructions.
- B. Gauges shall be installed with the face in the vertical position at the indicated locations. Gauges shall be mounted independently on stanchions, with flexible connectors, installed to minimize the effect of water hammer and vibrations.

** END OF SECTION **

SECTION 15050 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing vibration isolation systems for mechanical equipment. Additional vibration isolation system requirements may be included in individual equipment sections.
- B. The WORK also includes coordination of design, assembly, testing and installation.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment, General

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Mechanical Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASHRAE CH 52 1987 Handbook, HVAC Systems and Applications, Sound and Vibration Control

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Static and dynamic deflections, weights, isolator locations, and flexible connector design information.
 - 2. Information on spring deflections and diameters, compressed spring heights and solid spring heights.
 - 3. Curb mounted base seal and wind resistance details.
 - 4. Scale drawing of Type D mounting hanger showing the 30 degree arc capability.
 - 5. Seismic restraint load deflection curves.
 - 6. Qualifications of the engineer who will perform the vibration isolation design.

1.6 OWNER'S MANUAL

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Certified seismic restraint dynamic analysis report.
 - 2. Manufacturer's final inspection report and certification.

PART 2 - PRODUCTS

2.1 GENERAL

- A. **Mounting Requirements:** Unless the equipment incorporates unit construction using an integral rigid frame or is indicated otherwise, each item of mechanical equipment, along with its drive unit, shall be mounted on a rigid steel and concrete base. Cast iron bases are not permitted when equipment is furnished with a vibration isolation system. Where indicated, the equipment, including the base, shall be mounted on or suspended from vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the supporting structure. Vibration isolation available internally in the equipment will not be considered equivalent and shall not be provided in lieu of the vibration isolation indicated. Normally provided internal vibration isolators shall be replaced with rigid supports in such cases. Vibration isolators shall be selected in accordance with unit weight distribution to produce reasonably uniform deflections at each support. Unless otherwise indicated, bases, isolators, and deflections shall be as indicated in Table 27, ASHRAE CH 52.
- B. **Design Requirements:** The CONTRACTOR shall cause all vibration isolation systems, including the isolators, seismic restraints, and flexible connectors between the isolated equipment and associated piping, ducting and/or electrical work, to be designed by an engineer qualified in this type of work and having no less than 3 years' experience in it. This provision, however, shall not be construed as relieving the CONTRACTOR of his overall responsibility for the work. The CONTRACTOR shall submit the engineer's qualifications prior to starting the vibration isolation design. Flexible connectors shall be provided by the manufacturer of the mechanical equipment item in accordance with the recommendations of the vibration isolation system engineer.
- C. **Seismic Restraints:**
 - 1. **General:** Restraint devices shall resist the forces indicated and shall be designed in accordance with IBC. Design lateral forces shall be distributed in proportion to the mass distribution of the equipment.
 - 2. **Floor Mounted Equipment:** Equipment and appurtenances floor mounted on spring or pad type vibration isolators, except for curb mounted equipment, shall be provided with seismic snubbers. Equipment shall receive four all-directional restraint snubbers. The capacity of snubbers, at 3/8-inch deflection, shall be 3 to 4 times the load at the adjacent equipment mount.

Restraint assembly for floor mounted equipment shall consist of welded steel interlocking assemblies welded or bolted securely to the equipment or the equipment bases and the supporting structure. Restraint assembly surfaces which engage under seismic motion shall be lined with a resilient elastomer, 3/4 inches thick. Restraints shall be field adjustable and be positioned for 1/4-inch clearance both vertically and horizontally or clearance as required to prevent interference during normal operation, stopping, or starting. Restraint assembly shall have a minimum rating of 2g based on independent test data.

3. Curb Mounted Equipment: Seismic restraints for equipment mounted on vibration isolation curbs shall consist of slack stainless steel cables designed to provide 2g restraint in the four primary horizontal directions based on independent test data.
4. Suspended Equipment: Restraint assembly for suspended equipment, piping, or ductwork shall consist of plow steel cable attached to steel thimbles with neoprene sleeve all specifically designed for cable service and securely fastened to the equipment or the equipment base and the building structure. Cables shall be sized for a force of 2g with a minimum safety factor of 2 based upon independent test data. Cables shall be installed to prevent excessive seismic motion but not engage during normal operation, starting or stopping.
5. Testing: Seismic restraint dynamic tests shall be conducted in an independent laboratory or under the supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the elastomeric nor the snubber body sustained any obvious deformation after release of load.

2.2 BASES

- A. Curb Mounted Bases: Curb mounted equipment where vibration isolation is required, principally roof top heating, ventilating, and air conditioning equipment, shall be mounted on vibration isolation bases that fit over the curb and under the isolated equipment. The extruded aluminum top and bottom members shall contain cadmium-plated springs having a 1-inch minimum deflection with 50 percent additional travel to solid. Spring diameters shall be no less than 0.8 times the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4 inch so as not to interfere with spring action except in high winds. The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible neoprene connection duct joining the outside perimeter of the aluminum members. Foam or other contact seals are unacceptable at the spring cavity closure. Caulking shall be kept to a minimum.
- B. Type I Bases: Type I bases shall be structural steel bases. The bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases, which may be "T" or "L" shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be beams with a minimum depth equal to 1/10 of the longest dimension of the base. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1 inch.
- C. Type II Bases: Type II bases shall be steel members used to cradle machines having legs or bases that do not require a complete supplementary base. All members shall be sufficiently rigid to prevent strains in the equipment. Height saving brackets shall be employed in all mounting locations to provide a clearance of 1 inch below the base.
- D. Type III Bases: Type III bases shall be rectangular foundations consisting of concrete filled structural steel beam or channel forms. Bases for split case pumps shall be of sufficient size to provide support for suction and discharge base ells. The base depth need not exceed 12 inches unless specifically recommended by the base manufacturer or required for mass or rigidity. In general, base depth shall be a minimum of 1/12 of the longest dimension of the base but not less than 6 inches. Forms shall include, as a minimum, concrete reinforcement consisting of 1/2-inch bars or angles welded in place or additional steel as required by structural conditions. Forms shall be provided with drilled steel members with sleeves welded below the holes to receive equipment anchor bolts where the anchor bolts fail in concrete locations. Height saving brackets shall be employed in all mounting locations to maintain a 1-inch clearance below the base.

2.3 VIBRATION ISOLATION MOUNTINGS

- A. Type A Mountings: Type A mountings shall be double deflection neoprene mountings having a minimum static deflection of 0.35 inches. All metal surfaces shall be neoprene covered to avoid corrosion and shall have friction pads both top and bottom so that they need not be bolted to the floor. Bolt holes and anchor bolts shall be provided where required to resist lateral migration. Resilient washers and bushings shall be provided to prevent contact between the bolts and the equipment support bases. On equipment such as small vent sets, steel rails shall be used above the mountings to compensate for the overhang.
- B. Type B Mountings: Type B mountings shall be free-standing spring type isolators laterally stable without any housing and complete with 1/4-inch neoprene acoustical friction pads between the base and the support. Mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 times the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Mountings shall be hot-dip galvanized steel.
- C. Type C Mountings: Type C mountings shall be Type B mountings with a housing having vertical limit stops to prevent spring extension when weight is removed. Type C mountings shall be provided for equipment with operating weight different from the installed weight, such as chillers and boilers, and equipment exposed to the wind, such as cooling towers. The housing shall serve as blocking during erection and shall be located between the supporting steel and roof or the grillage and dunnage as indicated. The installed and operating heights shall be the same. A minimum clearance of 1/2 inch shall be maintained around restraining bolts and between the housing and the spring to prevent interference with the spring action. Limit stops shall be out of contact during normal operations. Mountings shall be hot-dip galvanized steel.
- D. Type D Mountings: Type D mountings shall be steel hangers which contain a steel spring and a 0.3-inch deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing which passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be of sufficient size to permit the hanger rod to swing through a 30 degree arc before contacting the hole. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection.
- E. Type E Mountings: Type E mountings shall be double deflection cork and rubber sandwich pads consisting of a high-density cork layer permanently bonded to top and bottom layers of corrugated oil-resistant synthetic rubber. The corrugated design shall allow deflection to increase with load and shall form a nonskid surface to resist lateral migration of the equipment. Bolt holes and anchor bolts shall be provided where required to resist migration. Resilient washers and bushings shall be provided to prevent contact between the bolts and the equipment support bases.

2.4 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by one of the following (or equal):
 - 1. Kinetics Noise Control
 - 2. Korfund Dynamics (VMC Group)
 - 3. Mason Industries, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Vibration isolators and equipment shall be installed in accordance with the manufacturer's written instructions.
- B. Flexible connectors shall be provided by the manufacturer of the mechanical equipment item in accordance with the recommendations of the vibration isolation system engineer.

3.2 FIELD INSPECTION

- A. The vibration isolation manufacturer, or his qualified representative, shall provide such supervision as is necessary to assure correct installation and adjustment of the isolators and seismic restraints. Upon completion of the installation and after the system is put into operation, the manufacturer or his representative shall make a final inspection and submit his report in writing certifying the correctness of installation and compliance with shop drawings.

**** END OF SECTION ****

SECTION 15100 - VALVES, GENERAL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for valves including epoxy coating, installing, adjusting, and testing of valves and where buried valves are indicated, valve boxes to grade, with covers, stem extensions, and position indicators.
 - 1. Section 15105 Check Valves
 - 2. Section 15106 Ball Valves
 - 3. Section 15109 Gate Valves
 - 4. Section 15113 Air Release and Vacuum Valves
 - 5. Section 15114 Pressure Regulating Valves
 - 6. Section 15115 Miscellaneous Valves

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions
 - 2. Section 15000 Piping Components
 - 3. Section 15101 Valve Operators

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following standards apply to the WORK of this Section:
 - 1. ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 250
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings
 - 3. ANSI/ASME B1.20.1 General Purpose Pipe Threads (Inch)
 - 4. ANSI/ASME B31.1 Power Piping
 - 5. ASTM A 36 Specification for Carbon Structural Steel
 - 6. ASTM A 48 Specification for Gray Iron Castings
 - 7. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

- | | | |
|-----|----------------|---|
| 8. | ASTM A 536 | Specification for Ductile Iron Castings |
| 9. | ASTM B 61 | Specification for Steam or Valve Bronze Castings |
| 10. | ASTM B 62 | Specification for Composition Bronze or Ounce Metal Castings |
| 11. | ASTM B 148 | Specification for Aluminum-Bronze Castings |
| 12. | ASTM B 584 | Specification for Copper Alloy Sand Castings for General Applications |
| 13. | ANSI/AWWA C500 | Gate Valves for Water and Sewerage Systems |
| 14. | ANSI/AWWA C506 | Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types |
| 15. | AWWA C508 | Swing-Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS |
| 16. | ANSI/AWWA C509 | Resilient-Seated Gate Valves for Water and Sewage Systems |
| 17. | AWWA C550 | Protective Interior Coatings for Valves and Hydrants |
| 18. | SSPC-SP-2 | Hand Tool Cleaning |
| 19. | SSPC-SP-5 | White Metal Blast Cleaning |

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
1. Manufacturer's product data including catalogue cuts.
 2. Manufacturer's installation instructions.
 3. Shop drawings showing details and dimensions.
 4. Manufacturer's certification that products comply with the indicated requirements.
 5. Schedule of valves indicating valve identification and location.
 6. Manufacturer's certification that epoxy coatings have been factory tested and comply with the indicated requirements.

1.5 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:
1. Manufacturer's installation and operating instructions.
 2. Manufacturer's maintenance procedures.

3. List of special tools.
4. Schedule of valves indicating valve identification and location.

1.6 FACTORY TESTING

- A. General: Valves shall be tested in compliance with the AWWA Standards as indicated. Except as otherwise indicated, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Proof-of-Design Tests: The CONTRACTOR shall furnish the CONSTRUCTION MANAGER three (3) certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing for all valves of sizes 10-inch and larger unless indicated otherwise in the specific valve Section. In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory representative. Proof-of-design testing shall have been performed on not less than three valves, with all three units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

1.7 FIELD TESTING

- A. Testing: Valves shall be field-tested for compliance with the indicated requirements.

PART 2 - PRODUCTS

2.1 VALVES

- A. General: Shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Valves mounted higher than 7 feet above working level shall be provided with chain operators.
- B. Valve Flanges: The flanges of valves shall comply with Section 15000 – Piping Components.
- C. Gate Valve Stems: Where dezincification is indicated, gate valve stems shall be fabricated with bronze conforming to ASTM B 62, containing not more than 5 percent of zinc nor more than 2 percent of aluminum. Gate valve stems shall be designed for minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems are poured. Where dezincification is not indicated, bronze conforming to ASTM B 584 may be used.
- D. Protective Coating: Except where otherwise indicated, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, and exterior surfaces shall be fusion bonded epoxy coated conforming to Section 09800 – Protective Coating. Flange faces of valves shall not be epoxy coated.
- E. Valve Operators: Where indicated, valves shall include electric operators recommended by the manufacturer. Operators of the same type shall be furnished by the same manufacturer. Valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.

- F. Nuts and Bolts: Nuts and bolts on valve flanges, bodies and supports shall comply with Section 05500 – Miscellaneous Metalwork.

2.2 NAMEPLATES, TOOLS AND SPARE PARTS

- A. Nameplates: Except as otherwise indicated, a label shall be provided on all valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve.
- B. Spare Parts: Two sets of packings, O-rings, gaskets, discs, seats, and bushings shall be furnished with each valve, as applicable.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. General: Valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's installation instructions. Valves shall be independently supported to prevent stresses on the pipe.
- B. Access: Valves shall be installed to provide easy access for operation, removal, and maintenance and to prevent interferences between valve operators and structural members or handrails.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the combinations shall be properly assembled and installed to ensure that systems are compatible and operating properly.

**** END OF SECTION ****

SECTION 15101 - VALVE AND GATE OPERATORS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all shut off and throttling valves with manual and power operators as indicated. The CONTRACTOR shall provide the valve and gate operators, complete and operable, including all controls, motors, gears, enclosures and other necessary appurtenances as indicated.
- B. The WORK also requires that the valve or gate manufacturer accept responsibility for furnishing the WORK in this Section but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the valve or gate, as a minimum.
- D. The WORK also includes coordination of design, assembly, testing and installation.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11293 Sluice and Shear Gates
 - 2. Section 15100 Valves, General

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. NEMA ICS-2 Industrial Control Devices, Controllers and Assemblies

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals, in addition to the provisions of Section 15100 – Valves, General:
 - 1. Electrical wiring and control diagrams.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Unless otherwise indicated, all shut-off and throttling valves, and externally-actuated valves and gates, shall be provided with manual operators. The CONTRACTOR shall furnish all operators complete and operable with mounting hardware, gears, handwheels, levers, chains, and extensions, as applicable. All operators shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering.

- B. **Manufacturers:** Where indicated, certain valves and gates may be provided with operators manufactured by the valve or gate Manufacturer. Where operators are furnished by different manufacturers, the CONTRACTOR shall coordinate selection to have the fewest number of manufacturers possible.
- C. **Materials:** All operators shall be current models of the best commercial quality materials and liberally-sized for the maximum expected torque. All materials shall be suitable for the environment in which the valve or gate is to be installed.
- D. **Mounting:** All operators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and of ample strength. The word "open" shall be cast on each valve or operator with an arrow indicating the direction to open in the counter-clockwise direction. All gear and power operators shall be equipped with position indicators. Where possible, manual operators shall be located between 48 and 60 inches above the floor or a permanent work platform.
- E. **Standard:** Unless otherwise indicated and where applicable, all operators shall be in accordance with ANSI/AWWA C 540 - AWWA Standard for Power-Actuating Devices for Valves and Sluice Gates.
- F. **Functionality:** Electric, pneumatic, and hydraulic operators shall be coordinated with power and instrumentation equipment indicated elsewhere in the Contract Documents.

2.2 MANUAL OPERATORS

- A. **General:** Unless otherwise indicated, all valves and gates shall be furnished with manual operators. Valves in sizes up to and including 32 inches shall have direct acting lever or handwheel operators of the Manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual operators, with an operating pull of maximum 60 pounds on the rim of the handwheel. All buried and submerged gear-assisted valves, all gates, all gear-assisted valves for pressures higher than 250 psi, all valves 30 inches in diameter and larger, and where so indicated, shall have worm-gear operators, hermetically-sealed and grease-packed, where buried or submerged. All other valves 4 inches to 24 inches in diameter may have traveling-nut operators.
- B. **Buried Valves:** Unless otherwise indicated, all buried valves shall have extension stems to grade, with wrench nuts located within 6 inches of the valve box cover, position indicators, and cast-iron or steel pipe extensions with heavy valve boxes with stay-put, hot-dip galvanized covers, and operating keys. Where so indicated, buried valves shall be in cast-iron, concrete, or similar valve boxes with covers of ample size to allow operation of the valve operators. Covers of valve boxes shall be permanently labeled as requested by the local Utility Company or the ENGINEER. Wrench-nuts shall comply with AWWA C 500 -Metal - Seated Gate Valves for Water Supply Service, and a minimum of 2 operating keys, or one key per 10 valves, whichever is greater, shall be furnished.
- C. **Floor Boxes:** Hot-dip galvanized cast-iron or steel floor boxes and covers to fit the slab thickness shall be provided for all operating nuts in or below concrete slabs. For operating nuts in the concrete slab, the cover shall be bronze-bushed.
- D. **Adjustable Shaft Valve Boxes:** Adjustable shaft valve boxes shall be concrete or cast iron valve extension boxes. Box covers on water lines shall be impressed with the letter "W". Gas line covers shall be impressed with the letter "G".

- E. Traveling-Nut Operator: The operator shall consist of a traveling-nut with screw (Scotch yoke) contained in a weather-proof cast-iron or steel housing with spur gear and minimum 12-inch diameter handwheel. The screw shall run in 2 end bearings, and the operator shall be self-locking to maintain the valve position under any flow condition. The screw and gear shall be of hardened alloy steel or stainless steel, and the nut and bushings shall be of alloy bronze. The bearings and gear shall be grease-lubricated by means of grease nipples. All gearing shall be designed for a 100 percent overload.

2.3 ELECTRIC MOTOR OPERATORS

A. General

1. Equipment Requirements: Where electric motor operators are indicated, an electric motor-actuated valve control unit shall be attached to the actuating mechanism housing by means of a flanged motor adaptor piece.
2. Gearing: The motor operator shall include the motor, reduction gearing, reversing starter, torque switches, and limit switches in a weather-proof NEMA 4 assembly. The operator shall be a single or double reduction unit consisting of spur or helical gears and worm-gearing. The spur or helical gears shall be of hardened alloy steel and the worm-gear shall be alloy bronze. All gearing shall be accurately cut with hobbing machines. All power gearing shall be grease- or oil-lubricated in a sealed housing. Ball or roller bearings shall be used throughout. Operator output speed changes shall be mechanically possible by simply removing the motor and changing the exposed or helical gearset ratio without further disassembly of the electric operator.
3. Starting Device: Except for modulating valves, the unit shall be so designed that a hammer blow is imparted to the stem nut when opening a closed valve or closing an open valve. The device should allow free movement at the stem nut before imparting the hammer blow. The operator motor must attain full speed before stem load is encountered.
4. Switches and Wiring: Travel in the opening and closing directions shall be governed by a switch responsive to mechanical torque developed in seating the valve, or by an obstruction met in opening or closing the valve, or by an on-board microprocessor. The torque switch shall be adjustable and shall function without auxiliary relays or devices, or it shall be adjustable in one-percent increments, sensed by a pulse-counter which receives 15 pulses per rotation of the unit. The geared limit switches shall be of the open type and shall be actuated by a rotor cam with 4 contacts to each cam or gear train. The operator shall have a number of gear trains as required to produce the operation indicated. The operator shall be wired in accordance with the schematic diagram. All wiring for external connections shall be connected to marked terminals. One 1-inch and one 1-1/4-inch conduit connection shall be provided in the enclosing case. A calibration tag shall be mounted near each switch correlating the dial setting to the unit output torque. Position limit switches and associated gearing shall be an integral part of the valve operator. To provide the best possible accuracy and repeatability, limit-switch gearing shall be of the "counting" intermittent type, made of stainless steel, grease-lubricated, and enclosed in its own gearcase to prevent dirt and foreign matter from entering the gear train. Switches shall not be subject to breakage or slippage due to over-travel. Traveling-nuts, cams, or microswitch tripping mechanisms shall not be used. Limit-switches shall be of the heavy-duty open contact type with rotary wiping action.

5. Handwheel: A permanently-attached handwheel shall be provided for emergency manual operation. The handwheel shall not rotate during electrical operation. The maximum torque required on the handwheel under the most adverse conditions shall not exceed 60 lb-ft, and the maximum force required on the rim of the handwheel shall not exceed 60 lb. An arrow and either the word "open" or "close" shall be cast or permanently affixed on the handwheel to indicate the appropriate direction to turn the handwheel.
6. Motor: The motor shall be of the totally-enclosed, non-ventilated, high-starting torque, low-starting current type for full voltage starting. It shall be suitable for operation on 480-volt, 3-phase, 60-Hz current, and have Class F insulation and a motor frame with all dimensions in accordance with the latest revised NEMA MG Standards. The observed temperature rise by thermometer shall not exceed 55 degrees C above an ambient temperature of 40 degrees C when operating continuously for 15 minutes under full rated load. With a line voltage ranging between 10 percent above to 10 percent below the rated voltage, the motor shall develop full rated torque continuously for 15 minutes without causing the thermal contact protective devices imbedded in the motor windings to trip or the starter overloads to drop-out. All bearings shall be of the ball type and thrust bearings shall be provided where necessary. All bearings shall be provided with suitable seals to confine the lubricant and prevent the entrance of dirt and dust. Motor conduit connections shall be watertight. Motor construction shall incorporate the use of stator and rotor as independent components from the valve operation such that the failure of either item shall not require operator disassembly or gearing replacement. The motor shall be furnished with a space heater suitable for operation on 120-volt, single-phase, 60-Hz circuit unless the entire operator is an hermetically-sealed, non-breathing design with a separately sealed terminal compartment which prevents moisture intrusion.

B. Electric Motor Operators (AC Reversing Control Type)

1. General: Where indicated, electric motor operators shall be the AC reversing type complete with local control station with open/close and local/remote selector switches.
2. Operator Appurtenances: The operator for each valve shall be supplied with open and close status lights; open, close and lock-out-stop push-buttons, and all other devices indicated.
3. Starter: The starter shall be a suitably sized amperage rated reversing starter with its coils rated for operation on 120-volt, 1-phase, 60-Hz current. A control power transformer shall be included to provide a 120-volt source, unless otherwise indicated. The starter shall be equipped with 3 overload relays of the automatic reset type. Its control circuit shall be wired as indicated. The integral weatherproof compartment shall contain a suitably sized 120-volt ac, single-phase, 60-Hz space heater to prevent moisture condensation on electrical components.

2.4 MANUFACTURERS

A. Products shall be from the following manufacturers, or equal.

1. Valve Boxes

Brooks
Christy
Empire

2. AC Reversing Control Type Operators

EIM
Keystone
Limatorque
Rotork

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping, or mechanical equipment.

3.2 SERVICES OF MANUFACTURER

A. Field Adjustments

1. Field representatives of manufacturers of valves or gates with pneumatic, hydraulic, or electric operators shall adjust operator controls and limit-switches in the field for the required function.

3.3 INSTALLATION

- A. All valve and gate operators and accessories shall be installed in accordance with Section 15100 - Valves, General.

**** END OF SECTION ****

SECTION 15105 - CHECK VALVES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing check valves of the types and sizes indicated with epoxy coating, appurtenances, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15100 Valves, General

1.3 FACTORY TESTING

- A. Valves shall be tested in compliance with AWWA C508, and Section 15100 – Valves, General.
- B. Proof-of-design tests shall be submitted in compliance with Section 15100 – Valves, General, for all check valves size 10-inch and larger.

PART 2 - PRODUCTS

2.1 SWING CHECK VALVES

- A. General: Except as otherwise indicated, swing check valves designed for sewage and general service shall be of resilient, flexible disc type, complying with AWWA C 508, and full port opening; valves shall be designed for a water-working pressure of 150 psi and shall have a flanged cover piece designed to provide access to the disc. Interior and exterior surfaces of valves shall be fusion bonded epoxy coated complying with Section 09800 – Protective Coating.
- B. Design: The valve body shall be designed to provide full pipe size flow area. Seating surface shall be on a 45 degree angle with disc travel to full open of 35 degrees. Valve shall have non-slam closure characteristics.
- C. Body: The valve body shall be fabricated with ductile iron conforming to ASTM A 536 or cast iron conforming to ASTM A 126, class B, with flanged ends conforming to ANSI B 16.1, class 125 unless otherwise indicated.
- D. Disc: The valve disc shall be fabricated of Buna-N conforming to ASTM D 2000 with steel reinforcing.
- E. Backflow Actuator: A stainless steel backflow actuator shall be provided to allow opening of the valve during no-flow conditions.
- F. Disc Position Indicator: A mechanical stainless steel actuator shall be provided for indication of valve position.

- G. **Proximity Switch:** A proximity switch shall be provided to indicate when the disc is closed.
- H. **Boss:** Provide a threaded boss upstream of the disc for installation of air release assembly associated with self-priming non-clog pump installation where indicated on the drawings.

2.2 MANUFACTURERS

- A. Check valves shall be manufactured by the following (or Owner pre-approved equal):
 - 1. Swing check valves:
VAL-MATIC (Valve and Manufacturing Corporation) Surgebuster

PART 3 - EXECUTION

3.1 GENERAL

- A. Valves shall be installed in accordance with Section 15100 – Valves, General

**** END OF SECTION ****

SECTION 15106 - BALL VALVES

PART 1 – GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing manually-operated ball valves with epoxy coating, operators, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15100 Valves, General

1.3 FACTORY TESTING

- A. Valves shall be tested in compliance with AWWA C507 and Section 15100 – Valves, General.
- B. Proof-of-design tests shall be submitted in compliance with Section 15100 – Valves, General, for all ball valves size 10-inch and larger.

PART 2 – PRODUCTS

2.1 BALL VALVES (6-INCH AND LARGER)

- A. Construction: Except as otherwise indicated, ball valves in sizes 6-inches and larger shall comply with ANSI/AWWA C 507, with cast iron, ductile iron, or cast steel bodies, support legs or pads, flanged ends, and shall be designed for velocities up to 35 fps, temperatures up to 125 degrees F, and design pressures of 150 psi. The balls shall be fabricated with cast iron, ductile iron, or cast steel, and designed for shaft- or trunnion-mounting, with tight shut-off, single or double seat, and full bore. The valves shall be rubber- or metal-seated, with stainless steel or monel shafts, and shall include at least one thrust bearing. Ferrous surfaces of valves 6-inches and larger, where contact with water is indicated, shall be epoxy-coated conforming to Section 09800.
- B. Operators: Except as otherwise indicated, ball valves shall have manual operators with handwheel, position indicator, and 2-inch square operating nut. Operators for buried valves and for power operated valves shall comply with Section 15101 – Valve and Gate Operators.

2.2 BALL VALVES (4-INCH AND SMALLER)

- A. General Requirements: Except as otherwise indicated, ball valves in sizes up to 4 inches shall have manual operators with lever or handwheel. Ferrous surfaces of valves where contact with water is indicated shall be epoxy-coated conforming to Section 09800 – Protective Coating.
- B. Body: Ball valves up to 1-1/2 inches in size shall have bronze or forged brass 2- or 3-piece bodies with ends threaded and shall be designed for a pressure rating of not less than 300 psi. Valves 2-inch to 4-inch in size shall have bronze forged brass or steel 2-or 3-piece bodies with flanged ends and shall be designed for a pressure rating of 150 psi.

- C. Balls: The balls shall be fabricated of solid brass, chrome plated bronze, or Type 316 stainless steel, with full openings.
- D. Stems: The valve stems shall be of the blow-out proof design, and fabricated of bronze or Type 316 stainless steel and shall include reinforced Teflon seals.
- E. Seats: The valve seats shall be of Teflon or Buna-N.

2.3 PLASTIC BALL VALVES

- A. General Requirements: Plastic ball valves designed for use with corrosive fluids shall be fabricated of polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), or polyvinylidene fluoride (PVDF), as recommended by the manufacturer for use in the service indicated. Valves shall have manual operators except as otherwise indicated.
- B. Construction: Plastic ball valves shall have union ends or flanged ends conforming to ANSI B 16.5, class 150. Balls shall have full size ports and Teflon seats. Body seals, union O-ring seals, and stem seals shall be Viton. Valves shall be suitable for a maximum working of 150 psi at 73 degrees F for PVC.

2.4 MANUFACTURERS

- A. Ball valves shall be manufactured by the following (or equal):

- 1. Ball Valves (6-inch and Larger):

Grove Valve and Regulator Company
 McNally Pittsburg, Inc.
 Henry Pratt Company
 Willamette Valve, Inc.

- 2. Ball Valves (4-inch and Smaller):

Jamesbury Corporation
 Jenkins Bros.
 Lunkenheimer Flow Control
 Wm. Powell Company
 Worcester Controls

- 2. Plastic Ball Valves:

ASAHI-America, (full port: ½ to 4 inches only)
 G F Plastic Systems, Inc., (full port: ½ to 2 inches only)
 NIBCO Inc., (Chemtrol), (full port: ½ to 4 inches only)
 Spears, (full port: ½ to 6 inches only)

PART 3 – EXECUTION

3.1 GENERAL

- A. Valves shall be installed in accordance with Section 15100 – Valves, General.

** END OF SECTION **

SECTION 15109 - GATE VALVES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing solid wedge, manually operated, fusion bonded epoxy lined/coated gate valves.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 15100 Valves, General

PART 2 - PRODUCTS

2.1 GENERAL

- A. Gate valves shall be of the rising stem, manually operated type, except where space restrictions require a non-rising stem. Valves shall be constructed of ASTM A48 Ductile Iron. Valves shall be Class 125 with flanged ends. Valve shall be of the solid wedge type. All valves shall be the product of one manufacturer and shall fully comply with AWWA C 509. Valve shaft shall be stainless steel or low zinc bronze alloy.
- B. Flanges: Valve flanges shall be Class 125, flat-faced conforming to ANSI B16.1.
- C. Bonnet: Valve shall have bolted bonnet with bearings designed to withstand all loads for the operating conditions.
- D. Operator: Valves shall be equipped with handwheel operators capable of operation with a maximum applied force of 40-lbs. CONTRACTOR shall provide any additional gearing required. Buried valves shall be provided with 2-inch square operating nut extended to no less than two feet below the finished grade, within a valve box.
- E. Hardware: All body, flange, and bonnet bolts shall be Type 316 stainless steel.
- F. Lining/Coating: Ferrous surfaces of the valves shall be fusion bonded epoxy lined/coated, conforming to Section 09800 – Protective Coating.

2.2 GATE VALVES (SMALLER THAN 3-INCH)

- A. Construction: Gate valves, smaller than 3 inches, shall be heavy duty type for industrial service, with threaded or soldered ends. The bodies shall have threaded tops or union bonnets, fabricated of bronze conforming to ASTM B-62, with bronze stems, solid wedges, metal handwheels, and Teflon-impregnated packing. Buried valves shall have non-rising stems. Exposed valves (above ground) shall have rising stems. Valves shall have a minimum pressure rating of 125 psi steam, or 200 psi coldwater except as otherwise indicated.

2.3 MANUFACTURERS

A. Products of the type or size indicated shall be manufactured by one of the following (or equal):

1. Solid-wedge gate valves:

Clow Corporation
Kennedy Valve Mfg. Co., (ITT Grinnell)
Mueller Company

2. Gate valves (smaller than 3-inch)

Crane Company
Milwaukee Valve Company
Wm. Powell Company
Stockham Valves and Fittings

PART 3 - EXECUTION

3.1 INSTALLATION

A. Gate valves shall be installed in accordance with Section 15100 – Valves, General.

**** END OF SECTION ****

SECTION 15113 - AIR RELEASE AND VACUUM VALVES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing air release and vacuum valves as indicated, complete and operable, including accessories and drain connections.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15100 Valves, General

PART 2 - PRODUCTS

2.1 GENERAL

- A. Air and Vacuum Valves: Air and vacuum valves shall be capable of venting sufficient quantities of air as determined by the manufacturer's approved sizing methods, while pipelines are being filled and allowing air to re-enter while pipelines are being drained. They shall be of the size indicated, with flanged or screwed ends to match piping. Bodies shall be of Type 316 stainless steel. The float, seat, and all moving parts shall be constructed of Type 316 stainless steel or HDPE. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise indicated.
- B. Air-Release Valves: Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size indicated and shall meet the same general requires as specified for air and vacuum valves except that the vacuum feature will not be required. They shall be designed for a minimum water-working pressure of 150 psi, unless otherwise indicated.
- C. Combination Air Valves: Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting sufficient quantities of air, as determined by the manufacturer's approved sizing methods, while a system is being filled or drained, respectively. They shall have the same general requirements as specified for air and vacuum valves.
- D. Sewage Air Release Valves: Sewage air release valves shall vent accumulating gases during system operation. They shall have long float stems and bodies to minimize clogging. The same general requirements shall apply as specified for air and vacuum valves. Each sewage air release valve shall be furnished with the following backwash accessories, fully assembled on the valve:
 1. Inlet shut-off valve
 2. Blow-off valve
 3. Clear water inlet valve
 4. Rubber supply hose
 5. Quick disconnect couplings

2.2 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):
 - 1. APCO (Valve and Primer Corporation)
 - 2. Crispin (Multiplex Manufacturing Company)
 - 3. Vent-O-Mat, Series RGX

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Air release and vacuum valves shall be installed at high points in piping systems and where indicated.
- B. All valves shall be installed in accordance with the manufacturer's printed recommendations.
- C. All air and vacuum release valves shall have PVC piped outlets to the nearest acceptable drain, firmly supported, and installed in such a way as to avoid splashing and wetting of floors.

**** END OF SECTION ****

SECTION 15114 - PRESSURE REGULATING VALVES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing pressure regulating valves indicated, complete and operable, with all accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 15100 Valves, General

PART 2 - PRODUCTS

2.1 PRESSURE REGULATING VALVES (1-1/2 INCHES AND SMALLER)

- A. **General:** Small air and water pressure regulating valves shall be of the spring-loaded diaphragm type with a minimum pressure rating of 250 psi, with bronze body, nickel alloy or stainless steel seat, and threaded ends. Each valve shall be furnished with built-in or separate 304 stainless steel strainer and union ends.

2.2 MANUFACTURERS

- A. Products shall be manufactured by one of the following (or equal):

- 1. Small pressure regulating valves:

- A.W. Cash Valve Mfg. Corp.
 - Watts Regulator Company
 - Wilkins Regulator (A Division of Zurn Industries)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Pressure regulating valves shall be installed in accordance with the manufacturer's written instructions.

** END OF SECTION **

SECTION 15115 - MISCELLANEOUS VALVES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing miscellaneous valves as indicated, complete and operable, including accessories and operators.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 15100 Valves, General

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTER VALVES

- A. General: Backflow preventers shall work on the reduced pressure principle. They shall consist of 2 spring-loaded check valves, automatic differential pressure relief valve, drain valves, shut-off valves as well as test ports at each pressure chamber. The body material shall be bronze or cast iron for a working pressure of not less than 150 psi, with bronze or stainless steel trim. Drain lines with air gaps shall be provided.

2.2 CORPORATION STOPS

- A. Unless otherwise indicated, corporation stops shall be made of solid brass for key operation, with screwed ends with corporation thread or iron pipe thread, as required.

2.3 MANUFACTURERS

- A. Products of the type or model indicated shall be manufactured by one of the following (or approved equal):
 - 1. Backflow preventer valves
 - Cla-Val Company
 - Febco
 - Hersey Products, Inc.
 - 2. Corporation stops
 - Ford Meter Box Company
 - James Jones Company
 - Mueller Company

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Backflow preventers shall be installed in potable water lines where required by applicable codes or regulations, or wherever there is any danger of contamination, and where indicated.
- B. All valves shall be installed in accordance with the manufacturer's printed recommendations.
- C. All backflow preventers shall have piped outlets to the nearest acceptable drain, firmly supported, and installed in such a way as to avoid splashing and wetting of floors.

**** END OF SECTION ****

SECTION 15150 - METERS, GENERAL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for meters and flow measurement devices with associated instrumentation and controls designed for indicated functions including flow measurement, and batch metering of wastewater.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02630 Ductile Iron Pipe
 - 2. Section 11000 Equipment General Provisions
 - 3. Section 15000 Piping Components
 - 4. Section 15164 Ultrasonic Flow Meters (Field Mounted)

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ISA - S 5.1 Instrumentation Symbols and Identification
 - 2. ANSI - B16.1 Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, and 250
 - 3. ANSI/AWWA C207 Steel Pipe Flanges for Waterworks Service - Sizes 4 In Through 144 In.
 - 4. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 5. ASTM B 61 Specification for Steam or Valve Bronze Castings
 - 6. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings
 - 7. ASME REPORT Fluid Meters, Sixth Edition, 1971

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's product data including catalogue cuts.
 - 2. Shop drawings showing details and dimensions.

3. List of special tools.
4. Schedule of meter identifications and locations.

1.5 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 1. Certified performance data including curves showing flow and pressure drop.
 2. Manufacturer's installation instructions.
 3. Manufacturer's maintenance and operating instructions.
 4. Manufacturer's certification that meters comply with published accuracies for the flow ranges indicated.
 5. Certification that meters have been field-calibrated, under flow conditions.

1.6 INSPECTION, TESTING AND ACCURACY

- A. Inspection and Testing: The manufacturer shall provide an experienced factory service representative to inspect and test meters for proper performance and installation and field calibrate meters under flow conditions.
- B. Accuracy: Except as otherwise indicated, flow meters shall be designed and fabricated for an accuracy of plus or minus 2 percent of actual flow throughout the range indicated. Density measuring devices shall have an accuracy within plus or minus 2 percent of actual solids content over the range indicated.

1.7 SERVICES OF MANUFACTURER

- A. Inspection, Startup, and Field Adjustment: An authorized service representative of the manufacturer shall visit the site for not less than 1 day to furnish the indicated services.
- B. Instruction of OWNER'S Personnel: The authorized service representative shall also furnish the indicated services for instruction of the OWNER'S personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than one day.

PART 2 - PRODUCTS

2.1 SPECIAL TOOLS

- A. The WORK includes special tools recommended by the manufacturer and one extra steel spool for each size of meter. Spools shall be labeled and shall show meter identification, size and service.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Meters shall be installed in accordance with the manufacturer's installation instructions.

- B. Meters shall be installed in easily accessible locations and oriented for ease of reading and maintenance, and, where shown, for balancing of flow. Wherever possible, meters shall be installed in such a way to comply with the manufacturer's recommendations. Meters, shut-off and balancing valves shall be properly supported. In-line meters shall be installed to ensure full-line flow and not less than the manufacturer's recommended head at all times.

3.2 TESTING

- A. Equipment shall be prepared for operational use in accordance with manufacturer's instructions after field calibration. The OWNER and the CONSTRUCTION MANAGER (at the option of either) reserve the right to observe field calibration.
- B. Meters shall be field tested at no less than 3 flow conditions over the total range of capability of the equipment. Where applicable, tests shall be conducted in accordance with the Test Code of the Standards of the Hydraulic Institute.

** END OF SECTION **

SECTION 15164 - ULTRASONIC FLOW METERS (FIELD-MOUNTED)

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing field-mounted ultrasonic flow meters with acoustic sensors, local flow indicators, electronic transmitters, mounting hardware, cables, junction boxes, and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15150 Meters, General

PART 2 - PRODUCTS

2.1 GENERAL

- A. Basic Design: Field-mounted ultrasonic flow meters shall measure flow bi-directionally and shall consist of transducers mounted to gasketed saddles strapped to the force main pipe. The meters shall be designed to measure flow by ultrasonic measurement of velocity and shall be suitable for measuring raw sewage with an accuracy of plus or minus 2 percent at velocities greater than one foot per second, from 10 to 100 percent of capacity.
- B. Schedule: Ultrasonic flow meters shall comply with the following:

<u>I.D. No.</u>	<u>Service</u>	<u>Pipe Size (In.)</u>	<u>No. of FM to Monitor</u>	<u>Flow Range (gpm)</u>	<u>Line Pressure (psig)</u>	<u>Pipe Material</u>
SPS 84	Raw Sewage	10	2	0 – 1500	120	Ductile Iron

2.2 BASIC MATERIALS

- A. Metering Elements: Two sensors shall be attached to a straight pipe, secured by Type 316 stainless steel straps. Installation shall be in accordance with manufacturer's recommendation to ensure that acoustic pulses are appropriately transmitted. Meter shall be designed to operate on 110/220-volt ac supply with a power consumption of not more than 30 watts. The probes shall be fabricated of non-corrosive material and shall be equipped with an armored triaxial cable. The equipment manufacturer shall recommend and select the signal and frequency to be utilized for the measurement to ensure proper ultrasonic transmission.
- B. Instrumentation: The electronic unit recommended by the manufacturer to measure the flow of water in the pipe shall be housed in a NEMA 4X housing designed for wall-mounting. The electronic unit shall utilize the output of the velocity sensing probes to measure fluid velocity in each pipe and shall be factory wired, solid state. The electronic unit shall include an integral totalizer display and a data logger memory. An attached programming unit shall include a signal strength indication display for use during calibration of the meter unit. The transmitter unit shall produce a 4 to 20 mA-dc signal, and a scaled pulse output signal (where totalization is indicated) proportional to the flow rate. A local flow indicator, scaled in the indicated flow range, shall be installed in an accessible location to allow reading.

2.3 MANUFACTURERS

- A. Meters shall be Siemens SITRANS FUS1010, or Owner pre-approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Sensors shall be located in accordance with the manufacturer's specifications using mounting templates provided by the manufacturer. Sensors are recommended be installed with a minimum of 10 pipe diameters of unobstructed straight upstream approach, and a minimum of 3 pipe diameters of unobstructed straight downstream pipe.
- B. Sensors shall be installed in accordance with the manufacturer's installation instructions and Section 15150 – Meters, General.

**** END OF SECTION ****

SECTION 15430 – PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing cast-iron floor drains, hose bibbs, hoses, nozzles, hose racks and emergency eyewash/shower units.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 15000 Piping Components
 - 2. Section 15010 Mill Piping – Exposed and Buried

1.3 CODES

- A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:
 - 1. International Mechanical Code
 - 2. International Plumbing Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI Z358.1 Standard for Emergency Eyewash and Shower Equipment

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's product data including catalogue cuts.
 - 2. Shop drawings showing details and dimensions.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's product data.
 - 2. Manufacturer's installation instructions.
 - 3. Manufacturer's maintenance and operating instructions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Plumbing specialties shall be new products manufactured for the intended usage.

2.2 FLOOR DRAINS

- A. Floor drains shall be of cast iron, in the sizes indicated.

2.3 HOSE BIBBS

- A. Hose bibbs in exposed locations shall be of the non-freeze type and, where indicated, shall include vacuum breakers.
- B. Wall-type non-freeze hose bibbs shall be heavy duty bronze with nickel-bronze face, hinged cover, recessed box, and key.

2.4 WALL-MOUNTED HOSE RACKS

- A. Wall-mounted hose racks shall be installed at locations indicated. Racks shall be of all-welded steel construction, minimum 8-gauge sheet steel, hot-dip galvanized after fabrication, and shall have a capacity to hold 100 feet of 3/4-inch or 1-1/2-inch hose.

2.5 HOSES AND NOZZLES

- A. The following quantities, lengths and sizes of hose shall be provided:
 - 1 – 75 ft length of 3/4-inch hose;
 - 1 – 100 ft length of 1-1/2-inch hose.
- B. Hose shall include male and female connectors and nozzle and shall be seamless, extruded rubber with dacron cotton exterior and shall be designed for a working pressure of at least 200 psi.
- C. Nozzles shall be capable of complete shut-off and shall produce a solid straight stream and up to a 90-degree conical fog. Nozzle material shall be brass with polished finish, and nozzles shall include rubber bumper.

2.6 EMERGENCY EYEWASH AND SHOWER

- A. Emergency eyewash and shower shall be non-freeze type suitable for outdoor installation. Shower shall be drench type with ABS shower head with integral self-regulating flow control. Eyewash shall have a stainless steel receptor with ABS plastic eyewash anti-surge heads, 304 stainless steel yoke, and dust covers. Shower and eyewash shall have freeze-proof self-closing manual valves that drain after closing. Unit shall meet the requirements of ANSI Z358.1.

2.7 MANUFACTURERS

- A. Products of the type or model indicated shall be manufactured by one of the following (or equal):

1. Floor drains:

Josam Mfg. Co.
Jay R. Smith Mfg. Co.
Zurn Industries, Inc.

2. Non-freeze wall-type hose bibbs:

Josam Mfg. Co.
Jay R. Smith Mfg. Co.
Zurn Industries, Inc.

3. Hose valves 3/4-inch and 1-inch:

Chicago Faucet
Ford Meter Box Co., Inc.

4. Hose valves other than 3/4-inch and 1-inch:

Mueller Co.
James Jones Co.

5. Emergency eyewash and shower:

Haws 8300FP

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Plumbing specialties shall be installed in accordance with the manufacturer's installation instructions.

**** END OF SECTION ****

SECTION 15855 - AIR HANDLING AND MOVING EQUIPMENT

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing:
 - 1. Centrifugal fans and accessories.
 - 2. Axial fans and accessories.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions
 - 2. Section 15880 Air Distribution Devices and Accessories
 - 3. Section 16040 Electric Motors

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. International Mechanical Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

AMCA 99	Standards Handbook
AMCA 210	Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
AMCA 300	Reverberant Room Method for Sound Testing of Fans
AMCA 301	Methods for Calculating Fan Sound Ratings from Laboratory Test Data
AMCA 500	Laboratory Methods of Testing Louvers/Dampers for Rating
ANSI/ABMA 9	Load Ratings and Fatigue Life for Ball Bearings

ANSI/ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
ANSI/UL 900	Test Performance of Air Filter Units
NFPA 90A	Installation of Air Conditioning and Ventilation Systems
SMACNA	Low Pressure Duct Construction Standards
SMACNA	Fibrous Glass Duct Construction Standards

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals, and in addition to the requirements of Section 11000 – Equipment General Provisions.
1. Shop drawings indicating assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
 2. Product data indicating dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.
 3. Fan curves with specified operating point clearly plotted.
 4. Sound power levels for both fan inlet and fan outlet and casing radiation at rated capacity.
 5. Product data for filter media, filter performance data, filter assembly, and filter frames.
 6. Electrical requirements for power supply wiring including wiring diagrams for interlock and control.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals, and in addition to the requirements of Section 11000 – Equipment General Provisions:
1. Instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Compliance: Products shall comply with the following:
1. Fan Performance Ratings: conforming to AMCA 210 and bearing the AMCA Certified Rating Seal.
 2. Sound Ratings: conforming to AMCA 301; tested to AMCA 300 and bearing AMCA Certified Sound Ratings Seal.
 3. Fabrication: conforming to AMCA 99.

2.2 FAN CRITERIA

- A. Fans shall not increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from indicated values; fans shall be designed for static pressure variations of plus or minus 10 percent. Fans Sones level shall not exceed 20.
- B. Fan performance shall be based on sea level conditions.
- C. Fans shall be statically and dynamically balanced to eliminate vibration and noise transmission to occupied areas.
- D. Fan Bearings: Fan bearings shall comply with ANSI/ABMA 9, L-10 life of 50,000 hours, heavy duty pillow block type, self-aligning, grease-lubricated ball bearings, or ANSI/ABMA 11, L-10 life of 120,000 hours, pillow block type, self-aligning, grease-lubricated roller bearings.

2.3 CENTRIFUGAL FANS

- A. Construction:
 - 1. Housings: Housings shall be fabricated as follows:
 - a. Material: heavy gauge steel, spot welded for AMCA 99 designated Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
 - b. Finish: factory-finished before assembly with baked-on powder finish.
 - 2. Motors and Drives: Motors and drives shall comply with Section 16040.
 - 3. Accessories: Fans shall include the following:
 - a. Airflow Switch: Single-pole double-throw switch for monitoring fan operation.
 - b. Safety Screen and Guards: Type 316 stainless steel, 1/2-inch mesh, 16 gauge.
 - c. Access Door: Same material as housing with type 316 stainless steel fasteners.

B. Equipment List:

<u>Equipment No.</u>	<u>Item</u>	<u>Process Area</u>	<u>Location</u>
SF-1	Fresh Air Supply Fan	SPS Dry Well	Indoor
EF-1	Fresh Air Exhaust Fan	SPS Dry Well	Indoor

C. Operating Requirements:

Fan motors shall be nonoverloading on all points of the operating curve. Fans shall be designed for continuous duty service and designed to comply with the following:

<u>Equipment number</u>	<u>Capacity, scfm</u>	<u>Static pressure, in. w.c.</u>	<u>Maximum fan speed, rpm</u>	<u>Motor HP</u>	<u>Drive type</u>	<u>Operating voltage/phase/frequency</u>
SF-1	4000	1.0	1400	2	Belt	460 / 3 / 60
EF-1	4000	1.0	1400	2	Belt	460 / 3 / 60

2.4 AXIAL FANS

A. Axial fans shall comply with the following:

1. Airfoil Impeller Blades: Adjustable die cast aluminum alloy or welded steel die formed blades with direct drives.
2. Hub: Die cast steel hub with direct drive of spun, welded steel, bored and keyed to shaft; to facilitate indexing of blade angle with manual adjustment stops.
3. Cast Components: Components shall be X-rayed after fabrication and statically and dynamically balanced before attachment to motor or shaft.
4. Casings: Casings shall comply with the following:
 - a. Casing shall be fabricated of 1/4 inch steel for fans 40 inch in diameter and smaller and 3/8 inch steel for larger fans.
 - b. Welding shall be continuous, with inlet and outlet flange connections, and motor or shaft supports; flow straightening guide vanes shall be included for fans specified for static pressures greater than 1 inch wg.
 - c. Casings shall be finish-painted with one coat enamel applied to interior and exterior.
5. Accessories: Fans shall include the following:
 - a. Inlet Screens: Galvanized steel welded grid to fit inlet bell.
 - b. Access Doors: Shaped to conform to casing with quick opening latches and gaskets.
6. Motors and Drives: Motors and drives shall comply with the requirements for air handling units and the following:
 - a. Lubrication: Permanent lubricated.
7. Propeller Fans:
 - a. Impeller: Shaped steel or steel reinforced aluminum blade with heavy hubs, statically and dynamically balanced, keyed and locked to shaft.
 - b. Motor: Rigid mount with neoprene vibration isolation between fan assembly and mounting plate.
 - c. Frame: One piece, square steel with die formed venturi orifice, mounting flanges and supports, with baked enamel finish.
 - d. Safety Screens: One-inch galvanized wire over inlet, motor, and drive.

B. Equipment List:

1. Generator Room:

<u>Equipment No.</u>	<u>Item</u>
EF-2	Exhaust Air Fan
SF-2	Fresh Air Supply Fan

C. Operating Requirements:

Fan motors shall be nonoverloading on all points of the operating curve. Fans shall be designed for continuous duty service in a corrosive environment and designed to comply with the following:

<u>Equipment number</u>	<u>Capacity, scfm</u>	<u>Static pressure, in. w.c.</u>	<u>Maximum fan speed, rpm</u>	<u>Motor HP</u>	<u>Drive type</u>	<u>Operating voltage/phase/frequency</u>
EF-2	1200	0.25	1140	1/6	Direct	120 / 1 / 60
SF-2	1200	0.25	1140	1/6	Direct	120 / 1 / 60

2.5 SPARE PARTS

- A. Spare Parts: Spare parts recommended by the manufacturer shall be furnished to the OWNER by the CONTRACTOR.

2.6 MANUFACTURERS

- A. Air handling units shall be manufactured by one of the following (or equal):
1. Aerovent
 2. Howden
 3. Greenheck
 4. Loren Cook
 5. Penn Ventilator

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Air handling and moving equipment shall be installed in accordance with the manufacturer's installation instructions.
- B. Alignment: Equipment shall be properly aligned and operate free from defects including binding, scraping, vibration, end-shaft runout, or other defects. Drive shafts shall be measured just prior to assembly to ensure correct alignment without forcing. Equipment shall be bolted in position and neat in appearance.

3.2 GENERAL REQUIREMENTS

- A. Fans shall not be operated for any purpose until ductwork is clean, bearings lubricated, and fans have been test run under observation.
- B. Fans shall be mounted on vibration isolators recommended by the manufacturer and complying with Section 15050.

3.3 CENTRIFUGAL FANS

- A. Centrifugal fans shall be installed with:

1. Resilient mountings and flexible electrical leads.
2. Flexible connections complying with Section 15880 between fan inlet and discharge ductwork and in metal connectors with bands installed parallel with minimum one-inch flex between ductwork and fan while running.
3. Restraining snubbers and flexible connectors.
4. Sheaves for final air balance.
5. Safety screen where inlet or outlet is exposed.
6. Scroll drains to nearest floor drain.
7. Backdraft dampers on discharge of exhaust fans and as indicated.

3.4 AXIAL FANS

- A. Axial fans shall comply with the installation requirements for centrifugal (except that scroll drains are not required) and as follows:
 1. Adjustable blade axial fan wheels shall include access for varying blade angle setting and for varying range of volume and pressure.

** END OF SECTION **

SECTION 15880 - AIR DISTRIBUTION DEVICES AND ACCESSORIES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing:

1. Ductwork and Accessories
2. Exhaust grilles
3. Supply registers
4. Smoke detectors

Definitions distinguishing these items are as follows:

Grille: A louvered covering of an air outlet or inlet.

Register: A grille with a volume control device attached. The air is normally discharged between 45 degrees and perpendicular to the surface in which the register is located.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 15855 Air Handling and Moving Equipment

1.3 CODES

A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. International Mechanical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. ASHRAE Handbook 1981 Fundamentals, Chapter 33 - Duct Design
2. ASHRAE Handbook 1983 Equipment; Chapter 1 - Duct Construction
3. ASTM A 90 Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
4. ASTM A 167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

6. ASTM A 527 Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality
7. ASTM B 209 Aluminum and Aluminum Alloy Sheet and Plate
8. ASTM B 221 Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
9. NFPA 90A Installation of Air Conditioning and Ventilating Systems
10. SMACNA Low Pressure Duct Construction Standards
11. UL 33 Heat Responsive Links for Fire-Protection Service
12. UL 181 Factory-Made Air Ducts and Connectors
13. UL 268A Smoke Detector for Duct Applications
14. UL 555 Fire Dampers and Ceiling Dampers
15. ADC 1062 Air Distribution and Control Device Test Code
16. ARI 650 Air Outlets and Inlets
17. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets
18. ADC 1062 Air Diffusion Council Equipment Test Code

1.5 REGULATORY REQUIREMENTS

A. Ductwork shall be constructed in compliance with NFPA 90A.

1.6 QUALITY ASSURANCE

- A. The WORK of this Section shall comply with the following:
 1. The performance of air outlets and inlets shall be tested and rated in accordance with ASHRAE 70.
 2. All grilles and registers shall be installed as shown on the drawings and shall be of the manufacture size and capacity indicated thereon.

1.7 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 1. Shop Drawings:
 - a. Indicating duct fittings and details such as gauges, sizes, welds, and configuration prior to start of work for low pressure systems.
 - b. Indicating, for shop fabricated assemblies, duct access doors.

- c. Indicating assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.

2. Product Data:

- a. Including catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.
- b. Indicating configuration, general assembly, and materials used in fabrication, and including catalog performance ratings which indicate air flow, static pressure, and NC designation.

3. Schedules:

- a. Of outlets and inlets indicating type, size, location, application, and noise level.

4. Samples:

- a. Two of each required air outlet and inlet type.

1.8 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's installation instructions.
 - 2. Manufacturer's maintenance procedures.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Only products certified as complying with the indicated requirements shall be provided.
- B. Products: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

2.2 DUCTWORK

- A. Ductwork shall comply with the following:
 - 1. General: non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

2. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength. Provide PVC coating and lining.
3. Fasteners: Rivets, bolts, or sheet metal screws.
4. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
5. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 DAMPER BEARINGS AND REGULATORS

- A. Damper bearings shall comply with the following:
 1. Except in round ductwork 12 inches and smaller, end bearings shall be included and on multiple blade dampers, bearings shall be oil-impregnated nylon or sintered bronze.
- B. Regulators shall comply with the following:
 1. Locking, indicating quadrant regulators shall be included on single and multi-blade dampers except that where rod lengths exceed 30 inches include regulator at both ends.
 2. On insulated ducts, quadrant regulators shall be mounted on stand-off mounting brackets, bases, or adapters.

2.4 FIRE DAMPERS

- A. Fire dampers shall be fabricated as follows:
 1. In accordance with NFPA 90A and UL 555, and as indicated.
 2. Ceiling firestop flaps of galvanized steel, 22 gauge frame and 16 gauge flap, two layers 0.125 inch ceramic fiber on top side with locking clip.
 3. Ceiling dampers of galvanized steel, 22 gauge frame, stainless steel closure spring, and light weight, heat retardant non-asbestos fabric blanket closure.
 4. Curtain type dampers of galvanized steel with interlocking blades; stainless steel closure springs and latches for horizontal installations; with blades out of air stream except for low pressure ducts up to 12 inches in height.
 5. Multiple blade fire dampers with 16 gauge galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops and locks.
 6. Fusible links, UL 33, which separate at 160 degrees F with adjustable link straps for combustion fire/balancing dampers.

2.5 BACKDRAFT DAMPERS

- A. Backdraft dampers shall be fabricated as follows:
 1. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with manufacturer's standard construction.

2. Multi-blade, parallel action gravity balanced backdraft dampers of extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel differential static pressure.

2.6 DUCT ACCESS DOORS

- A. Duct access doors shall be fabricated as follows:
 1. In accordance with SMACNA Low Pressure Duct Construction Standards.
 2. With rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices; for insulated ductwork, minimum 1-inch thick insulation shall be installed with sheet metal cover.
 3. Access doors smaller than 12 inches square may be secured with sash locks.
 4. With two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches; additional hinge shall be provided for larger sizes.
 5. Access doors with sheet metal screw fasteners are not acceptable.

2.7 WALL SUPPLY REGISTERS/GRILLES

- A. Wall supply registers/grilles shall comply with the following:
 1. Grilles shall be streamlined and individually adjustable blades; depth shall exceed 3/4-inch maximum spacing with spring or other device to set blades, horizontal face, single deflection.
 2. Grilles shall be fabricated of 1-1/4 inch margin frame with countersunk screw mounting and gasket.
 3. Grilles shall be fabricated of aluminum extrusions, with factory baked enamel finish.

2.8 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Wall exhaust registers and grilles shall comply with the following:
 1. Grilles shall include streamlined blades; depth shall exceed 3/4 inch spacing, with spring or other device to set blades, horizontal face.
 2. Grilles shall be fabricated of 1-1/4 inch margin frame with countersunk screw mounting.
 3. Grilles shall be fabricated of steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory baked enamel finish.
 4. Where not individually connected to exhaust fans, grilles shall include integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.9 ROOF HOODS

- A. Roof hoods shall comply with the following:
 - 1. Air inlet or exhaust hoods shall be fabricated in accordance with SMACNA Low Pressure Duct Construction Standards.
 - 2. Hoods shall be fabricated of galvanized steel, minimum 15 gauge base and 20 gauge hood, or aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; birdscreen with 1/2-inch square mesh for exhaust and 3/4-inch for intake, and factory baked enamel grey finish.
 - 3. Hoods shall be mounted on minimum 12-inch high curb base with insulation between duct and curb.
 - 4. Hood outlet area shall be minimum of twice throat area.

2.10 DUCT SMOKE DETECTORS

- A. Duct smoke detectors shall comply with the following:
 - 1. Detector housing shall be UL listed per UL 268A for use in air handling systems.
 - 2. Detector shall be equipped with two DPDT Form-C relay contacts.
 - 3. Detector shall use photoelectronic technology.

2.10 MANUFACTURERS

- A. Air Inlets and Outlets: Inlets and outlets shall be manufactured by one of the following (or equal):
 - 1. Titus
 - 2. Agitair
 - 3. Krueger
- B. Fire and Backdraft Dampers: Dampers shall be manufactured by one of the following (or equal):
 - 1. Greenheck
 - 2. Air Balance
 - 3. Lloyd Industries
- C. Duct Smoke Detectors: Detectors shall be manufactured by one of the following (or equal):
 - 1. Fire-Lite Alarms
 - 2. Air Products and Controls

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Products shall be installed in accordance with the manufacturer's written installation instructions.

3.2 DUCTWORK FABRICATION

- A. Low pressure ductwork shall be fabricated as follows:
 - 1. Ductwork shall be fabricated and supported in accordance with SMACNA Low Pressure Duct Construction and ASHRAE handbooks, except as otherwise indicated and shall include duct material, gauges, reinforcing, and sealing for operating pressures indicated.
 - 2. Round ducts installed in place of rectangular ducts shall be sized in accordance with ASHRAE table of equivalent rectangular and round ducts.
 - 3. T's, bends and elbows shall be constructed with radius of not less than 1-1/2 times width of duct on centerline; where not possible and where rectangular elbows are used, air foil turning vanes shall be installed.
 - 4. Duct sizes shall be increased gradually and shall not exceed 15 degrees divergence wherever possible; convergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
 - 5. Easements shall be provided where low pressure ductwork conflicts with piping and structure; where easements exceed 10 percent duct area, duct shall be split into two ducts maintaining original duct area.
 - 7. Crimp joints shall be used with or without beads for joining round duct sizes 8-inch and smaller with crimp in direction of air flow.
 - 8. Double nuts and lock washers shall be used on threaded rod supports.
 - 9. Duct systems shall be cleaned by forcing air at high velocity through duct to remove accumulated dust.

3.3 INSTALLATION OF DUCTWORK

- A. Ductwork shall be installed as follows:
 - 1. Openings shall be provided in ductwork where required to accommodate thermometers and controllers and pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage.
 - 2. Ducts shall be located with sufficient space around equipment to allow normal operating and maintenance activities.
 - 3. Plenum doors shall be installed 6 to 12 inches above floor; door swings shall be arranged so that fan static pressure holds door in closed position.

4. During construction, temporary closures of metal or taped polyurethane shall be installed on open ductwork to prevent construction dust from entering ductwork system.

3.4 INSTALLATION OF AIR OUTLETS AND INLETS

- A. Air outlets and inlets shall be installed as follows:
 1. Location of outlets and inlets shall be checked and necessary adjustments shall be made in position to conform with architectural features, symmetry, and lighting arrangement.
 2. Diffusers shall be connected to ductwork with air tight connection.

3.5 APPLICATION OF ACCESSORIES

- A. The installation of accessories shall comply with the following:
 1. Fire dampers shall be installed at locations indicated, where ducts and outlets pass through fire rated components. Dampers shall be installed with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
 2. Re-setting of fire dampers shall be demonstrated to authorities having jurisdiction and OWNER.
 3. Backdraft dampers shall be installed on exhaust fans or exhaust ducts nearest to outside and where indicated.
 4. Flexible connections shall be installed immediately adjacent to equipment in ducts associated with fans and motorized equipment.
 5. Duct access doors shall be installed for inspection and cleaning at fire dampers, and elsewhere as indicated; doors shall be minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
 6. Duct smoke detectors shall be installed in straight sections of duct with the holes of the sensing tube parallel to the airflow. Detectors shall be installed at locations readily accessible for routine maintenance.

** END OF SECTION **

SECTION 16000 - GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section includes performance and design requirements, standard operating requirements, and other general considerations for the electrical and instrumentation work of this project.
- B. This Division includes the provisions for all material, labor, tools, equipment, testing and services necessary to provide a complete and operable electrical system. Additional or other specific equipment/system related requirements may be listed in individual sections of this Division. The Contractor shall promptly notify the City of any discrepancies. The Contractor shall provide the complete system, which includes all the requirements of the specifications.
- C. The work of this section applies to the work of the following sections:
 - 1. Section 16040 Electrical Motors
 - 2. Section 16110 Raceways, Fittings, and Supports
 - 3. Section 16120 Wire and Cable
 - 4. Section 16130 Junction and Device Boxes and Fittings
 - 5. Section 16150 Wiring Devices
 - 6. Section 16155 Motor Starters
 - 7. Section 16160 Control Cabinets and Panel Devices
 - 8. Section 16400 Low Voltage Electrical Service and Distribution
 - 9. Section 16421 Utility Service Entrance
 - 10. Section 16440 Disconnect Fuses and Switches
 - 11. Section 16450 Grounding
 - 12. Section 16480 Motor Control Centers
 - 13. Section 16500 Lighting
 - 14. Section 16620 Packaged Engine Generator System
 - 15. Section 16700 Supervisory Control and Data Acquisition (SCADA) and Intrusion System
 - 16. Section 16900 Controls and Instrumentation

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

1. Section 01300 Contractor Submittals.
2. Section 01660 Equipment Testing and Start-Up.
3. Section 01999 Reference Forms.

1.3 CODES

- A. The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following specifications and standards shall apply to the work of this section, as well as to the electrical work, including connection to electrical equipment integral with mechanical equipment described elsewhere in other sections of Division 16:

1. Federal standards.
2. State and local codes and ordinances and inspecting authorities.
3. National Board of Fire Underwriters.
4. National Fire Protection Association.
5. Underwriters Laboratories Inc. (UL).
6. Factory Mutual (FM).
7. National Electrical Manufacturers' Association (NEMA).
8. American National Standards Institute, Inc. (ANSI).
9. Institute of Electrical and Electronics Engineers (IEEE).
10. Instrumentation Society of America
11. American Society of Heating, Refrigerating, and Air Conditioning Engineers.
12. American Society for Testing and Materials.
13. American Gear Manufacturers' Association.
14. Insulated Power Cable Engineers Association (IPCEA).
15. American Bearing Manufacturers' Association, Inc.
16. California State Department of Industrial Safety (Cal-OSHA).
17. California State Public Utilities Commission.
18. JIC (Joint Industry Council) Standards.

1.5 SHOP DRAWINGS AND SAMPLES

- A. A sample of each type of wire and cable shall be submitted to the Owner in compliance with requirements of Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals. The cable samples shall be of sufficient length to determine their rating and quality.
- B. The submittal package for each individual equipment or groups of related equipment shall be complete and in accordance with this section.
- C. In compliance with these specifications, the Contractor shall furnish the manufacturers statements accepting unit responsibility.
- D. The following, as a minimum, shall be submitted:
 - 1. Manufacturer and manufacturer's type and designation.
 - 2. Manufacturers catalog data indicating rated capacity, efficiency, rated output and other characteristics.
 - 3. Any exception to these specifications along with justification for each exception.
 - 4. Shop drawings.
 - 5. Parts list with material of construction.
 - 6. Installation requirements, showing various clearances required.
 - 7. Details of all appurtenances to be furnished with the specified item.

1.6 INFORMATION TO BE PROVIDED

- A. Before payment of the 75 percent progress payment, the Contractor shall provide the following additional information for each item of the equipment.
 - 1. The Contractor shall provide wiring and interconnection diagrams, which shall show terminal blocks of all distribution and control assemblies, all power, control and signal raceways, junction and pull boxes, all devices, and all interconnecting wiring. Diagrams shall show conductor tag numbers, control wire color code as applicable, and power wire and cable sizes.
 - 2. The motor control center (MCC) is to be identified by MCC number, and name and number of equipment. The outgoing power and control wires shall be run as single lines representing the raceways and shall show any junction boxes or ancillary control devices that may be located in the raceway system or tapped off the raceway along the route. All raceways shall be appropriately identified showing the proposed tag inscription. Wires are to be fanned out and labeled at each point showing the terminal number of the wire and typical wire tags. For factory wired equipment, both the factory terminal numbers as well as the terminal numbers shown on the contract control diagrams shall be shown. If additional space is required, more than one sheet may be used for the connection diagram.
 - 3. Operation and maintenance data per Division 1 requirements.

4. Maintenance manuals per section per Division 1 requirements.
5. Installation certificates per Division 1 requirements.

1.7 QUALITY ASSURANCE

A. UNIT RESPONSIBILITY

Equipment systems made up of two or more components shall be provided as a unit by the responsible manufacturer. Unless otherwise indicated, the Contractor shall obtain each system from the supplier of the driven equipment, which supplier shall provide all components of the system to enhance compatibility, ease of construction, and efficient system performance and maintenance. The Contractor shall be responsible to the Owner for performance of all systems as indicated.

B. PERFORMANCE AND DESIGN REQUIREMENTS

1. Manufacturer's Qualifications:

- a. The Contractor shall ensure that the equipment to be furnished under Division 16 to be the product of firms regularly engaged in the design and manufacture of the type of item specified. The Contractor shall possess the required technical competence, skill, resources and ability to complete the work specified herein with the requisite degree of quality in a timely and efficient manner. The Contractor shall adequately document the qualifications of the manufacturers nominated to provide the equipment specified under this Division. All documentation shall be submitted to the City prior to fabrication and shipment of any component specified herein. Nothing contained within these provisions shall be construed as relieving the Contractor of his responsibility for any portion of the work covered by this Division.
- b. Materials and equipment used in the performance of the electrical construction shall be fully UL approved for the class of service for which they are intended.

2. Arrangement:

- a. The plan drawings are generally diagrammatic and the location of outlets and equipment terminals are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interference's, and the location of electrical terminations on equipment.
- b. The Contractor shall examine the architectural, structural and mechanical plans and shop drawings, for the various equipment, in order to determine exact routing and final terminations for all raceways and cables. Conduits shall be stubbed up as near as possible to equipment terminals and shall be within the concrete base for the equipment or a separate concrete curb.
- c. Allowance has been made in the design for the number of raceways, cables and conductors considered adequate for feeding the various drives and equipment. These circuits and diagrams are based on available data pertaining to the particular design of equipment and portray the systems, which the City has chosen to effect the required operation and level of control. Equipment provided by the Contractor (even though of the make and model specified) may differ in

detail, arrangement, or connections from that shown. If the Contractor uses equipment which differs from the equipment shown, in major aspects, and requires modifications to power, control or other electrical service, the City's acceptance of the equipment will be based upon the Contractor providing the modifications required, and they shall be of the same quality as shown and shall be provided at no additional cost to the City.

3. Seismic Consideration:

- a. All structures shall be designed in accordance with the requirements for IBC and/or SEAC.
- b. Each piece of equipment installed shall be anchored to resist a minimum lateral seismic force of 40 percent of the operating weight of the equipment. This force shall be considered acting at the center of gravity of the piece under consideration. No equipment shall be anchored to vertical structural elements without written approval of the City.
- c. Vibration isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated location without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100 percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 3 inches.
- d. All raceways, ductwork, accessories, appurtenances, etc., furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.
- e. Calculations and shop drawings shall be submitted for all anchorage details. All calculations must be made and signed by a registered engineer. Inasmuch as all anchorage of equipment is to be made of poured-in-place concrete elements, it is imperative that types of anchorage be coordinated with the concrete Contractor so that anchorage may be installed at the time of concrete placement. If calculations and anchorage details are not submitted prior to placement of the concrete, the Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.

C. OPERATING REQUIREMENTS

1. Temporary Power: The Contractor shall at his own expense make arrangements for the purchase of power or portable power and provide for the extension of utility lines to the point of usage. The cost of power shall be included in the appropriate bid items to which it is appurtenant and shall include full compensation for furnishing all labor, materials, tools, and equipment that may require power.
2. Utility Company Requirements: The City shall make application for telephone service in coordination with the Contractor. All requirements of the serving utility company shall be observed including submitting shop drawings as required and obtaining the necessary approval. All costs connected including cable charges and other fees shall be paid by the Contractor.
3. Permits: The Contractor shall pay for all permits, inspections, and other costs incidental to providing electrical installations.

4. Contractor's Record Drawings: The Contractor shall maintain a neatly marked set of red line drawings showing the installed location and routing of conduits, trays, cables, junction boxes, pull boxes, outlets, and interconnection circuits, etc., and the current status of control circuits as reflected on the control diagrams. These marked up red line drawings shall be used by the Design Consultant to produce the as-built drawings.
5. Inspection: The Contractor shall cooperate with the City and shall provide assistance at all times for the inspection of the electrical work performed under this contract. He shall remove covers, operate machinery, or perform any reasonable work, which, in the opinion of the City, will be necessary to determine the quality and adequacy of the work.

1.8 ENVIRONMENTAL CONDITIONS

A. ELECTRICAL EQUIPMENT ENCLOSURES

1. Remote electrical units located in electrical equipment enclosures will be subjected to environmental conditions: temperatures may vary from 50 to 113 degrees F; relative humidity may range 10 to 100 percent; trace quantities of chlorine gas, hydrogen sulfide, and dust may be present.
2. In exterior areas, ambient temperatures may vary from 28 to 113 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have wind-blown dust, sand, hail, and rain occurring. The site has a yearly rainfall ranging from 6 to 26 inches.

B. UNCLASSIFIED FIELD LOCATIONS

1. Field equipment located in interior areas which have not been classified as hazardous locations as defined by the National Electrical Code, Article 500, may be subjected to ambient temperatures varying from 41 to 113 degrees F and relative humidity ranging up to 100 percent. Incidental quantities of hydrogen sulfide gas and dust also may be present.
2. In exterior areas, ambient temperatures may vary from 28 to 113 degrees F with strong direct radiation from the sun. Relative humidity in all exterior field areas will vary from 10 to 100 percent with condensation and icing occurring. All areas may have trace quantities of hydrogen sulfide gas with wind-blown dust, sand, hail, and rain occurring. Chlorination areas may have concentrations of chlorine gas or sulfur dioxide gas up to 2 parts per million. The site has an average yearly rainfall of almost 12 inches.

C. CLASSIFIED FIELD LOCATIONS

1. Field equipment located in hazardous areas such as wet well shall comply with the National Electrical Code, Article 500.

1.9 SHIPMENT

1. The major equipment items as listed in this provision and furnished under this Contract shall be shipped in sealed, weathertight, enclosed conveyances in a manner designed to protect the equipment against damaging stresses during transport.

1.10 WARRANTY

1. Refer to Section 01660 – Equipment Testing and Start-Up, for warranty periods. Major equipment such as motor's, MCC's and emergency generators shall have a two year warranty period.

PART 2 - PRODUCTS

2.1 MATERIALS

1. All material and equipment shall be new, free from defects, of current manufacture, and of the quality specified or shown, and shall be listed by the Underwriters Laboratories Inc. (UL) for the purpose for which it is to be used where such listing has been applied by UL to similar products. Each type of material shall be of the same manufacture and quality throughout the work.

2.2 CORROSION PROTECTION

- A. Unless otherwise noted, all equipment and appurtenances provided under this section shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment, then primed and painted with a durable enamel finish. Minimum dry film thickness shall be 3 mils. The Contractor shall ensure that all panels or enclosures specified to be painted in this section shall match in color to ANSI 61, gray for all exterior surfaces and flat white on all interior surfaces. Nonconforming panels shall be repainted.
- B. Field painting of all equipment shall conform to the procedure or outline in applicable sections of this project manual that specify painting and finishing.
- C. Galvanizing, where specified, shall conform to the applicable division of the specifications. Galvanized equipment and appurtenances shall not be shop primed or painted but will be field painted as specified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall cause each item of equipment provided as a part of this project to be installed, aligned, and tested by skilled workmen to the tolerances recommended by the equipment manufacturer.
- B. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The City reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

3.2 TESTING AND STARTUP

A. GENERAL

1. The Contractor shall furnish all labor, materials, instruments and tools to make all connections for testing. All electric power, fuel, water, supplies, and utilities required for all tests shall be provided by the Contractor.

2. All equipment shall be demonstrated as operating properly prior to the acceptance of the work. These tests shall be made in the presence of the City and the results shall be recorded. All deficiencies or unsatisfactory conditions as determined by the City, or inspecting authorities, shall be corrected by the Contractor in a satisfactory manner at his own expense.
3. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements.

B. PROTECTIVE DEVICES

1. All protective devices shall be properly set and operative during the testing period. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment prior conducting the testing.

C. INSPECTION OF JOINTS

1. Joints and connections in conductors No. 6 AWG and larger shall be inspected by the City after the joints have been made and prior to application of any tape.

D. PRELIMINARY TESTING

1. After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system of wiring shall be thoroughly tested for shorts and grounds. The Contractor shall correct all defects.

E. INSULATION RESISTANCE TESTS

1. Wire and Cable: All wires and cables to be used as feeders, branch circuit wiring, control circuits and other wiring shall be tested with an insulation resistance tester rated 500 volts D.C. and capable of measuring 100 megohms (Biddle Company Megger, or equal). Single conductor wires and cable shall have a resistance to ground not less than 10 megohms, and conductors of multiple conductor cables not less than 1 megohms to ground. Do not directly megger solid-state device circuits. Disconnect solid-state devices prior to resistance tests.
2. Tests: The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured for the following.
 - a. Motor feeders shall be measured with the motor disconnected.
 - b. Control circuits shall be measured with pushbuttons, interlocking relays, instruments, overcurrent devices, and the like connected.
 - c. Lighting feeders to panelboards shall be measured with the branch circuit breakers open.
 - d. The test shall be made with the branch breakers closed, and with receptacles and fixtures mounted, but before lamping.
 - e. Power feeders shall be measured with switches and circuit breakers in place.

F. EQUIPMENT TESTS

1. Service Centers, Main Switchboards, MCCs, and Control Panels: The following tests shall be performed.

- a. Megger the main bus and all power and control circuits.
 - b. Check the wire terminals for clean connections.
 - c. Check all control switches, alarm devices, indicating instruments for proper operation under normal and simulated abnormal conditions.
 - d. Check the thermal overload heaters for each motor and the reset mechanism.
 - e. Check the motor nameplate full load current as the basis for checking the heater selection.
 - f. The thermal overload heaters shall be in accordance with the starter manufacturer's heater tables for motor enclosure and starter enclosure.
2. Phase Rotation: The connections of all equipment shall be checked for correct phase rotation.
 3. Circuit Breakers: The following tests shall be performed.
 - a. Inspect each circuit breaker.
 - b. Check for loose connections.
 - c. Operate each circuit breaker manually.
 - d. Set the adjustable trips to the values specified.

G. MOTOR INSULATION TESTING

1. Each polyphase motor shall have its insulation resistance to ground measured with 1000 volt "Megger" prior to connection. Values of resistance of less than 10 megohms shall be cause for equipment rejection.

H. THERMAL OVERLOAD PROTECTIVE DEVICES

For each motor the Contractor shall compile the following data in neatly tabulated form. Data shall be obtained from the equipment as provided on the job.

1. Equipment driven.
2. Nameplate amperes.
3. Service factor.
4. Overload device catalog number.
5. Overload device current range and setting.

**** END OF SECTION ****

SECTION 16040 - ELECTRICAL MOTORS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The CONTRACTOR shall provide electric motors, accessories, and appurtenances, complete and operable, in accordance with the Contract Documents. The provisions of this Section apply to all electric motors.

1.2 RELATED SECTIONS

- A. The Work of the following Section applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.
 - 1. Section 16050 Basic Electrical Materials and Methods

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 - 1. ANSI/NEMA MG 1 Motor and Generator
 - 2. ANSI/NEMA MG12.53 Motor Testing
 - 3. ANSI/IEEE 112 Standard Test Procedure for Polyphase Induction Motors and Generators
 - 4. IEEE 43 Recommended Practice for Testing Resistance of Rotating Machinery
 - 5. IEEE 841 Standard for Petroleum and Chemical Industry Premium Efficiency, Severe-Duty, Totally Enclosed Fan Cooled (TEFC) Squirrel Cage Induction Motors

1.4 CONTRACTOR SUBMITTALS

- A. Shop Drawings and Catalog Data: Submit shop drawings and catalog data submittals in accordance with Section 01300 - Contractor Submittals.
- B. Motor Data: Complete motor data shall be submitted in the shop drawings for driven machinery. Motor data shall include:
 - 1. Machine name and specification number of driven machine.
 - 2. Name of the motor manufacturer.
 - 3. Motor type or model and dimension drawing. Include motor weight.
 - 4. Nominal horsepower.
 - 5. NEMA design.

6. Enclosure.
 7. Frame size.
 8. Winding insulation class and temperature rise class.
 9. Voltage, phase and frequency ratings.
 10. Service factor.
 11. Full load current at rated horsepower for application voltage.
 12. Full load speed.
 13. Guaranteed minimum full load efficiency. Also provide nominal efficiencies at $\frac{1}{2}$ and $\frac{3}{4}$ load.
 14. Type of thermal protection or overtemperature protection, if included.
 15. Wiring diagram for devices such as motor leak detection, temperature, or zero speed switches, as applicable.
 16. Bearing data, with recommended lubricants for relubricatable type bearings.
 17. If used with a variable frequency controller, verify motor is inverter duty type. Include minimum speed at which motor may be operated for the driven machinery.
 18. Power factor at $\frac{1}{2}$, $\frac{3}{4}$ and full load.
 19. Recommended size for power factor correction capacitors to improve power factor to 0.95 (lagging) when operated at full load.
- C. Water Cooling: If water cooling is required for motor thrust bearings, the shop drawings shall indicate this requirement.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Identical Motors: Electric motors driving identical machines shall be identical.
- B. Maximum Motor Loading: Maximum motor loading shall in all cases be equal to nameplate horsepower rating or less, exclusive of service factor and as verified with the approved submittal data of the driven machinery.
- C. Minimum Motor Horsepower: All motors shall be sized to carry continuously all loads which may be imposed through their full range of operation. The motor horsepower shall be not less than the estimated minimum specified for each driven machine. If the estimated minimum horsepower specified is not adequate to satisfy the foregoing restrictions or any other requirements of these Specifications, the motor with the required horsepower shall be supplied at no additional cost to the OWNER. In addition, any changes caused by increase in motor horsepower shall be made by the CONTRACTOR at no additional cost to the OWNER; such changes may involve circuit breakers, magnetic starters, motor feeder conductors, conduit sizes, etc.

- D. Exempt Motors: Motors which are for valve operators, submersible pumps, or motors which are an integral part of standard manufactured equipment, i.e., non-NEMA mounting, common shaft with driven element, part of domestic or commercial use apparatus may be excepted from these Specifications to the extent that such variation reflects a necessary condition of motor service or a requirement of the driven equipment.

2.2 DESIGN REQUIREMENTS

- A. General: All electric motors shall comply with ANSI/NEMA MG 1 - Motor and Generator.
- B. NEMA Design: Electric motors shall be NEMA Design B, (except as indicated in Equipment Specifications for motors controlled for variable speed operation and other special motors,) constant speed squirrel-cage induction motors having normal starting torque with low starting current. In no case shall starting torque or breakdown torque be less than the value in ANSI/NEMA MG 1. Motors shall be suitable for the starting method indicated on the Electrical Drawings.
- C. Motor Voltage Ratings: Motors shall have voltage ratings in accordance with the following, unless otherwise indicated:
 - 1. Motors below ½ hp shall be rated 115 V, single-phase, 60-Hz. Dual voltage motors rated 115/230 V, 115/208 V, or 120-240 V are acceptable, provided all leads are brought out to the conduit box.
 - 2. Motors ½ hp and larger shall be rated 230 V, or 460 V, 3-phase, 60-Hz, as required and as indicated. Dual voltage motors rated 230/460 V or 208/230/460 V are acceptable, provided all leads are brought out to the conduit box.
- D. Insulation: All three-phase motors shall be furnished with Class F insulation, rated to operate at a maximum ambient temperature of 104 degrees F and at the altitudes where the motors will be installed and operated, without exceeding Class B temperature rise limits stated in ANSI/NEMA MG 1-12.42. Single phase motors shall have Class F insulation with temperature rise not to exceed the insulation class.
- E. Motors in Nonhazardous Areas: Motors 50 hp or smaller located in nonhazardous areas shall be totally enclosed, fan cooled with a service factor of 1.15 unless otherwise indicated. Motors larger than 50 hp and up to 200 hp located in nonhazardous areas shall be open drip-proof (ODP) with a service factor of 1.15.
- F. Motors in Hazardous Areas: Motors for use in hazardous areas shall have enclosures suitable for the classification shown on the Drawings. Such motors shall be UL listed and stamped as such.
- G. Motors for 25 hp and larger shall have space heaters. Space heaters shall be 120 VAC.
- H. High Efficiency Motors:
 - 1. Motors with a nameplate rating of 1 hp and above shall be "high efficiency" units. Motors shall be stamped with the efficiency on the nameplate with the caption "NEMA Nominal Efficiency" or "NEMA Nom. Eff." Such motors shall have efficiencies determined by the test as set forth in ANSI/IEEE 112-Standard Test Procedure for Polyphase Induction Motors and Generators, Method B.

2. Efficiency Index: Efficiency index, nominal efficiency, and minimum efficiency shall be defined in accordance with ANSI/NEMA MG 12.53 - Motor Testing; these values shall be stated in the shop drawing submittal.
3. High efficiency motors shall conform to the guaranteed minimum, full-load efficiency requirement presented in the schedule at the end of this Section.

2.3 ACCESSORY REQUIREMENTS

- A. General: Horizontal motors 3 hp and larger, and all vertical motors, shall have split-type cast metal conduit boxes. Motors other than open drip-proof shall be gasketed. Motors less than 3 hp shall have the manufacturer's standard conduit boxes.
- B. Lifting Devices: All motors weighing 265 pounds or more shall have suitable lifting eyes for installation and removal.
- C. Special Requirements: Refer to individual equipment specifications for special requirements such as motor winding thermal protection, multispeed windings, etc.
- D. Grounding Lugs: Provide motor grounding lug suitable to terminate ground wire, sized as indicated on the Drawings.
- E. Nameplate: All motors shall be fitted with a permanent, stainless steel nameplate indelibly stamped or engraved with NEMA Standard motor data, in conformance with NEMA MG-1-10.40.

2.4 MOTOR THERMAL PROTECTION

- A. Single Phase Motors: All single-phase 120, 208, or 230 V motors shall have integral thermal overload protection or shall be inherently current limited.
- B. Thermostats: Winding thermostats where specifically indicated shall be snap action, bi-metallic, temperature-actuated switch. Thermostats shall be provided with one normally closed contact. The thermostat switch point shall be precalibrated by the manufacturer.
- C. RTDs: Bearing RTDs and/or winding RTDs (two per phase) shall be provided where specifically indicated. RTDs shall be 100-ohm platinum.

2.5 MOTOR BEARINGS

- A. General: Bearings shall conform with the provisions of Section 11000 - Equipment General Provisions, except as supplemented or modified by the requirements of this Specification.
- B. Bearing Life: All motors greater than 2 hp shall have bearings designed for a minimum rated L-10 life of 10 years or 100,000 hours, whichever comes first.
- C. Fractional Horsepower: Fractional horsepower through 2-hp motors shall be furnished with Lubricated-for-Life ball bearings.
- D. Horizontal Motors Over 2 Horsepower: Motors larger than 2 hp shall be furnished with relubricatable ball bearings.
- E. Vertical Motors Over 2 Horsepower: Vertical motors larger than 2 hp shall be furnished with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

2.6 MANUFACTURERS

- A. The CONTRACTOR's designated equipment supplier shall have the responsibility to select and supply suitable electric motors for the driven equipment. The choice of motor manufacturer shall be subject to review by the CONSTRUCTION MANAGER. Such review will consider the future availability of replacement parts and compatibility with driven equipment. Acceptable manufacturers include the following, or equal:
 - 1. U.S. Motors.
 - 2. Reliance Electric.
 - 3. Louis Allis (Division of Magnetek, Inc.)
 - 4. Marathon Electric Manufacturing Co.
 - 5. Siemens Energy & Automation, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Motor installation shall be performed in accordance with the motor manufacturer's written recommendations and the written requirements of the manufacturer of the driven equipment.
- B. Electrical work involving connections, controls, switches, and disconnects, shall be as indicated in Division 16.

3.2 FACTORY TESTING

- A. Motors rated 100 hp and larger shall be factory tested in conformance with ANSI/IEEE 112, IEEE 43 - Recommended Practice for Testing Resistance of Rotating Machinery, and NEMA MG-2. Test reports shall include heat run, performance, bearing (temperature, noise), locked rotor, speed torque, no-load saturation, surge, and megohmmeter/dielectric absorption ratio. Test report shall indicate test procedure and instrumentation used to measure and record data. Test report shall be certified by the motor manufacturer's test personnel and be submitted.

3.3 FIELD TESTING

- A. The CONTRACTOR shall perform the following field tests:
 - 1. Inspect each motor installation for any deviation from rated voltage, phase or frequency; or improper installation.
 - 2. Visually check for proper phase and ground connections. Verify that multivoltage motors are connected for proper voltage.
 - 3. Check winding and bearing temperature detectors and space heaters for functional operation.
 - 4. Test for proper rotation before connection to the driven equipment.
 - 5. Test insulation (megger test) of all new as well as reused motors in accordance with NEMA MG-1. Test voltage shall be 1000 VAC plus twice the rated voltage of the motor.

** END OF SECTION **

SECTION 16110 - RACEWAYS, FITTINGS, AND SUPPORTS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all raceways, wire ways, raceway supports, and concrete encased ducts.
- B. All raceways shall be PVC Coated rigid galvanized steel, Robroy PlastiBond II or equal, conduit unless otherwise noted.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittals.
 - 2. Section 16000 General Electrical Provisions.

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the following, and specifications and standards of Section 16000 – General Electrical Provisions, and other applicable specifications and standards.
 - 1. ANSI Standard C80.1, Electrical Rigid Steel Conduit
 - 2. UL 6, Electrical Rigid Metal Conduit
 - 3. UL 514B, Conduit, Tubing and Cable Fittings
 - 4. UL 651, Schedule 40 and 80 Rigid PVC Conduit and Fittings
 - 5. NEMA Standard RN 1, PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - 6. NEMA Standard TC 2, Electrical PVC Conduit

1.5 SHOP DRAWINGS AND SAMPLES

- A. Shop Drawings and Samples shall be submitted in compliance with Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.
- B. Submittal of all materials shall be in one complete submittal package. Submittals shall include the following data, drawings, and description of materials.

1. Manufacturer and manufacturer's type and designations for each equipment item.
2. List of construction material for all conduits, fittings, supports and accessories.
3. Any exception to these specifications along with justification for each accessories.

1.6 QUALITY ASSURANCE

A. Performance and Design Requirements:

1. The PVC used for Schedule 40 conduits and PVC coating on rigid galvanized steel conduit shall be made from virgin material.

B. Inspection:

1. All ducts shall be inspected by the City prior to pouring concrete. The inspection shall include backfill compaction, drainage slope, spacers, flotation ties, conduit condition, and joints. The concrete shall not be poured until this inspection is complete.
2. The Contractor shall coordinate with the utility companies for power and telephone service, duct bank location, routing, and inspection and shall comply with their requirements.

1.7 ENVIRONMENTAL CONDITIONS

- A. The raceways, fittings, and supports shall be installed either exposed, concealed, or in duct banks in a wastewater pumping facility. Ambient temperatures are expected to range between 30 degrees F to 125 degrees F. Relative humidity should range from 40 percent to 100 percent. In some installations, the raceways, fittings, and supports may contain hydrogen sulfide gas, dust, moisture, and/or methane gas.
- B. The raceways, fittings, and supports located in and around hazardous areas shall be suitable for Class I, Division I, Group D locations.

PART 2 - PRODUCTS

2.1 MATERIAL

A. RACEWAYS

1. General: Underground raceways shall be polyvinyl chloride (PVC) Schedule 40, encased in concrete duct banks. Raceways installed in stud walls or above suspended ceilings shall be electrical metallic tubing (EMT). All raceways installed in exposed location shall be rigid galvanized steel conduit with PVC bonded coating and lining. Flexible metal conduit shall be employed for connections to the lighting fixtures. Explosion-proof conduits and fittings shall be employed in hazardous location. Final raceway runs to electrical equipment on machinery requiring flexibility or that is subject to vibration shall be liquid-tight flexible metal conduit. All fittings and supports installed in exposed locations shall be PVC coated. Minimum size of all conduits shall be 3/4 inch except PVC conduits, which shall be 1 inch.
2. PVC Conduit: Nonmetallic conduit shall be high impact PVC, Schedule 40. The nonmetallic conduit shall be corrosion resistant. Tensile strength shall be 6000-psi minimum, and compressive strength 9000-psi minimum. The material shall have a smoke emission rate of not more than 5.1 grams/100 grams by the Arapahoe smoke chamber test.

3. PVC Coated Conduit: PVC coated conduit shall be hot-dip galvanized including the threads. The interior and exterior surfaces shall be coated with 2 mils thick urethane. The exterior of the conduit shall be PVC coated to a minimum 40-mil thickness. The PVC coating shall be permanently bonded to the conduit. The coating shall have a minimum tensile strength of 3500-psi. A PVC coated coupling shall be furnished with each length of the conduit. The PVC sleeve of the coupling shall equal the outside diameter of the coated conduit and shall extend 12 inches from each end of the coupling. All exterior PVC coating shall be green color.
4. Flexible Metal Conduit: Flexible metal conduit shall be formed from spirally wound galvanized steel strip with successive convolutions that are securely interlocked. Minimum size of the flexible metal conduit shall be 2 inch. Fittings shall be of the compression type. Lengths shall not exceed 60 inches. Flexible metal tubing shall include a code size insulated green ground conductor.
5. Liquid-tight Flexible Metal Conduit: Liquid-tight conduit shall be formed from spirally wound galvanized steel strip with successive convolutions securely interlocked, jacketed with a liquid-tight plastic cover. Minimum size shall be 2 inch.

B. FITTINGS

1. PVC Conduit Fittings: Fittings used with PVC conduits shall be of the solvent-weld type PVC and shall be of the same material as the conduit. Expansion fittings shall be provided as recommended by the manufacturer.
2. PVC Coated Rigid Steel Conduit Fittings: Fittings with PVC coated rigid steel conduit shall be PVC coated in a manner similar to the conduit. The exterior of the fittings shall be coated with 2-mil thick urethane prior to the application of the 40-mil exterior PVC coat. Interior of the fittings shall have a 2-mils urethane finish. The fittings shall have ribbed finish to assist in the installation of fittings. Threadless fittings shall not be used with PVC coated rigid steel conduit. Bushings and ground bushings shall be as specified for rigid galvanized steel conduits. All exterior PVC coating shall be green color.
3. Flexible Metal Conduit Fittings: Fittings used with flexible metal conduit shall be compression type, cadmium-plated malleable iron body with locknut and bushing. Forty-five and 90degree fittings shall be used where applicable.
4. Liquid-tight Conduit Fittings: Fittings used with liquid-tight conduit shall have cadmium-plated malleable iron body and gland nut, brass grounding ferrule threaded to engage conduit. These fittings shall also use spiral and "O" ring seals around the conduit, the box connection and insulated throat. Forty-five and 90degree fittings shall be used where applicable. In areas where PVC coated conduit is required, liquid-tight fittings shall be PVC coated.

C. WIREWAYS

All wireways and auxiliary gutters shall be JIC sectional flange oil-tight type with hinged covers. Minimum size shall be 8 inches by 8 inches unless otherwise noted. All wireways shall be painted.

D. RACEWAY SUPPORTS

1. General: Raceway support systems shall be designed to provide a factor of safety of no less than five.

2. Conduit Supports: Conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. When used with PVC coated rigid steel conduit, the conduit supports shall be 40 mils thick PVC coated.
3. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel pipe hangers. Straps or hangers of plumber's perforated type shall not be acceptable. Hanger rods shall be ½ inch minimum galvanized all-thread rod and shall meet or exceed ASTM A193B7 and ASME Boiler and Pressure Vessel Code specifications. Trapeze, rod type hangers shall not be loaded in excess of 700 pounds per rod. Where loading exceeds this value, rigid frames shall be provided.
4. Racks: Racks shall be constructed from framing channel. Channels and all associated hardware shall be steel, hot-dip galvanized after fabrication of the channel. Field cuts shall be painted with zinc-rich paint. Channels attached directly to building surfaces shall be 14-gage minimum material 1-5/8 inches wide by 13/16 inch deep. All other channels shall be 12gage minimum material 15/8 inch wide by 15/8 inch minimum depth. Racks shall be designed to limit deflection to 1/360 of span. All exposed ends of framing channel shall be covered with manufacturer's standard plastic inserts. When used with PVC coated rigid steel conduits, the racks shall be PVC coated to 40-mil thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. CONDUIT

1. All exposed conduits shall be PVC coated rigid galvanized steel conduits. Exposed conduit shall be run on supports spaced not more than 8 feet apart and shall be constructed with runs parallel or perpendicular to walls, structural members or intersection or vertical planes and ceiling. No conduit shall approach closer than 6 inches to any object operating above the rated temperature of its cable temperature.
2. Conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using one-hole hot-dip galvanized malleable iron straps with nesting backs or, if three or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8 inch to 1 inch by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized wrought steel pipe hangers. Where three or more conduits are suspended from the ceiling, suitable steel racks shall be constructed subject to submittal to the City for review.
3. Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors in accordance with the structural section of these specifications. Individual conduit supports may be similar to cast-in-place anchors, die-cast, rustproof alloy expansion shields or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts shall not be used as a base to secure conduit supports.
4. Welding, brazing or otherwise heating of the conduit is not allowed. Plumber's perforated tape shall not be used for any purpose.
5. Where required for ease of pulling and as necessary to meet code, the Contractor shall provide cast junction or pullboxes even though not shown on the drawings. The Contractor shall limit the number of equivalent 90degree bends to three in any run between pull boxes. Runs shall be limited to 400 feet, less 100 feet for each equivalent

90degree bend in the run. Bends and offsets shall be avoided where possible, but where necessary, shall be made with an approved hickey or conduit bending machine, or shall be factory preformed bends.

6. All conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing constructed over the conduit end. All conduit entering NEMA 12 boxes shall be terminated with a rain-tight hub having an insulated liner. All surface mounted cast boxes and plastic enclosures shall have threaded hubs. All joints shall be made with standard threaded couplings or specified unions. Metal parts of plastic control stations and coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of all conduit shall be cut square, reamed and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Male threads on rigid steel conduit shall be coated with electrically conductive zinc rich paint. Threading shall be done with dies, with the guide sleeve bored out to allow for increased diameter of the PVC coated conduit. Conduit shall be made with the next larger bend or next larger shoe bushed for proper fit.
7. PVC coated conduit shall be tightened, with strap wrenches and the plastic overlap shall be coated and sealed per manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. All damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating. Joints in multiple conduit runs shall be staggered.
8. Wherever conduits penetrate concrete wall panels to outdoors or as shown, the Contractor shall detail the required mountings. He shall locate and use a galvanized pipe sleeve for passage of the conduit. A compression type seal shall be used to form a complete watertight installation. The installation design shall be submitted to the City. Provide seals at underground conduit terminations inside the conduit to prevent outside water from entering enclosures.
9. All underground conduits shall be PVC Schedule 40. Transition shall be made from PVC Schedule 40 conduit to rigid galvanized steel conduit at all stub-ups and when entering equipment. The transition shall consist of a rigid galvanized conduit. Conduits shall be laid with a minimum grade of 2 inches per 100 feet from structure to manhole or from high point to manholes.
10. Conduit constructed in concrete slabs or walls shall be placed in the middle third of the slab or wall. Conduit rising through a slab shall be protected by a formed concrete pad approximately 6 inches in diameter and 4 inches above the finished floor, or the conduit shall come up through the equipment pad. Clearances equal to the conduit trade diameter, but not less than 12 inches, shall be maintained between conduit-encased slabs. Clearances of less than 12 inches at conduit crossing and terminating locations may be allowed by the City at its discretion. Flexible conduit shall not be used as a general purpose raceway but shall be provided in locations requiring flexibility with the approval of the City.
11. Liquid-tight conduit shall be used for all motor connections as detailed. Where flexibility is required for electrical raceways on equipment, liquid-tight conduit shall be used in accordance with JIC standards, these specifications, and the local inspection agency. The maximum length of flexible conduit shall be 36 inches. The terminating fitting and sealing shall be as shown in the motor details.

12. Nonjacketed flexible conduit may be used for connections to lighting fixtures in furred spaces (architecturally treated areas).
13. Each conduit passing from a hazardous area into a non-hazardous area shall be provided with a sealing fitting which may be located on either side of the boundary. The seal shall be installed at the boundary and in accordance with NEC requirements. The seal shall be UL approved and shall be filled with approved sealing compound of the same manufacturer.
14. The Contractor shall exercise the necessary precautions to prevent the lodging of dirt, concrete or trash in the conduit, fittings and boxes during the course of construction.
15. Each conduit shall be identified at each end with a permanent non-corrosive metal marker. Designation shall be pressure stamped into the tag. The conduit identification shall be the designated conduit number as shown.

** END OF SECTION **

SECTION 16120 – WIRE AND CABLE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all wire and cable used for electrical current conductors.
- B. All conductors shall be copper, Type B stranded. The minimum size of field conductors shall be No. 12 AWG for power circuits and No. 14 AWG for control circuits.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 16000 General Electrical Provisions

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this WORK shall include the current editions of the specifications and standards of Section 16000 – General Electrical Provisions, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

A sample of each type of wire and cable shall be submitted to the Owner in compliance with the requirements of Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals. The cable samples shall be of sufficient length to determine their rating and quality.

1.6 ENVIRONMENTAL CONDITIONS

The wire and cable will be installed in raceways in a Wastewater Pumping Facility. Ambient temperatures are expected to range between 40° F to 125 ° F. Relative humidity is expected to range from 40 percent to 100 percent. In some installations, the wire and cable will be subjected to dust and moisture.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. SINGLE CONDUCTORS

Conductor insulation shall be 600 volt, NEC Type THWN or XHHW.

B. CONDUCTOR COLOR

Insulated conductors shall be color coded as follows:

<u>System</u>	<u>Service</u>	<u>Color</u>
480V, 3 phase	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
240V, 3 phase	Phase A	Black
	Phase B	Red
	Phase C	Blue
240V, 1 phase	L1	Black
	L2	Red
120V, 1 phase	L	Black
P1	Control	Blue
P2	Control	Yellow
All	Ground	Green

All neutrals shall be white.

The same color conductor shall be connected to the same phase throughout the plant for a particular voltage level. On cable No. 4 AWG and larger, black may be used with colored 3/4inch vinyl plastic tape for 6 inches for each end at all terminations and in pull boxes.

C. PORTABLE CORD

1. Cord shall be NEMA Type SO or STO with NEMA Class G copper stranding. Cords larger than No. 2 AWG shall be National Bureau of Mines, Type G. All cords shall contain an equipment grounding conductor.
2. Rubber covered multi-conductor cable shall not be used on stationary industrial equipment for any voltage exceeding 250 volts AC, nor shall it be used for connections to any motor rated 1/4 horsepower or larger. For these purposes, JIC E12.4.4 through E12.4.8 and E13.3 shall apply, except that fittings referenced in E13.3.3 shall apply.
3. Portable cord for supply to permanent installations, such as pumps, cranes, hoists and portable equipment shall have a wire mesh cord grip of flexible stainless steel wire to take the tension from the cable termination. Weatherproof strain relief fittings shall be used for all connections. Forty-five degree and 90 degree connectors shall be used where applicable to prevent unnecessary strain on cords. Flexible cords feeding submersible non-wicking neoprene construction.

D. CONTROL CABLE

The cable shall be Type SO extra flexible and shall consist of No. 16 copper conductors insulated for 600-volt service. The overall jacket shall consist of 7/64inch neoprene minimum. The number of conductors shall be as shown on the drawings.

E. PANEL CABLE

Cable for panel wiring shall be 600 volt, NEC Type MTW rated 90 degrees C, and shall be flame, moisture and oil-resistant polyvinyl chloride insulated machine tool wire. Panel cable shall not be used in conduits and shall not be smaller than No. 14 AWG.

F. SHIELDED CABLE

1. Instrumentation cable shall be single twisted No. 18 AWG shield pair or multiple twisted No. 18 AWG shielded pair cable. Conductors shall be coated copper per ASTM B 33, Class B strand.
2. Insulation shall be 20 mils, cross-linked polyethylene rated 300 volts. Each conductor shall be color coded, and each pair shall be number coded. Insulation shall meet electrical and physical requirements of IPCEA S66524.
3. The assembled pairs shall have an aluminum/Mylar tape shield with a tinned copper drain wire over it.
4. The assembly shall be covered with a polyethylene jacket per IPCEA S1981.

2.2 GROUNDING

- A. A grounding system shall be installed in accordance with the National Electrical Code. All grounding surfaces shall be thoroughly cleaned before connecting the grounding electrodes. All conduit shall be grounded directly or through equipment frames and ground buses to the grounding system.
- B. In addition to the conduit system, all equipment having 480 volt, 120/208 volt or 120/240 volt supply shall be grounded to the supply source ground bus by a green insulated code sized ground conductor installed in the conduit with the phase cables. Ground conductors for small panels and equipment shall be of same size as associated conductors.
- C. Grounding of motor frames to the conduit system shall be accomplished with a ground clamp on the rigid conduit system of the feeder and by connection to the motor frame with a ground cable as shown.

2.3 WIRE AND CABLE CONNECTORS

All connectors shall be of the one-piece tool applied compression type of the correct size and UL listed for the specific application. Connectors for copper shall be tin-plated electrolytic copper. Connectors for wires No. 10 AWG and smaller shall be self-insulating ring tongue or locking spade terminals. Connectors for No. 8 AWG and larger shall be one-hole lugs up to size No. 3/0 AWG and two-hole or four-hole lugs for size No. 4/0 and larger. Mechanical clamp or screw type terminals shall not be acceptable.

2.4 WIRE AND CABLE TERMINATION

- A. Power and control conductors shall be terminated in terminal blocks with solderless box lugs. Signal leads shall be terminated in terminal blocks with saddle-type pressure connectors capable of receiving two No. 16 AWG or smaller conductors on each point.
- B. Splices are not allowed.

- C. Solid wire shall not be lugged nor shall electrical spring connectors be used on any wiring. Lugs and connectors shall be installed with a compression tool recommended by the lug manufacturer for the particular lug used.
- D. All conductors shall be tagged at each end in motor control centers, control panels, and control stations with a legible permanent coded wire marking sleeve showing 'to' and 'from' information. All conductors shall be identified in each manhole, handhole or pull box. Field conductors shall be similarly tagged at each end except that each conductor termination shall have its marking sleeve imprinted with terminal identification for both ends of the conductor. A schedule shall be provided with the as-built drawings correlating these wire markings.

2.5 PORTABLE CABLE FITTINGS

Portable cable fittings for terminating the cable shall provide a watertight seal between the cord and the terminator and between the terminator and mounting hub. The cable terminator shall be provided with a neoprene liner, which grips the cord jacket when the back nut on the fitting is tightened. In addition, on all pendant cord applications and other applications where called for, a stainless steel wire mesh cord grip shall be provided as an integral part of the cord terminator.

2.6 PULLING LUBRICANT

- A. All cables shall be properly coated with pulling compound recommended by the cable manufacturer before being pulled into conduits so as to prevent mechanical damage to the cables during installation.
- B. Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptability for the cable being installed.

2.7 WIRE MARKERS

- A. Each power and control circuit conductor shall be identified at each terminal to which it is connected with a legible permanent coded marking sleeve. Provide 'to' and 'from' information on tags. Sleeves shall be yellow or white tubing, sized to fit the conductor insulation, with machine printed black marking. Adhesive strips are not acceptable.
- B. In each manhole, handhole and pull box, each conductor shall be similarly marked with a split sleeve, machine marked so the identification can be made using groups of letters and numbers.

PART 3 - EXECUTION

3.1 GENERAL

- A. Care shall be exercised in pulling wire and cable into conduit or trays to avoid kinking, putting undue stress on the cables, or otherwise abrading them. No grease will be permitted in pulling wire or cable. Soapstone, talc or UL listed pulling compound only will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it.
- B. Incoming wire in panels and motor control centers, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, and neatly spread into tees and connected to their respective terminals. Sufficient slack shall be allowed in cables for alterations in terminal connections. Lacing shall be done with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for wire runs, lacing is not necessary when the wire is properly installed in the ducts. Slack shall be provided in junction and pull boxes and in handholes and manholes. Amount of slack shall be equal to the largest perimeter dimension of the box.

- C. Wires crossing hinges shall be made up into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.

3.2 PERFORMANCE TESTS

- A. All terminations are subject to inspection by the City prior to and after insulating.
- B. After the visual inspection of joints and connections and the application of tape and other insulating materials, all sections of the complete system of wiring shall be thoroughly tested for shorts and grounds. The Contractor shall correct all defects.
- C. Each 230/460-volt motor shall have its insulation resistance to ground measured with 1000 volt "Megger" prior to connection, in the presence of the City, and shall make record of these values. Values of resistance of less than 10 megohms will not be acceptable.
- D. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms, for testing and startup documentation requirements.

** END OF SECTION **

SECTION 16130 - JUNCTION AND DEVICE BOXES AND FITTINGS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all electrical junction boxes, device boxes, fixture support boxes, floor boxes, terminal cabinets and fittings.
- B. Unless otherwise listed, all junction boxes, device boxes, fittings, etc., shall be hot-dip galvanized cast ferrous alloy type. All exposed boxes and fittings shall be PVC coated.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittal.
 - 2. Section 16000 General Electrical Provisions.

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000 – General Electrical Provisions, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

Submittals shall comply with the provisions set forth in Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.

1.6 ENVIRONMENTAL CONDITIONS

The boxes and fittings will be installed in a Wastewater Pumping Facility. Ambient temperatures are expected to range between 40 degrees F to 100 degrees F. Relative humidity may be expected to fluctuate between 40 percent to 100 percent. In some installations, the boxes and fittings will be subjected to hydrogen sulfide gas, dust, moisture and methane gas.

PART 2 - PRODUCTS

2.1 MATERIALS

Junction boxes, device boxes, fixture support boxes, oblong, round and rectangular conduit fittings shall be hot-dip galvanized cast ferrous alloy. Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5thread contact on tightening. Drilling and threading shall be done before galvanizing. The cover plate shall be of similar hot-dip galvanized cast ferrous alloy material. A full body neoprene gasket and

Type 316 stainless steel screws shall be provided for all covers. Hubs for connection of conduit to sheet steel junction, device or terminal boxes shall be made of cast ferrous alloy, electroplated with zinc, and shall have insulating bushings. The hubs shall utilize a neoprene "O"-ring and shall provide a watertight connection.

2.2 EQUIPMENT

A. JUNCTION AND DEVICE BOXES

1. **Outlet and Switch Boxes:** Outlet and switch boxes shall be FS or FD boxes as manufactured by CrouseHinds, Appleton, or equal. Boxes shall be provided with blank covers for all unused openings.
2. **Ganged Boxes:** Outlet and device boxes shall be ganged where two or more devices are located together. Device covers shall be ganged for gang boxes and shall be gasketed with suitable neoprene gaskets to fit the devices and box used.
3. **Floor Boxes:** Floor boxes shall be hot-dip galvanized cast boxes with a NEMA 4 rating. The boxes shall be provided with a recessed ring neoprene gasket, hot-dip galvanized steel checker plate covers, and Type 316 stainless steel machine screws of not less than 1/4-inch diameter. The cover screws shall be flat head type or recessed socket head screws with no material projecting from the face of the cover.
4. **Sheet Steel Boxes:** Boxes larger than FD boxes shall be fabricated from code gage steel, finished inside and out as specified for terminal cabinets. Before finish is applied, a grounding pad drilled for two bolted grounding lugs or a grounding stud shall be welded to the inside of the box. All hardware shall be Type 316 stainless steel. Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4 where exposed to the weather or dripping water.
5. **Terminal Cabinets:** Terminal cabinets shall, as a minimum, meet NEMA 12 and JIC requirements, shall be code gage sheet steel, and shall be provided with hinged doors. All cabinets exposed to weather or dripping water shall meet NEMA 4 requirements. All cabinets except those located in electrical equipment rooms shall be finished inside and out with a powder resin thermosetting system resistant to abrasion, moisture, acids, alkalis, high temperatures and flame. Exterior color shall be gray ANSI No. 61. Terminal cabinets shall be provided at all locations where connection of control cables is required. Similar cabinets with a mounting panel shall be provided for mounting miscellaneous field equipment when required. All terminal cabinets shall be equipped with terminal blocks. Before finish is applied, a copper-grounding pad for a two-bolt ground lug or grounding stud shall be provided inside of these terminal cabinets. All hardware shall be Type 316 stainless steel.

B. FITTINGS

The fittings used with various types of boxes shall be of a compatible material. All fittings in exposed locations shall be 40 mils thick PVC coated. PVC coated seal fittings shall be employed at hazardous locations and sealed with suitable sealing compound. Seals for entry into the chlorine area shall be "C" fittings filled with non-setting compound.

PART 3 - EXECUTION

3.1 GENERAL

Outlet and switch boxes shall be located to provide ample clearance between fixtures and pipes, beams and ducts. The location shall be verified on the job to avoid conflict with other work. Boxes shall be accurately placed and shall be independently and securely supported. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes nor shall welding or brazing be used for attachment. Boxes shall be secured by galvanized brackets, expansion bolts, toggle bolts, or machine or wooden screws depending on the type of construction. Unless otherwise indicated, receptacle boxes shall be mounted 12 inches above the floor in offices and similar areas and 48 inches above the floor in all other areas. Switch boxes shall be mounted 48 inches above the floor.

****END OF SECTION****

SECTION 16150 - WIRING DEVICES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

This section provides specifications for all electrical receptacles, plugs, plug strips, switches, and device plates.

1.2 RELATED SECTIONS

The work of Section 16000 – General Electrical Provisions, applies to the work of this section. Other sections of the specifications, not referenced in this section, shall also apply to the extent required for proper performance of this work.

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000 – General Electrical Provisions and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

Submittals shall comply with the provisions set forth in Section 16000 – General Electrical Provisions.

1.6 QUALITY CONTROL

All wiring devices shall be of the heavy-duty type with ratings as shown on the drawings or as specified.

1.7 ENVIRONMENTAL CONDITIONS

- A. The receptacles, plugs together with all plug strips, switches and device plates shall be installed in a wastewater pumping facility, where a temperature range of 40 degrees F to 125 degrees F, and a relative humidity range of 40 and 100 percent are expected.
- B. All wiring devices installed in hazardous locations shall be suitable for Class I, Division 1, Group D locations.

PART 2 - PRODUCTS

2.1 MATERIAL

A. GENERAL

All wiring devices shall be specification grade with provisions for back wiring and side wiring with captive held binding screws. All receptacles shall be of the grounding type. Devices located in areas with suspended ceilings or stud walls shall be ivory finish.

B. SINGLE PHASE RECEPTACLES AND PLUGS

1. 120V Receptacles: 120V receptacles shall be NEMA 520R and shall accept NEMA 515p or 520p plug caps. These shall be General Electric Co. GE 41082, Hubbell 5362 (I), or equal.
2. 120V GFCI Receptacles: 120V GFCI receptacles shall be UL listed and shall have provisions for trip indication, testing and resetting. They shall be as manufactured by 3M, Square D, or equal.
3. Weatherproof Receptacles: Weatherproof receptacles shall be of the parallel blade grounding type and shall be designed so that the watertight integrity of the plug receptacle is maintained when the units are plugged together and the live parts are equally protected when the plug is removed and when the cover is in place. The units shall consist of oil-resistant rubber cover assembly with a polycarbonate receptacle body. Plug caps shall match the receptacle and shall be of the same manufacturer.
4. Three Phase Receptacles and Plugs: Three phase receptacles shall be for 3 phase, 3 or 4 wire, 480 volt service, with ampere rating as shown, of the type manufactured from cast metal housing and insulated inserts. The receptacles and plugs shall be of the grounding type and shall be so designed that the grounding pole is permanently connected to the housing. The grounding prong or pole shall make contact before the line poles are engaged when the plug is connected to the receptacle housing. The plug sleeve shall also make contact with the receptacle housing before the line and load poles make contact.
5. All receptacle housings shall be provided with a screw thread connection to the ring provided on the plug body. The receptacle shall be provided with gasketed cap fastened with a chain. The plug receptacle combination shall be rated weather resistant and rain tight. Appropriate back boxes of cast metal and having cast hubs for the appropriate conduit sizes shall be provided. All back boxes shall be provided with gaskets at the joint with the receptacle housing.

C. SWITCHES

1. General Purpose: General purpose switches shall be quiet AC type, specification grade, and shall be installed in accordance with the required rated capacities. Switches shall match receptacles in color. Switches shall be manufactured by General Electric Co., Hubbell, or equal, and shall be as follows.

	15A, 120-277V		20A, 120-227V	
	G.E. CO.	Hubbell	G.E. CO.	Hubbell
Single	GE5931-2	1201-I	GE5951-2	1221-I
Three-way	GE5933-2	1203-I	GE5953-2	1223-I
Momentary	GE5935-2	1556-I		1557-I

2. Weather-exposed and Corrosive: Maintained contact switches in weather-exposed and corrosive areas or where shown on the drawings shall be the press switch type as manufactured by Arrow Hart Co., Hubbell, or equal, and shall be as follows:

15A, 120V**20A, 120V**

	Arrow Hart Co.	Hubbell	Arrow Hart Co.	Hubbell
Single	2891	1751	2991	1781
Three-way	2893	1753	2993	7733

Push switches in weather-exposed and corrosive areas shall be mounted in "FS" type mounting boxes with weatherproof Hypalon or neoprene cover plates, Arrow Hart No. 2881G, or equal. (The cover plate is included in the Hubbell catalog number for the switch.)

Momentary contact switches in weather-exposed and corrosive areas shall be the same as specified for other areas, except that a CrouseHinds Type DS181, or equal, weatherproof cast device plate shall be used.

D. DEVICE PLATES**1. General:**

- a. Device plates located in areas with suspended ceilings and stud walls shall be type 302 stainless steel, satin finish, 0.40 inch minimum thickness. Device plates in all other areas shall be cast ferrous metal with neoprene gasket and corrosion resistant hardware. Receptacle covers exposed to weather shall be provided with lift covers.
- b. Stainless steel device plates shall be engraved directly with the service legend. Engraving shall be 1/8 inch high with black filling. Cast ferrous metal plates shall be provided with engraved laminated phenolic nameplates with 1/8inch white characters on black background. Nameplates for switches shall identify the panel and the circuit number and the area served. Nameplates for receptacles shall identify circuit and voltage, if other than 120 volts single phase. Engraving schedule shall be submitted for review prior to engraving.

2. Switch Covers: Switch covers shall be heavy cast aluminum with bat handle toggle operators and shall be Appleton, Killark or CrouseHinds, or equal. Stainless steel screws and neoprene gasket shall be provided with each cover. Where scheduled, nameplates shall be phenolic in accordance with the specifications for nameplates, except the lettering shall be 1/8 inch high.

3. Receptacle Covers: Receptacle covers shall be heavy cast copper-free aluminum with a gasketed spring floor cover over each outlet. The receptacle cover shall have all exposed metal surfaces factory coated with a durable epoxy coating. Stainless steel screws and a neoprene gasket shall be provided with each receptacle cover.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Boxes shall be secured by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws according to the type of construction. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes.

- B. Unless otherwise shown, receptacle boxes shall be mounted 12 inches above the floor in offices, control rooms, and similar areas and shall be mounted 48 inches above the floors in other locations unless otherwise shown.
- C. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements.

** END OF SECTION **

SECTION 16155 - MOTOR STARTERS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all motor starters and associated equipment.
- B. Motor starters shall be the AC combination magnetic, or manual type with fully magnetic circuit breakers and thermal overload elements, as indicated.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 16000 General Electrical Provisions
 - 3. Section 16480 Motor Control Centers

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000 – General Electrical Provisions, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

Submittals shall comply with the provisions set forth in Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.

1.6 QUALITY ASSURANCE - PERFORMANCE AND DESIGN REQUIREMENTS

- A. Motor starters furnished shall be of the type indicated on the drawings and shall be suitable for 480 volt, 3 phase, 60 hertz, AC service with a control transformer for 120 volt controls. Motor starters and their components shall be sized in accordance with NEMA standards. Starters smaller than NEMA size 1 shall not be permitted.
- B. Stand-alone motor starters shall be installed in NEMA 1 gasketed enclosures for all indoor locations, and in NEMA 4X for all outdoor or corrosive locations.
- C. Motor starters not installed within a motor control center shall be located in separate enclosures as shown on the drawings.

1.7 ENVIRONMENTAL CONDITIONS

All motor starters and associated equipment will be installed in a Wastewater Pumping Facility where the ambient temperatures may range between 30 and 125 degrees F. Relative humidity is expected to range between 40 and 100 percent.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. GENERAL

1. Motor starters installed in motor control centers shall be located as shown on the drawings in motor control centers furnished by the motor control center manufacturer. These motor starters shall contain "stab on" self aligning connectors having free-floating spring construction to ensure a positive cadmium to silver contact at both sides of the bus.
2. The starter units and the associated "stab on" connectors shall include provisions for guiding the units from their disconnected or withdrawn position to their connected position.
3. The combination starters shall be interchangeable with starters of the same size.
4. Motor starters shall have replaceable, heavy duty tungsten tipped contacts of the non-welding type with wipe action to keep contacts clean.
5. Motor starter wiring and components shall be readily accessible.

B. TYPE

1. Motor starters for non-reversing, single speed motors rated up to 50 HP shall be full voltage, non-reversing starters.
2. All multiphase motors shall be furnished with magnetic contactor starters. Single-phase motor starters shall either be magnetic or manual, as indicated on the drawings.
3. Magnetic Contactors: Magnetic contactors shall be capable of closing and holding when a minimum voltage of 85 percent is applied to the operating coil. All contactors and relays shall be equipped with at least two normally open and two normally closed auxiliary contacts.
4. Overload Elements: Overload elements shall be bimetallic ambient temperature compensated overload relays. Magnetic contactors for all 3phase motor starters shall be equipped with overload relays on each phase. Single-phase motor starters shall contain one overload trip element for 120-volt applications and two overload trip elements for 208 volt, 240 volt, or 480 volt applications.

C. CIRCUIT BREAKERS

1. Molded case circuit breakers on combination type starters shall be fully magnetic with instantaneous trip adjustments. The breakers shall have continuous ratings to match the motor nameplate horsepower shown on the single line diagrams. The circuit breakers shall have a minimum of six trip adjustment points. Circuit breakers shall also have provisions for manual tripping. This trip device shall provide mechanical simulation of overcurrent tripping through activation of linkages and latch surfaces that are not operated by the circuit breaker handle.

2. Magnetic circuit breakers shall have a current limiting fuse where indicated or when the short circuit rating is higher than the basic interruption rating.
3. Combination units without current limiting fuses shall be rated for 42,000 amperes rms; units with current limiting fuses shall be rated for 200,000 symmetrical amperes rms.
4. The circuit breaker shall be designed so the loss of any one or more fuses shall trip the breaker automatically. The external operating handle of the circuit breaker shall have provisions for installing a padlock in the open position. The circuit breakers shall comply with the requirements of sections in this project manual that specify overcurrent protective devices.

PART 3 - EXECUTION

3.1 GENERAL

All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The City reserves the right to require minor changes in the equipment or its location prior to roughing in without incurring any additional cost.

3.2 TESTING

- A. Each installed motor starter shall be individually tested to ensure that the starter has been properly installed and connected and that it operates as required and specified.
- B. Refer to Section 01660 - Equipment Testing and Start-Up and Section 01999 - Reference Forms for testing and startup documentation requirements.

**** END OF SECTION ****

SECTION 16160 - CONTROL CABINETS AND PANEL DEVICES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all control devices, control cabinets, panels, and necessary appurtenances for an integrated control system. These specifications and drawings include descriptions of functional operation and performance, as well as standards, but do not necessarily enumerate detailed specifications for all components and devices which are necessary. However, all components and devices shall be furnished and installed as required to provide completed and operable systems capable of providing the functions and meeting the performance set forth hereinafter.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 16000 General Electrical Provisions

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. National Electric Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the specifications and standards for this WORK shall include the current editions of the specifications and standards of Section 16000, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

- A. General:
 - 1. Submittals shall comply with the provisions set forth in Section 16000 and Section 01300.
 - 2. Submittals for all instrumentation and control equipment provided under this project shall be prepared and submitted to the City. The submittal package for each individual equipment, device(s) or groups of related equipment shall be complete.
 - 3. As a condition precedent to the review of submittals required under these specifications, the CONTRACTOR shall furnish the manufacturers' statements accepting unit responsibility. The purpose of this provision is to both insure compatibility of all components specified under the specific technical specification, but, also to provide

sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the CONTRACTOR is not relieved of his responsibility for the indicated portions of the WORK. The following submittal data shall be provided for each item of equipment. Additional data specific to individual equipment sections will be listed under individual specifications on an as-needed basis.

B. Shop Drawings and Submittal Data:

1. Contract Drawings:

- a. The drawings are generally diagrammatic unless detailed or dimensioned. The exact locations and routing or wiring, conduit and pipe shall be governed by structural conditions, physical interferences and location of terminations equipment.
- b. The CONTRACTOR shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment in order to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.

2. Deviations from Specifications:

- a. Should CONTRACTOR's proposed system designs deviate from the specifications, such deviation shall be documented and submitted to the City for approval. All deviations shall be stated on the submittal transmittal sheet.

3. Organization and Binding Submittals:

- a. The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the maintenance manuals required of this Section. Therefore, the initial submittal of drawings and data, and all copies of subsequent submittals, shall be bound in standard size, 3-ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage, except as noted. Binder size shall not exceed 3-inch rings.
- b. Cabinet, panel and console detail drawings shall be prepared and submitted on a uniform size paper not in excess of 22 by 34 inches; these drawings shall be submitted in a roll, in order by subject, and shall neither be folded, nor bound. Other details and drawings to be bound in the 3 ring binders shall be prepared on 8-1/2 by 11-inch, or on 11 by 17-inch paper.
- c. The submittal shall be organized in three parts, not including preliminary administrative material such as table of contents, as follows:

Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.

Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.

Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

4. Submittal:

- a. General: The CONTRACTOR shall submit to the City for review, five sets of detailed drawings and data prepared and organized by the systems organization designated at the time of bidding. These drawings and data shall be submitted as a complete package at one time. The content, organization and binding of this submittal shall be as specified below.
- b. Data sheets: These data sheets shall be in a standardized format and shall include the following:
 - (1) Component name used herein and on the drawings.
 - (2) Manufacturer's model number or other product designation.
 - (3) Project tag number.
 - (4) System of which the component is part.
 - (5) Location or assembly at which the component is to be installed.
 - (6) Input and output characteristics.
 - (7) Scale range and units (if any) and multiplier (if any).
 - (8) Requirements for electrical supply (if any).
 - (9) Requirements for air supply (if any).
 - (10) Materials of component parts to be in contact with, or otherwise exposed to, process media.
 - (11) Reference to Manufacturer's descriptive technical bulletin or brochure.
 - (12) Reference other features so that all specified features are stated on the data sheet.
- c. Technical Product Bulletins or Brochures: Following each data sheet, a technical product bulletin, or brochure (or clear Xerox copy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue.
- d. Data Sheets and Catalog Data for accessories: Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear Xerox copies thereof). These shall be arranged in a logical sequence and shall cover such items as:
 - (1) Control circuit devices, components and wiring.
 - (2) Pneumatic components, fittings and tubing.
- e. Cabinets, Panels, and Consoles: Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough other details, to clearly establish the style and overall appearance of each assembly.

C. Operation and Maintenance Manuals:

1. General:

- a. Before payment of the 75 percent progress payment, the CONTRACTOR shall provide final sets of maintenance manuals. Prior to this, two sets of preliminary manuals shall be submitted to the City within 60 days after return of favorably reviewed shop drawings and data required above.

- b. Following the review of the preliminary manuals, one set will be returned to the CONTRACTOR with comments. The final five (5) sets shall be prepared and submitted to the City at least 30 days prior to start-up of systems and shall reflect as-built conditions.

2. Content:

- a. A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service maintenance and repair. Exploded or other detailed view of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
- b. In addition to the requirements set forth elsewhere, the instruction manuals shall consist of at least the following:
 - (1) Table of contents.
 - (2) System block and schematic diagrams.
 - (3) Component schematic diagrams.
 - (4) Written, verbal, step-by-step operating, trouble-shooting and calibrating instructions for each of the systems and each of the components of each system.
 - (5) As-built electrical and control drawings.
 - (6) Letter from CONTRACTOR that as-builts have been checked for proper indication of equipment, wiring numbers etc.
 - (7) Warranty contracts, warranty service information for all equipment.
 - (8) Owner furnished.

1.6 QUALITY ASSURANCE

A. Acceptable Manufacturers:

- 1. Furnish instruments and devices by the named manufacturers or equal equipment by other manufacturers.
- 2. The named manufacturers have been specified to establish the standard quality and performance of the equipment supplied.
- 3. Obtain all instruments or devices of a given type from the same manufacturer.

PART 2 - PRODUCTS

2.1 PANEL LAMICOID NAMEPLATES

A. General:

- 1. Provide laminated plastic nameplates for identification of panels and components mounted thereon as follows:
 - a. Nameplates shall be of 1/16-inch thick laminated phenolic type with black matte finish surface and white letter engraving.

- b. Panel identification nameplates to have ½-inch high letter engravings.
- c. Grouped component identification (i.e., Sewer Pump No. 1) nameplates to have 3/16-inch high letter engravings.
- d. Panel mounted component identification (i.e., control devices, indicating lights, selector switches, etc.) nameplates to have 5/32-inch high letter engravings.
- e. Nameplate engravings shall be as shown on the drawings.

2.2 SELECTOR SWITCHES AND INDICATING LIGHTS

A. General:

- 1. Selector switches and indicating lights shall be supplied by one manufacturer and be of the same series or model type.
- 2. Type: Heavy duty, oil tight.
- 3. Mounting: Flush mounted on control panel front, unless otherwise noted.
- 4. NEMA 12 rated to match panel in which mounted.

B. Selector Switches:

- 1. Type: Provide two position selector switches.
- 2. Switch Operator: Standard black knob.
- 3. Contacts:
 - a. Provide one normally open and one normally closed contact.
 - b. Type: Double break, silver contacts with moveable contact blade providing scrubbing action.
 - c. Rating: Compatible with AC or DC current with devices simultaneously operated by the switch contacts but not less than 10 Amps resistive at 120 VAC/VDC continuous.

C. Indicating Lights:

- 1. Type: 120 VAC
- 2. Lamps: High visibility LED type, long life (20,000 hours minimum).
- 3. Indicating lights shall be push-to-test.

D. Environmental:

- 1. Operating Temperature: 30_F to +130_F.
- 2. Storage Temperature: -40_F to +365_F.
- 3. Humidity: 50 percent at 104_F.

E. Product and Manufacturer

1. Components as manufactured by Allen-Bradley:

- a. Selector Switch Model No. 800T-H2
- b. Contact Model No. 800T-XA
- c. Indicating Lights:
 - (1) Model No. 800T-QTH10R
 - (2) Model No. 800T-QTH10G
 - (3) Model No. 800T-QTH10A

2.3 TERMINAL STRIPS

A. Type:

- 1. General purpose terminal strips.

B. Ratings:

- 1. Voltage Rating: 600 VAC/VDC maximum.
- 2. Current Rating: 30 Amps maximum.
- 3. Insulation Temperature Range: -40_F to +194_F.

C. Construction:

1. Housing:

- a. The housing shall be designed to be self-extinguishing, polyamide 6.6 material with UL 94-2v2 flammability rating.
- b. Housing shall be finger-safe design to prevent contact with live circuits.
- c. Four-sided funnel wire guides for wire insertion.
- d. Color: Terminal black housing shall be gray, permanent in color throughout the material.

2. Metal Parts:

- a. Nickel plated terminals and stainless steel screws.
- b. Contacts shall have high copper content alloy.

3. Screws:

- a. Terminal blocks shall be provided with backed out screws.
- b. Tightening torque for each screw shall be 5.0 to 5.6 pounds per inch.

4. Wire Range:
 - a. Terminal blocks shall accept maximum of four #22 through one #12 AWG wire.
 - b. Wire strip shall be 0.35 inches.

D. Mounting Requirements:

1. All devices shall be suitable for mounting on DIN rail.
2. Mounting rail shall allow easy installation to panel using #10-32 screws.
3. Rail shall allow easy installation and removal of a block in a row.
4. DIN rail shall be zinc plated, yellow chromated steel.
5. Rail shall be symmetrical 35 mm wide by 7.5 mm deep by 1 meter long.
6. Density: 50 pieces per foot.

E. Accessories:

Terminal blocks shall have end barriers, end anchors, jumpers and pre-printed markers.

F. PRODUCT AND MANUFACTURER

1. Components as manufactured by Allen-Bradley:
 - a. Terminal Block Model No. 1492-W4
 - b. DIN Rail Model No. 199-DR1
 - c. End Barrier Model No. 1492-EB3
 - d. End Anchor Model No. 1492-EA35
 - e. Pre-printed Marker Card Model Nos:
 - (1) 1492-SM6X12H1-50
 - (2) 1492-SM6X12H51-100
 - (3) 1492-SM6X12H101-150
 - f. Jumper Model No. 1492-SJ6-10

2.4 CIRCUIT BREAKERS

A. Type:

1. Energy limiting, thermal magnetic, terminal style circuit breakers.

B. Ratings:

1. Voltage Rating: 480 VAC
2. Current Rating: 20 Amps and 15 Amps
3. Number of Poles: One.
4. Magnetic Trip Range: 6-10 times the rated current.

C. Construction:

1. Housing:
 - a. The housing shall be designed to be melamine/phenolic.
 - b. Housing shall be finger-safe design to prevent contact with live circuits.
 - c. Wire termination shall be clamping style, self-lifting box lug.
2. Wire Range:
 - a. Circuit breaker shall accept #16 through #6 AWG wire.
 - b. Wire strip length shall be 0.50 inches.

D. Mounting Requirements:

1. All devices shall be suitable for mounting on DIN rail.
2. Mounting rail shall allow easy installation to a panel using #10-32 screws.
3. Rail shall allow easy installation and removal of a block in a row.
4. DIN rail shall be zinc plated, yellow chromated steel.
5. Rail shall be symmetrical 35 mm wide by 7.5 mm deep by 1 meter long.

E. Accessories:

1. Circuit breakers shall have end anchors and group markers.

F. Product and Manufacturer:

1. Components as manufactured by Entelec.
 - a. 20 Amp Circuit Breaker Model No. GMU-20U
 - b. 15 Amp Circuit Breaker Model No. GMU-15U
2. Or equal as manufactured by Allen Bradley.

2.5 CONTROL RELAYS

A. Type:

1. General purpose, plug-in type rated for continuous duty.
- B. Electrical:
1. Pilot Duty Rating: NEMA B300
 2. Insulation Voltage: 300 VAC.
 3. Contacts:
 - a. Contacts shall be Form C, SPDT, with three terminals - one normally open, one normally closed and one common.
 - b. Ratings shall be Form C 10 Amps continuous at 120 VAC.
 - c. Rated thermal current 20 Amps maximum for all three poles.
 - d. Contact material shall be silver cadmium oxide.
 - e. Relay shall be 3PDT, 3 pole, 3 Form C, contacts.
 4. Coil Voltages: 120 VAC.
 5. Coil Consumption: \pm 10 percent.
 6. Inrush Current: 3.75 VA at 60 Hz.
 7. Sealed Current: 2.5 VA at 60 Hz.
 8. Relay shall have a dielectric withstand voltage of 1500 VAC pole to pole, contact to coil and contact to frame.
- C. Mechanical:
1. Guarded terminal sockets.
 2. 30 million life operations.
 3. 3600 switching frequency operations per hour.
 4. Operating Time Pickup: 15 msec
 5. Dropout time: 10 msec.
 6. Operating Rate: Maximum of four operations per second.
- D. Environmental:
1. Operating Temperature: - 49 F to +131 F.
 2. Storage Temperature: -67 F to +185 F.
 3. Altitude: 2000 meters
- E. Construction:

1. Relay shall be 1.40 inches wide, 1.46 inches high and 2.34 inches deep.
2. Tube base with pin style terminations.
3. Enclosure shall be transparent polycarbonate dust cover, wither finger grips for installation or removal.
4. Marking area molded into cover.
5. Mechanical ON/OFF indicator.
6. Insulating material shall be molded high dielectric material.
7. Each terminal shall be marked in accordance with EN50 0005.
8. Relay shall mount on an 11 pin, screw terminal base socket which can be panel or DIN rail mounted.

F. Product and Manufacturer:

1. Components as manufactured by Square-D
 - a. Relay Model No. KP13P14V20
 - b. Relay Mounting Base Model No. 8501NR62

2.6 TIME DELAY RELAYS

A. Type:

1. Dial adjustable, plug-in type time delay relay providing delay-on-make, delay-on-break, interval operation or one shot.

B. Electrical:

1. Pilot Duty Rating: NEMA C300.
2. Insulation Voltage: 300 VAC.
3. Contacts:
 - a. Contacts shall be Form C, DPDT.
 - b. Ratings shall be Form C 5 Amps at 120 VAC.
 - c. Rated thermal current 5 Amps.
 - d. Contact material shall be silver cadmium oxide.
 - e. Relay shall be DPDT, 2 pole, 2 Form, contacts.
4. Coil Voltages: 120 VAC.

5. Coil Consumption: ± 10 percent.
6. Relay shall have a dielectric withstand voltage of 1500 VAC pole to pole and contact to coil.

C. Mechanical:

1. Guarded terminal sockets.
2. 50 million life operations.
3. 1800 switching frequency operations per hour.
4. Repeat Accuracy: ± 3 percent, ± 10 msec at constant temperature and voltage.
5. Scale tolerance: ± 5 percent of full scale.
6. Timing Range: 0.05 seconds to 100 hours, timing change ± 0.5 percent of full scale.
7. Reset Time: 100msec.
8. Programmable Timing Modes: On Delay, Off Delay, Repeat Cycle and One Shot.

D. Environmental:

1. Operating Temperature: -22 F to + 131 F.
2. Storage Temperature: -67 F to + 185 F.
3. Altitude: 2000 meters.

E. Construction:

1. Relay shall be 1.89 inches wide, 1.89 inches high and 3.17 inches deep.
2. Tube base with pin style terminations.
3. Enclosure shall be impact resistant dust cover, with finger grips for installation and removal.
4. Insulating material shall be molded high dielectric material.
5. Each terminal shall be marked in accordance with EN50 0005.
6. Relay shall mount on a 11 pin, screw terminal base socket which can be panel or DIN rail mounted.
7. Relay shall be provided with timed-out and power/timing indicators.

F. Product and Manufacturer:

1. Components as manufactured by Allen Bradley:
 - a. Relay Model No. 700-H125TA17

- b. Relay Mounting Base Model No. 700-HN101

2.7 LEVEL CONTROLLER

- A. Non-contact ultrasonic level measuring systems shall consist of an electronic controller transmitter, a non-contact transducer, and interconnecting cables. The controller-transmitter shall generate the sonic signal to drive the transducer, detect the return echo and convert the elapsed time to a level signal. The controller transmitter shall have the following features; solid state design, integral level indicator, keypad for calibration and configuration, isolated 4-20 mA output signal linearly proportional to level, and transducer temperature compensation. Input power shall be 120 VAC 60 Hz. The sonic transducer shall be housed in a NEMA 12 enclosure and be constructed of corrosion resistant materials. Sonic level measuring systems shall be Pulsar, Inc. Ultra 3 and dB 15 transducer with 60 feet of cable. Provide fascia mounting type for door mounting on existing control panel,

PART 3 - EXECUTION

3.1 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

- A. Wiring Installation: All wires shall run in plastic wireways except for the following:
 - a. Field wiring.
 - b. Wiring between mating blocks in adjacent sections.
 - c. Wiring from components on a swing-out panel to components on a part of the fixed structure.
 - d. Wiring to panel-mounted components.
- B. Wiring Runs: Wiring runs from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties, and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.
- C. Wiring to Control Devices: Wiring to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.
- D. Wiring to Rear Terminals: Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.
- E. Shop drawings shall show conformance to the above wiring installation requirements.
- F. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, or permanently marked heat-shrink plastic.

3.3 CALIBRATION, TESTING, AND INSTRUCTION

- A. Refer to Sections 01660 - Equipment Testing and Start-Up and Section 01999 - Reference

Forms for testing and startup documentation requirements.

B. Inspection and Approval:

1. The panel fabricator shall conduct the following tests before shipment:
 - a. All alarm circuits rung out to determine their operability.
 - b. All electrical circuits checked for continuity and where applicable, operability.
 - c. All nameplates checked for correct spelling and size of letters.
 - d. Any other test required to place the panel in an operating condition.

**** END OF SECTION ****

SECTION 16400 - LOW VOLTAGE ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all electrical service sections, distribution switchboards, special control panels, control and terminal cabinets, control devices, circuit breakers, and all appurtenant work, complete and operable.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 16000 General Electrical Provisions
 - 2. Section 16421 Utility Service Entrance

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. National Electrical Code (NEC) NFPA 70

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/IEEE C37.20 Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
 - 2. ANSI/NEMA ICS-2 Controllers, Contactors and Overload Relays Rated 600V
 - 3. ANSI/UL 1008 Transfer Switch Equipment
 - 4. NEMA PB2 Dead Front Distribution Switchboard

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop drawings of the service section and switchboards. After review of shop drawings of the service section by the CONSTRUCTION MANAGER, said drawings shall also be submitted to the utility company for approval prior to fabrication.
 - 2. Design test reports conducted for similar assemblies at the factory.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:
 - 1. Operating procedures.
 - 2. Maintenance procedures.
 - 3. Manufacturer's parts list, illustrations, assemblies and diagrams.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials: All materials and equipment furnished under this Specification shall be new and shall bear the Underwriters' Laboratories label where such service is regularly available.
- B. Equipment: All equipment for the same purpose shall be of the same make.
- C. Enclosure Requirements: All outdoor equipment, fixtures, and wiring devices shall be of weatherproof construction.
- D. Standard Products: Materials and equipment shall be catalogue products of companies regularly engaged in the manufacture of such items, shall be the latest standard design that conforms to the specification requirements, and shall essentially duplicate material and equipment that has been in satisfactory use for several years.

2.2 SWITCHBOARDS

- A. Indoor construction shall be of the universal frame type using die-formed welded and bolted members. Enclosing panels shall be 14-gauge steel and shall be bolted in place. In addition, indoor construction shall conform to the following:
 - 1. Switchboard shall be totally enclosed, NEMA 1 gasketed.
 - 2. Bus bar shall be copper fully insulated. Copper shall be silver plated at joints. Bus bars shall be braced for short circuit currents of 65,000 amperes minimum, or as indicated. A full length copper ground bus bar shall be provided at the bottom of the switchboard enclosure.
- B. Floor-standing distribution switchboards and the main service switchboard shall be catalogue products of the main circuit breaker manufacturer. Switchboards shall be shipped fully assembled and tested.

2.3 MAIN SERVICE SWITCHBOARD

- A. General: The main service switchboard shall consist of a free-standing assembly which complies with the requirements for switchboards.
- B. Switchboard: Switchboard shall be front accessible only. The switchboard shall consist of the sections described in the following paragraphs.
- C. Service Section: The service section shall consist of an underground pull compartment and a revenue metering compartment which comply with utility requirements. Components such as meter bases, busses, lugs, auxiliaries shall be provided.

- D. Main Circuit Breaker Compartment: The main circuit breaker unit shall have the ratings indicated. Service neutral shall be brought to a terminal in the main circuit breaker compartment. A disconnecting link shall be provided in a bus bar connection between the neutral terminal and the switchboard ground bus.

The main circuit breaker shall have protective features with capability of selective tripping characteristics which can be used to provide overcurrent protection from overloads, short-circuits and ground faults. Provide 120 volt, shunt trip feature.
Circuit breakers shall be equipped with solid-state programmers.

- E. The main circuit breaker shall be individually mounted, stationary, of the size and type indicated.

2.4 SWITCHBOARD INSTRUMENTS

- A. Indicating instruments shall be approximately 4-1/2-inch square with 250-degree scales and white dials with black graduations. Case shall be semi-flush mounted with anti-glare glass. Front access zero adjustment shall be provided. Indication accuracy shall be as indicated.

Indicating meters shall be of the following type:

- 1. Main incoming circuit breaker:

- 1 - voltmeter, 0-600V, single-phase, one percent accuracy

- 1 - voltmeter transfer switch with pistol grip handle to permit a single-phase voltmeter to indicate voltage between phase of a three-phase system. Switch shall have an "Off" position

- 1 - AC indicating ammeter, five amperes full scale, single-phase, 0-500 amperes dial, one percent accuracy

- 1 - Ammeter transfer switch with pistol grip handle to permit a single-phase ammeter to indicate current in each phase of a three-phase system. Switch shall have an "Off" position

- B. Instrument transformers shall comply with ANSI/IEEE C37.20 and shall have standard accuracy for relaying and metering with the burdens imposed. Mechanical and thermal ratings of current transformers shall be coordinated with short circuit ratings of related circuit breakers. Potential transformers shall be mounted on a disconnecting rack and shall have primary fuse protection.

2.5 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by the following (or equal):

- 1. Solid state programmers for circuit breakers:

- General Electric Micro-Versatrip
 - Square D Micrologic Trip System

- 2. Indicating meters

- Voltmeter

- Westinghouse Type KA-251
 - General Electric Type AB-40

Voltmeter transfer switch

Westinghouse Type W
General Electric Type SB-1

AC indicating ammeter

Westinghouse Type KA-241
General Electric Type AB-40

Ammeter transfer switch

Westinghouse Type W
General Electric Type SB-1

3. Molded case, insulated case and power circuit breakers

Westinghouse Pow-R-Gear
General Electric Power Break
Square D

4. Switchboard

General Electric, AV-Line
Cutler-Hammer, Pow-R-Line C
Square D

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. All electrical equipment materials shall be installed securely in place. Equipment shall be mounted parallel and perpendicular to the walls, floors, and ceilings.
- B. All anchors and fasteners shall be types designed for the intended purpose and shall be capable of adequately, safely, and permanently securing the material in place. Screws shall be used on wood surfaces, masonry anchors in concrete or brick, toggle bolts on hollow walls, machine screws, bolts, or welded studs on steel. Nails shall be used only for temporary attachment or support.
- C. Omissions or conflicts on Drawings or between Drawings and Specifications shall be brought to the attention of the CONSTRUCTION MANAGER for clarification before proceeding with the work.
- D. The CONTRACTOR shall make all necessary provisions throughout the site to receive all equipment as construction progresses and shall provide adequate backing, supports, inserts, and anchor bolts for the hanging and support of all electrical cabinets, enclosures, conduit, panelboards, and switches, and shall provide sleeves through walls, floors, or foundations where electrical lines are required to penetrate.
- E. Floor standing equipment shall be leveled with shims as required to maintain horizontal surfaces within 1/32-inch per horizontal foot; after leveling, equipment shall be anchored, then grouted so that no space is existing between concrete and equipment support beams.

3.2 PREPARATION AND FINISH

- A. All equipment cabinets or enclosures furnished under this Section shall have a finish which conforms to manufacturer's standards.

3.3 TESTING

- A. All WORK shall be tested per Section 16000 – General Electrical Provisions.

**** END OF SECTION ****

SECTION 16421 - UTILITY SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Arrangement with Utility Company for permanent electric service.
- B. Underground service entrance.
- C. Metering equipment.

1.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. SDG&E Service Guide.

1.3 SYSTEM DESCRIPTION

System Characteristics: 277/480 volts, three phase, four-wire, 60 Hertz.

1.4 SUBMITTALS

Submit under provisions of the General Requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Utility Company written requirements.
- B. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 FIELD MEASUREMENTS

Verify that field measurements are as indicated on Utility Company drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

- A. Make arrangements with San Diego Gas & Electric Company to obtain new permanent electric service. Coordinate existing telephone connection relocation and service conduit realignment with Pacific Bell. Refer to drawings for Utility Company contact information.
- B. Coordinate location of Utility Companies facilities to ensure proper access is available.

3.3 INSTALLATION

- A. Install service entrance conduits from Utility Companies indicated point of connection to building service entrance equipment per Utility Companies drawings.

** END OF SECTION **

SECTION 16431 - SHORT CIRCUIT AND COORDINATION REPORT

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing a short circuit and protective device coordination study and harmonic measurement for the electrical power system.
- B. The studies shall include the electrical distribution system for normal and standby power sources.
- C. The studies shall include protection studies for motors supplied with factory-installed solid state overload and overcurrent protection devices.
- D. The WORK of this Section includes measurement of harmonic current and the installation of filters required for harmonic suppression.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 16000 General Electrical Provisions
 - 2. Section 16400 Low Voltage Electrical Service and Distribution

1.3 CODES

- A. The WORK of the Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:
 - 1 National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/IEEE 141 Recommended Practice for Electrical Power Distribution for Industrial Plants
 - 2. ANSI/IEEE 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - 3. ANSI C 37.5 Calculation of Fault Currents for Application of Power Circuit Breakers
 - 4. ANSI C 37.13 Low-Voltage AC Power Circuit Breaker (600-Volt Insulation Class)

5. IEEE 519 Recommended Practice and Requirements for Harmonic Control in Electrical Power Systems

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 1. Studies related to distribution system protection and coordination shall be submitted to the CONSTRUCTION MANAGER prior to submittal of distribution equipment shop drawings and/or release of equipment for manufacture. A preliminary submittal shall be made with sufficient detail to review the adequacy of products and to indicate the computer program selected for use in performing the WORK of this Section.
 2. Studies for harmonic current, voltage and line notching test results shall be forwarded to the CONSTRUCTION MANAGER prior to acceptance of the project and after installation of harmonic generating and harmonic sensitive equipment.
 3. Submittals for solid state motor protective devices shall be forwarded to the CONSTRUCTION MANAGER prior to loading the motor.
 4. Protective device and coordination evaluation studies must be approved by the CONSTRUCTION MANAGER prior to acceptance testing.
 5. Submittals shall indicate proposed changes to the protection scheme and equipment selection which will result in improved system reliability and safety.
 6. Documentation of at least one successful study of comparable size and complexity completed in the recent past, including contact names, addresses, and telephone numbers.

1.6 QUALIFICATIONS

- A. Short circuit studies, protective device evaluation studies, and protective coordination studies shall be performed by an electrical testing service regularly engaged in short circuit and protective device coordination studies, having at least one successful study of comparable size and complexity completed in the recent past.

1.7 STUDY REPORTS

- A. The results of the power system study and harmonic current, voltage and line notching measurements shall be summarized in a final report, signed by the professional electrical engineer, registered in the State of California responsible for the studies. Six bound copies of the final report shall be submitted in compliance with Section 01300 and shall include the following:
 1. Single-line diagram
 2. Impedance diagram
 3. Tabulation and identification of protective devices on a single-line diagram.
 4. Time/current coordination curves

5. Computerized fault current calculations
6. Test instrumentation, condition and connections, as applicable, for each study
7. Harmonic measurement results
8. Specific recommendations (if any)

PART 2 - PRODUCTS

2.1 GENERAL

- A. **General:** The report shall include a single-line and an impedance diagram of the power system. This diagram shall identify components included in the study and the ratings of power devices including transformers, circuit breakers, relays, fuses, busses, and cables. The resistances and reactance of cables shall be indicated in the impedance diagram. The study shall include written data regarding maximum available short circuit current, voltage, and X/R ratio of San Diego Gas and Electric Co.

2.2 SHORT CIRCUIT STUDY

- A. The short circuit study shall be performed with the aid of a computer program complying with ANSI C 37.5, IEEE Standard 242, and IEEE Standard 141.

2.3 PROTECTIVE DEVICE EVALUATION STUDY

- A. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the CONSTRUCTION MANAGER's attention in writing but in no case more than 7 days after discovery.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. A protective device coordination study shall be performed including calculations required to review the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage breaker trip characteristics and settings.

2.5 TIME/CURRENT COORDINATION CURVES

- A. The time/current coordination curves for the power distribution system shall include, on 5-cycle log-log graph paper, at least the following:
 1. Time/current curves for each protective relay or fuse showing graphically that the settings will provide protection and selectivity within industry standards. Each curve shall be identified, and tap and time dial settings shall be shown.
 2. Time/current curves for each device shall be positioned to provide the maximum selectivity to minimize system disturbances during fault clearing. Where selectivity cannot be achieved, the CONSTRUCTION MANAGER shall be promptly notified of the cause in writing but in no case more than 7 days after discovery.

3. Time/current curves and points for cable and equipment damage.
4. Circuit interrupting device operating and interrupting times.
5. Maximum fault values.
6. Sketch of bus and breaker arrangement.
7. Magnetizing inrush points of transformers.
8. Compliance with Code requirements and proper coordination intervals and separation of characteristics curves.
9. Thermal limits of motors 250 hp and above.

2.6 HARMONIC MEASUREMENT

- A. The report of the distribution system, at all voltage levels, shall indicate the harmonic currents anticipated at each voltage level. The report shall indicate sources of harmonic currents, voltages, and line notching of equipment. The report shall state the tolerance of sensitive equipment to harmonics.
- B. The report shall include measurement of harmonics present in the output of harmonic-generating equipment at the input terminals of sensitive equipment. Filters required to prevent equipment malfunction due to harmonics shall be installed. Harmonic measurements shall be performed and documented after the filter installation.
- C. Equipment which is required to conform with IEEE 519 shall be measured to determine output harmonic content. Corrective action necessary for compliance with IEEE 519, Tables 2 and 4 General System Class shall be made. Measurements and documentation shall be performed to demonstrate compliance with 5 percent voltage distortion limitation.

2.7 MOTOR PROTECTION

- A. Where overload protection as phase overcurrent for medium voltage motors is specified to be solid state protective modules, modules shall be adjusted for actual installed motor torque, current and thermal characteristics. Protective settings shall be submitted, and reviewed, before motors are run under load.

PART 3 - EXECUTION

3.1 TESTING, CALIBRATION, AND ADJUSTMENT

- A. The medium voltage equipment manufacturer shall provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the power system study for 2 days.

** END OF SECTION **

SECTION 16440 - DISCONNECT SWITCHES AND FUSES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for all disconnect switches, fuses and associated equipment.
- B. Disconnect switches shall be the heavy-duty type, either fused or unfused as indicated on the contract drawings.
- C. The fuses shall be, in general, of the current limiting type with time lag elements.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 16000 General Electrical Provisions

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

Submittals shall be in compliance with the provisions of Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.

1.6 QUALITY ASSURANCE - PERFORMANCE AND DESIGN REQUIREMENTS

- A. Disconnect Switches:
 - 1. Disconnect switches shall be fused or non-fused heavy-duty safety switches with line terminal shields having the electrical characteristics, rating and modifications as shown on the drawings.
 - 2. The switches shall be load break, manually operated, horsepower rated, 600-volt type for 277/480-volt systems and 250-volt type for 120/208 or 120/240 volt systems. The fused disconnect switches shall have rejection type reinforced fuse clips with RK5 low peak, dual element fuses. The switch and fuse shall be coordinated and shall have 200,000 RMS symmetrical ampere interrupting capacity.

3. A metal nameplate containing a permanent record of switch type (both standard and time delay), catalog number and horsepower rating shall be furnished with each switch.

B. Fuses:

1. The fuses shall have ratings as shown and as required for protecting downstream equipment.
2. Fuses employed for overcurrent protection shall be in combination with load break switches. The fuses shall be of the dual type element with rejection feature. The interrupting rating shall be 200,000 RMS amperes symmetrical.
3. Fuses employed for current limiting action shall be coordinated with circuit breaker combination.

1.7 ENVIRONMENTAL CONDITIONS

The disconnect switches and fuses will be installed in a Wastewater Pumping Facility. The ambient temperature may range from 40 degrees F to 125 degrees F. The relative humidity may range between 40 and 100 percent.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. The disconnect switch handle shall be easily recognizable and shall be capable of being padlocked in the OFF position with from one to three padlocks. The blades shall be of the visible type, with a quick make, quick break mechanism. The switch assembly plus the operating handle shall be one integral part of the enclosure base. In addition, the switches shall have interlocks that prevent unauthorized opening of the door when the handle is in the ON position.
- B. The disconnect shall meet NEMA 12 requirements for unclassified locations indoors, NEMA 3R requirements for unclassified locations outdoors, NEMA 4X requirements for corrosive areas, and NEMA 7D requirements for areas classified as hazardous.
- C. The disconnect shall be made with code gage sheet steel for NEMA 3R and NEMA 12 classification switches, stainless steel for NEMA 4X classification switches and cast ferroalloy for NEMA 7D classification switches.

2.2 FUSES

- A. Non-current-limiting fuses shall contain renewable elements for ratings of 60 amperes and above.
- B. Fuses employed for overcurrent protection shall be of the dual-element type with rejection feature. Fuses employed for current limiting action shall be Class L with a time delay.
- C. Blown fuse indicators shall be provided where indicated on the plans. The blown fuse indicator device shall have an actuator and contact for annunciator indication.

PART 3 - EXECUTION

3.1 GENERAL

- A. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The City reserves the right to require minor changes in equipment location prior to roughing in without incurring any additional costs.
- B. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements

** END OF SECTION **

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section provides specifications for grounding electrical equipment and structures in a Wastewater Pumping Facility.
- B. The equipment and material supplied under this section shall include ground rods, electrodes, conductors, ground wires, connection ground grids required to make a complete ground system.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 01300 Contractor Submittal
 - 2. Section 16000 General Electrical Provisions

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000 – General Electrical Provisions, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

Submittals shall be in compliance with the provisions of Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.

1.6 QUALITY ASSURANCE

- A. Performance and Design Requirements: The grounding system shall bond together and effectively ground all exposed non-energized metal surfaces containing energized parts, devices or conductors, all building steel, all metallic electrical raceways and the neutrals of all transformers.
- B. Inspection: All ground connections shall be inspected by the Owner prior to backfill or placing of the concrete.

1.7 ENVIRONMENTAL CONDITIONS

All materials used in connection with the grounding system will be installed in a Wastewater Pumping Facility. Temperatures are expected to range from 40 degrees F to 100 degrees F. Relative humidity is expected to range from 40 percent to 95 percent. Annual rainfall for the area is approximately 12 inches.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ground Rods: Ground rods shall be one piece, 3/4-inch in diameter by 10 feet in length and shall be copper clad steel. The copper exterior shall be molten welded to the steel core. The rod heads shall be chamfered to prevent mushrooming during driving. A handhole and cast concrete cover shall be provided at each ground rod installation as detailed.
- B. Ground Wires: Ground wires shall be bare copper wires with Class B stranding. Size shall be as shown.
- C. Grounding Grid: The grounding grid shall consist of a bare copper conductor No. 4/0 AWG minimum and ground rods as required to achieve the required ground conductivity as required in paragraph 3.01 of this specification.
- D. Connections: All ground connections below grade for copper shall be made by the exothermic weld process. They shall be Cadweld, Thermoweld, or equal, made with Cadweld, Thermoweld, or equal, molds and clamps. All connections in the ground wells shall be made with a bolted ground clamp and shall be Copperweld Type "AB" with hex head set screw, Weaver Type W, or equal. All connections above grade to equipment ground buses and flat copper bars shall have a 2-bolt pad and shall be bolted with nonferrous hexagon head bolts and nuts with spring lockwashers. They shall be Burndy Type "QAB," Thomas & Betts LockTite, or equal. All connections to motor shall be as shown. Connections to miscellaneous boxes, cabinets, panels, etc., shall be Burndy type "KC" servitposts, Thomas & Betts split bolt connector, or equal.

2.2 EQUIPMENT

A. GENERAL

- 1. The grounding system shall be as shown and as required by codes and regulations shall include the following as applicable:
 - a. A grounding grid installed around and bonded to all substations, switchgear, motor control centers, control centers, enclosures for intrinsically safe barriers for signal circuits and all motors rated over 100 HP.
 - b. Metallic conduits supplemented with a ground wire installed in the conduit for all circuits except control circuits.
 - c. An equipment grounding conductor installed in all nonmetallic conduit carrying power to any equipment.
 - d. Integral ground conductors in bus duct.
 - e. Cable trays.
 - f. Ground conductors in portable cords.
- 2. All ground conductors entering handholes, manholes, pull boxes, terminal boxes, or any other enclosure shall be bonded together and shall be bonded to the enclosure if it is metallic and to all metallic raceways within or terminating at the enclosure. An insulated grounding bushing shall be installed with a code size equipment grounding conductor bonded to the equipment frame for all conduits terminating under an

enclosure containing no metal floor plate, or at sheet metal panels which are not fastened to the equipment frame solidly enough to provide an effective ground connection. This will commonly be the case with switchgear, switchboards and MCCs.

3. Where cable tray sections or fittings are connected together or to equipment using connectors which do not maintain ground integrity such as adjustable angle connectors a No. 1/0 copper bonding conductor shall be provided.
4. Cable shielding, metallic conduits, wireways, metal enclosure of bus ways, cable boxes, electrical equipment housings, and all Non-current-carrying metallic parts of the installation shall be grounded. The conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor. Include a code sized green insulated copper grounding conductor in all nonmetallic and flexible conduits.
5. System neutral conductors shall be grounded at the point of service ahead of the main disconnect to a grounding electrode and to a domestic cold water main as required by code. Transformer neutral shall be grounded from the neutral bushing and solidly grounded to earth. If metallic domestic water system is greater than 100 feet remote, furnish a system ground conductor in conduit to the established system grounding electrode.
6. All conduit stubups shall be grounded, and where multiple stubups are made within an equipment enclosure, such as a switchboard, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
7. All services and feeder runs (and branch circuit wiring excluding light circuits) in nonmetallic or flexible conduit shall carry one green THWN/XHHW insulated code sized ground conductor per conduit.
8. Provide bonding devices, fittings, or jumpers at expansion fittings, isolation sections, or wherever continuity of ground is broken.

2.3 GROUNDING TECHNIQUES

- A. The grounding electrode shall consist of a combination of the following systems as required to accomplish a resistance to ground not to exceed 5 ohms.
 1. Bare Wire Under Foundations: The preferred method shall be a 20-foot length of bare No. 4/0 copper wire extended its full length below ground level and embedded along the bottom of the concrete foundation footing which is in direct contact with the earth and supported in such a manner that it cannot be less than 3 inches from the bottom or side of the concrete when the foundation concrete is poured. A loop at the approximate center of this grounding electrode shall be brought out at the top of the foundation and a No. 4/0 copper ground conductor shall be connected to this loop with a pressure-type solderless connector and extended to the service equipment and to the metallic cold water system and properly connected thereto. The point of connection of the ground conductor to the grounding electrode shall be mechanically protected in a concrete box with a removable cast iron cover plate marked "GROUNDING ELECTRODE" and shall be visible for inspection. Provide crushed rock in the bottom of the box, 18 inches in depth.
 2. Multiple-driven Rods: This system shall use no less than three rods of copper, copperclad steel, or galvanized steel, spaced a minimum of 6 feet from each other or other electrodes, and driven a minimum of 8 feet into the earth to a level below the permanent moisture level. Rods shall be continuous one-piece, minimum 10-foot length, and 3/4-inch copper or 1-inch plated steel, approved for ground rod use.

- B. Rods shall have clean metal surfaces and shall be bonded together by a No. 4/0 copper conductor 6 inches below slabs or 18 inches below finished grade, welded by the Exothermic process, with a loop in the conductor and a No. 4/0 copper systems ground conductor connected in an accessible concrete box as described above. Welds to plated rods shall be wire brushed clean of managed plate and coated with approved asphaltic paint.
- C. Test Electrode: A "test" ground electrode shall be driven approximately, but not less than, 10 feet from the system grounding electrode. The test electrode shall consist of one continuous one-piece, minimum 10-foot-long, 3/4-inch copper rod with an accessible concrete box with removable cast iron cover engraved "GROUND TEST." Resistance to ground shall not exceed code allowed measurement, and additional ground rods or longer ground rods driven to a greater depth shall be provided to attain this value or better.

PART 3 - EXECUTION

3.1 PERFORMANCE TESTS

- A. The Contractor shall test each ground rod, ground mat and water pipe, structure or other major system grounding connection to determine the ground resistance. The grounding check shall be made by the "fall of potential" method utilizing a commercial ground test instrument such as the Biddle Model 593 "megger" ground check or the Associated Research Vibroground Model 225, or equal. A plot of ground resistance readings for each isolated ground rod or ground mat shall be submitted to the City. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test, and the measurements shall be made at 10-foot intervals beginning 15 feet from the test electrode and ending 75 feet from it, all in direct line between the ground rod or center of grid and the current reference electrode.
- B. Any grounding system that shows greater than 5 ohms resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 5 ohms requirement. Use of salts, water or compounds to attain the specified ground resistance is forbidden.
- C. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements.

**** END OF SECTION ****

SECTION 16480 – MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The work of this section includes providing group-mounted motor control as required for motors provided.
- B. If motors furnished are different from those indicated, then starters, overload elements, and branch circuit protection shall be adjusted and coordinated as required to control and protect the motors provided.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 16000 General Electrical Provisions

1.3 CODES

The work of this section shall comply with the current edition of the National Electrical Code (NEC) NFPA 70 as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the work of this section:
 - 1. NEMA ICS-1 General Standards for Industrial Control and Systems
 - 2. NEMA ICS-2 Controllers, Contactors and Overload Relays Rated 600V
 - 3. UL 845 Electric Motor Control Centers
 - 4. UL 489 Molded Case Circuit Breakers
 - 5. UL 60947-4-1A Low Voltage Switchgear and Controlgear

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Shop drawings of all motor control centers and components: Shop drawing submittals shall comply with Section 16000 – General Electrical Provisions. The submittal shall also include conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase and ground; electrical characteristics including voltage, frame size and trip ratings of overcurrent devices, short circuit withstand ratings, and protective device time-current curves of all equipment and components.
 - 2. Product data on motor starters and combination motor starters, relays, pilot devices and switching and overcurrent protective devices.

3. A wiring diagram and an elementary control diagram for each motor control center cubicle. An identifying number shall be assigned to each wire.
4. Seismic design certification and anchorage sketches in accordance with Section 16000 – General Electrical Provisions.

1.6 OPERATIONS AND MAINTENANCE MANUAL

- A. The following shall be included in compliance with Section 01300, Contractor – Submittals:
 1. Spare parts data listing.
 2. Source and current prices of replacement parts.
 3. Recommended maintenance procedures and intervals.
 4. Factory test reports.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Motor control centers shall be stored in a clean, dry space. Maintain factory wrapping or provide an additional heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Motor control centers shall be handled carefully to avoid damage to motor control center components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Motor control center shall be a product of Allen Bradley or approved equal.
- B. All similar products of the same type shall be furnished by a single manufacturer.
- C. Motor control assemblies shall conform to the standards for NEMA Class II, type B assemblies.
- D. Components and assemblies shall comply with NEMA ICS 2.

2.2 DESIGN, CONSTRUCTION AND MATERIAL REQUIREMENTS

- A. The motor control center shall be 600 volt class suitable for operation on a three-phase 60 Hz system. The system operating voltage and number of wires shall be as indicated.
- B. The main horizontal bus shall be copper with minimum ampacity of 600 amperes or rated as indicated. Main bus shall be copper, silver-plated and enclosed in an isolated compartment.
- C. The vertical bus in each section shall consist of a single silver plated copper conductor per phase with a current capacity of not less than 300 amps. The vertical bus shall be completely isolated and insulated.
- D. All power busses shall be braced to withstand 42,000 amps RMS symmetrical. Components shall be rated for 42,000 amps available short circuit duty.

- E. A continuous copper ground bus shall be provided full width at the bottom of the motor control center line-up. Provide neutral plates.
- F. Where indicated, fully-rated, continuous, neutral bus shall be furnished through the control center. Lugs of appropriate capacity shall be furnished.
- G. A separate vertical wireway shall be provided adjacent to each vertical unit and shall be covered by hinged door. Each individual unit compartment shall be provided with a side barrier to permit pulling wire in the wire trough area without disturbing adjacent unit compartments.
- H. Indoor enclosure shall be NEMA type 1-gasketed.
- I. Motor control sections shall be nominally 90 inches high and 20 inches deep for front mounted units.

2.3 MOTOR STARTERS -- GROUP MOUNTED

- A. Group-mounted starters shall be mounted in standard motor control center assemblies and arranged as indicated.
- B. Each motor starter unit shall consist of a combination magnetic starter and circuit breaker all mounted in a completely enclosed cubicle. Short circuit protective device shall be a Motor Circuit Protector (MCP). Where continuous rating exceeds 400 amperes the protective device shall consist of a molded case circuit breaker with a thermal-magnetic trip unit. MCP unit shall have low level sensing and shall incorporate a device to prevent setting trip levels in excess of 1300 percent of continuous rating. Contactor circuit shall include 3-phase thermal overload protection, ambient compensated. Reset of thermal overload elements or adjustment of instantaneous trip settings shall be possible with unit door closed. Overload trip units shall be furnished to suit the nameplate full load current of the equipment installed. IEC rated starters are not acceptable.
- C. Magnetic starters shall have auxiliary contacts as required by electrical motor control diagrams including one spare N.O. and one N.C. contacts. The combination motor starters shall be drawout-type for size 3 and below. The fixed-type unit assembly shall be so constructed that it can be easily removed from its panel after disconnecting the wires to the terminal block and withdrawing from the primary bus. Removal of a unit assembly shall be possible without rear access and without disturbing any other unit in the motor control center.
- D. Each starter unit shall have its own control power transformer; it shall have a 120-volt grounded secondary. One secondary fuse and 2 primary fuses shall be provided. Unit control power transformers shall be sized to accommodate the control devices indicated. Local control devices shall be mounted independently of the cover door. All starters having automatic control shall have a local "green" running lamp. All cubicle control wires shall be terminated at a disconnecting (separable) or pull-apart terminal block at the cubicle.
- E. The motor control center manufacturer shall be responsible for identifying each control wire within each motor starter unit with wrap-around permanent plastic markers. Each control wire shall be as identified at both ends.
- F. Motor starter units shall be NEMA size 1 minimum and correspond to the motor size.
- G. Each motor control center shall be fitted with the manufacturer's nameplate which shall include the NEMA Standard electric rating and other pertinent data, including sales order number, date of manufacture, and place of manufacture.

- H. "Spaces" shall be starter cubicles arranged for future addition of the door and NEMA size starter indicated on the drawings. The vertical bus shall extend to, but not be exposed within "spaces".
- I. Transient surge suppressors shall be provided in each starter. Suppressor shall be encapsulated in a small module suitable for mounting directly to the starter or relay coil.
- J. Solid-state reduced voltage starter shall consist of a power section, a one piece printed circuit logic board and a field wiring interface terminal board. Internal construction shall consist of the following:
 - 1. The power section shall be three-phase, 60 hertz, and rated for the HP, current, and voltage as indicated. It shall consist of three sets of back-to-back phase controlled power semi-conductors. Maximum current-limit shall be 500 percent for standard units.
 - 2. Resistor/capacitor snubber networks shall be used to prevent false firing of SCRs due to dv/dt characteristics of the electrical system.
 - 3. Fan cooled units shall be supplied with thermal sensors on the heat sink to trip the control protective logic for over-temperature condition. Thermal sensors shall be rated 90 degree C maximum.
 - 4. The one piece logic board shall be mounted for easy testing, service and replacement.
 - 5. Three-phase current sensing via current transformers for closed loop control to ensure motor stability shall be provided.
 - 6. The logic board shall use a quick disconnect plug-in connector for current transformer inputs, line and load voltage inputs, SCR gate firing output circuits and status panel.
 - 8. The logic circuitry shall include as a minimum:
 - a. Short circuit electronic trip overcurrent protection. Time not to exceed 1/2 cycle.
 - b. Inverse time running overcurrent protection.
 - c. Auxiliary trip circuit.
 - d. Gate firing circuit lockout protection on trip.
 - e. Fault relay lockout protection.
 - f. 250 percent to 500 percent current limit adjustments.
 - g. Minimum and maximum voltage adjustments.
 - h. Voltage stability adjustment.
 - 8. The logic board shall include, current and motor slip sensing circuitry that will continually monitor motor load and regulate motor voltage to minimize motor kwh energy consumption.
 - 9. External interface circuitry shall include 120 volt relay logic interface capability.
 - 10. Tripped functions shall be designed to be cleared by removing power from the solid-state logic board.

11. The solid-state logic shall provide phase sequence protection.
12. Two ground lugs shall be furnished, one for incoming and one for outgoing ground connections.
13. Power terminations shall consist of pressure type terminals for top or bottom entrance.
14. The power section shall have metal oxide varistor (MOV) type surge suppressors across the SCRs rated 10 percent above the SCR rated voltage. The power semi-conductors shall be rated with peak inverse voltage at least 2.5 times SCR rated line-to-line voltage. Suitably rated snubbers for voltage suppression shall be included. Data shall be made available on tolerances to incoming line voltage surges or line spikes. Data shall include both magnitude and time content of each spike (voltage peaks and volt-seconds) plus tolerance to repetitive surges.
15. 100 percent to 200 percent load running current trip adjustment.
16. Provide current limiting fuses.
17. Provide manual bypass (NEMA rated) contactor and bypass selector switch. When the selector switch is in the BYPASS position the pump shall start across the line when a start signal is received. Bypass selection is manual and is an emergency mode operation in case of soft start failure. Refer to the drawings for control diagrams.
18. The soft starter shall have an integral shorting contactor. Provide Allen Bradley SMC Flex or approved equal.

2.4 MAIN AND FEEDER CIRCUIT BREAKERS

- A. Circuit breakers having a frame size of 150 amperes or less shall be molded-case type with thermal magnetic non-interchangeable, trip-free, sealed trip units. Breaker contact material shall be a non-weldable silver alloy. Breakers shall have arc-extinguishing chutes.
- B. Circuit breakers with a frame size of 225 amperes to 800 amperes shall be molded case with interchangeable thermal and adjustable magnetic trip elements. Main circuit breakers with a frame size of 1000 amperes and larger shall be insulated case type fully rated circuit breakers. Provide shunt trip device where indicated.
- C. The interrupting capacity of all main and feeder circuit breakers shall be a minimum of 42,000 RMS symmetrical amperes.

2.5 MOTOR STARTERS - UNIT MOUNTED

- A. Unit-mounted motor starters shall consist of individual units mounted in close proximity to the machinery controlled.
- B. Magnetic starters shall be the combination circuit breaker type with cover interlocked with circuit breaker handle; unit shall have control power transformer and panel mounted control devices all as specified for group-mounted starters in motor control centers.
- C. Manual starters shall have 2-pole thermal overload elements and shall have auxiliary control devices as shown. Operating handle shall be trip-free and shall be indicated "On", "Off" or "Tripped" positions.

2.6 PREPARATION AND FINISH

- A. The Contractor shall have the manufacturer of the motor control center enclosures prepare them in strict accordance with the following requirements:
 - 1. NEMA 1 gasketed indoor assemblies shall be prepared and finished using materials and methods of the manufacturer's standard finish and colors, except that at least 2 coats of the final finish shall be applied by the manufacturer.
- B. The average dry film thickness of the preparation and finish coating shall be not less than 2 mils for a baked coating or 3 mils for an air-dry coating.

2.7 CONTROL DEVICES

- A. Selector Switches: Selector switches shall be rated 10 amperes at 600 volts, shall be heavy-duty, oil-tight, shall have the number of positions and poles indicated. Each shall have a factory-engraved legend plate, as indicated.
- B. Pushbutton Switches: The pushbutton stations shall be heavy-duty type with NEMA enclosures of the type indicated. When required, provisions shall be made for padlocking the "Stop" button. Pushbutton devices in damp or outdoor locations shall be fitted with appropriate neoprene boots.
- C. Indicating Lights: Indicating lights shall be full-voltage, LED, push-to-test type, and shall be heavy-duty, oil-tight as specified above for selector switches. Each shall be nickel-plated with a screwed-on glass prismatic lens approximately one-inch in diameter.
- D. Magnetic Relays: Magnetic relays shall be machine tool type with 115-volt ac coils and 10-amp contacts, unless otherwise shown. Contacts shall be field convertible. Relays shall be base-mounted to a common mounting channel. Mounting dimensions and drilling for AC and DC relays shall be identical.
- E. Time Delay Relay: Time delay relays shall be solid state type, adjustable as indicated.
- F. Timers: Timers shall be synchronous motor driven with a solenoid operated clutch. Timer shall be on-delay or off-delay for semi-flush panel mounting. The timers shall be rated 120-volt, 60-Hz, with 10-amp rated contacts and with time range as indicated.
- G. Elapsed Time Meter: Elapsed time meter (ETM) shall be non-reset type; shall register hours and tenths of an hour; shall have flush panel-mount case not less than 3 inches square; shall be suitable for operation at 120 volts, 60-Hz, AC.
- H. Terminal Blocks: Terminal blocks for control wiring shall be molded type with barriers, rated not less than 600 volts. Crimped eyelets or approved equal shall be used on all stranded control wire wherever wires are terminated on screw terminals. White or other light-colored marking strips, fastened by screws to the molded sections at each block, shall be provided for circuit designation. Each connected terminal of each block shall have the circuit designation or wire number imprinted on the marking strip with permanent marking fluid. Provide at least 20 percent spare terminals. Terminals shall be vinyl insulated, locking fork type.
- I. Phase Failure Monitor: Phase monitor shall be 480 volt, Diversified Model PBD440ALE.
- J. Ammeters: Provide current transformers, ammeter switch, and ammeters for motor starters where indicated.

2.8 FACTORY TESTS

- A. The motor control centers and components shall be given manufacturer's standard electrical and mechanical production tests and inspections with complete test reports submitted to the Construction Manager for approval. The tests shall include, but not be limited to, electrical continuity check, dielectric tests for each circuit and inspection for proper functioning of all components, including controls, protective devices, metering and alarm devices.
- B. Motor control centers shall be tested in accordance with NEMA ICS-2.

2.9 NAMEPLATES, TOOLS AND SPARE PARTS

A. Spare Parts:

The work includes the following spare parts:

- 1. One unit control transformer for each size of magnetic starter
 - 2. Three bezels of each color installed in pilot indicators
 - 3. One dozen panel lamps
 - 4. One dozen control fuses of each size provided in the work
- B. Spare parts shall be stored in tool boxes and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

PART 3 – EXECUTION

3.1 GENERAL

The Contractor shall install the motor control center in accordance with manufacturer's published instructions. Conduit installation shall be coordinated with manufacturer's as-built drawings so that all conduit stubups are within the area allotted for conduit. Conduit shall be stubbed up in the section which contains the devices to which conductors are terminated.

3.2 INSTALLATION

- A. The motor control center shall be set level within 1/32-inch per horizontal foot. After leveling and shimming, the Contractor shall anchor motor control center to concrete pad and shall grout in place so that no space exists between the pad and support beams.
- B. The Contractor shall:
 - 1. Torque all bus bar bolts to manufacturer's recommendations; tighten all sheet metal and structure assembly bolts.
 - 2. Adjust all MCP devices to lowest setting consistent with reliable operation under normal conditions. Verify that overload devices are proper for equipment installed; make necessary changes in overload devices as required for motors having power factor correcting capacitors.
 - 3. After equipment is installed, touch up scratches and verify that nameplate and other identification is accurate and in compliance with these Specifications.

- B. The Contractor shall install pushbutton stations that are remote from the motor control centers, as shown on the drawings.

3.3 FIELD TESTING

- A. The Contractor shall test all pilot lamp indicators and test all controls prior to plant startup.
- B. Refer to Section 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements

** END OF SECTION **

SECTION 16500 – LIGHTING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

The work of this section includes providing lighting fixtures, accessories, and controls required for a complete and operable lighting system.

1.2 RELATED SECTIONS

The work of Section 16000 - General Electrical Provisions, applies to the work of this section. Other sections of the specifications, not referenced in this section, shall also apply to the extent required for proper performance of this work.

1.3 STANDARD SPECIFICATIONS

Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC or “Greenbook”) and the City of San Diego Standard Specifications for Public Works Construction (“WHITEBOOK”), as specified in Section 01090 – Reference Standards.

1.4 CODES

- A. The work of this section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. National Electrical Code (NEC), NFPA 70.
2. International Building Code (IBC).

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the work of this section:

1. UL Underwriters Laboratories
2. CBMA Certified Ballast Manufacturer's Association

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals, and Section 16000 – General Electrical Provisions:

1. List of all fixture types with manufacturer's name and full catalog number.
2. Catalog information for each fixture, accessory, and control device. Each equipment submittal shall clearly describe make, materials, and dimensions. Catalog information shall clearly show manufacturer's name and full catalog number. Additional information is required for the following items:
 - a. Fixtures. Material description shall include diffuser, hardware, gasketing, reflector and chassis, and finish.

- b. Ballasts. Type of ballast, power factor, starting characteristics, temperature and sound rating, input watts and lamp watts.
 - c. Lighting poles. Anchoring details, fixture attachment hardware, handholes, and pole mounted accessories or controls.
 - B. Polar plots on 8-1/2 x 11 inch paper providing candlepower vs. angle and foot-lamberts of brightness vs. angle for longitudinal and traverse axis.
 - C. Table of utilization factors for calculation of illumination levels by the zonal cavity method.
- 1.7 OPERATING AND MAINTENANCE INFORMATION
- A. The following shall be included in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's installation instructions.
 - 2. Manufacturer's maintenance procedures, including dismantling procedures and parts list.

PART 2 - PRODUCTS

2.1 GENERAL

Lighting materials including lighting fixtures, accessories, hardware, and controls shall conform with the detailed requirements indicated on the lighting fixture schedule. Lighting fixtures shall be provided where indicated. Raceway and wire, for other than street lighting, shall be in accordance with Division 16 sections specified herein.

2.2 FIXTURES

A. GENERAL

Fixtures shall be pre-wired with leads 18 AWG minimum, for connection to external lighting circuit.

B. EXTERIOR FIXTURES

Pole-mounted fixtures, in combination with their mounting pole and bracket, shall be designed to withstand 100 MPH winds without damage. Exterior fixtures shall have corrosion-resistant hardware and either hinged door or lens retainer.

2.3 NOT USED

2.4 LAMPS

A. Color:

High-pressure sodium lamps shall be "color corrected."

B. Other:

Unless otherwise indicated, high-pressure discharge lamps shall be suitable for operation in any burning position.

2.5 LIGHTING POLES

A. General:

Lighting poles shall be provided with pole cap and all necessary fixture mounting hardware.

2.6 MANUFACTURERS

A. Products of the type indicated shall be of the following manufacturer (or equal):

1. Lamps: General Electric, North American Philips (Norelco), Sylvania, Venture Lighting International.
2. Lighting Junction Boxes: Brooks Products, Christy Concrete Products, Forni Corporation, Utility Vault Company.
3. Emergency Lighting Power Supply: Bodine, Datbrite, Guth, Lithonia, Siltron.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

Raceways and lighting circuits shall be provided from the fixtures, switches, and fixture outlets to the power panelboard in accordance with the NEC. Raceways and wire, other than for street lighting, shall be provided in accordance with Section 16000 – General Electrical Provisions. Installation requirements for street lighting shall be in accordance with SSPWC section 307. Fixtures shall be aligned and directed to illuminate an area as indicated. A concealed latch and hinge mechanism shall be provided to permit access to the lamps and ballasts and for removal and replacement of the diffuser without removing the fixture from ceiling panels.

B. FIXTURES

Internally wired conductors of fixtures having a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to that of the fixture.

3.2 CLEANUP

- A. Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.
- B. All burned-out, broken, and otherwise disabled lamps shall be replaced when the project is ready for acceptance.

3.3 TESTING

Refer to Section 01660 - Equipment Testing and Start-Up and Section 01999 - Reference Forms for testing and startup documentation requirements

**** END OF SECTION ****

SECTION 16620 – PACKAGED ENGINE GENERATOR SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This specification outlines the requirements for providing, installing and acceptance testing for a complete and operable prototype tested standby natural gas engine generator.
- B. The manufacturer shall have available prototype test results for the assembled engine-generator set. Individual component tests for the major components are not acceptable as a substitute for prototype testing of the complete and assembled engine generator set. All the equipment shall be new, and of current design and shall be constructed in accordance with the applicable requirements of the IEEE, NEMA, UL, and ANSI standards.
- C. Equipment and materials shall be new and delivered to the job site factory tested and ready for installation. The work includes the following:
 - 1. Furnish and install engine-generator set with mounted and loose accessories as described herein and shown on the drawings. Transfer switch equipment shall be furnished and warranted by the generator supplier.
 - 2. Furnish tests, documents and services as specified.
 - 3. Furnish oil and antifreeze.
- D. The engine generator shall be equipped with the necessary devices to meet current San Diego APCD regulations for the operation of a standby natural gas engine generator in California. Contractor shall obtain a general permit registration number to submit application, pay for, and assist the City in obtaining a APCD permit to construct and operate the standby generator.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01300 Contractor Submittals
 - 2. Section 01600 Products, Materials, Equipment, and Substitutions
 - 3. Section 01660 Equipment Testing and Start-Up
 - 4. Section 16000 General Electrical Provisions

1.3 SUBMITTAL

- A. The equipment shall not exceed the allocated space indicated in the drawings without Engineer approval.
- B. Provide the following submittal and shop drawing information for review. Any deviation from the specifications shall be noted on the transmittal letters indicating reasons for them.

1. Outline drawing for engine generator showing overall dimensions, power and control wiring entrance locations, fuel connections, anchor points, weight, breaker location and control panel.
 2. Manufacturer data sheets for major components including engine, generator, protective controls, voltage regulator, batteries, charger, exhaust components, jacket water heater, and circuit breaker.
 3. AC and DC wiring diagrams.
 4. Outline drawing for automatic transfer switch showing dimensions, conduit area and entry points, anchor points and front panel layout.
 5. Manufacturer data sheets for automatic transfer switch showing withstand ratings, time delays, voltage sensors and accessories.
 6. Wiring diagrams for automatic transfer switch.
 7. Vibration isolation certified calculations for seismic installations.
 8. Warranty and Prototype test documents.
 9. General Permit Registration for "pre-permitting" engine generator with San Diego APCD.
 9. Acoustical silencers.
 10. Specification review noting compliance.
- C. Furnish, at time of start up, two (2) Operating and Maintenance Manuals in three ring notebooks containing graphic diagrams, equipment data, spare parts lists, maintenance instructions and operator and service instructions.

1.4 APPLICABLE DOCUMENTS

- A. The following documents shall apply to the specified equipment.
1. IEEE C62.41.1 Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits
 2. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits
 3. NEMA MG1 Motors and Generators
 4. NFPA 37 Installation and Use of Stationary Combustion Engines and Gas Turbines

PART 2 - MATERIALS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide natural gas generator, automatic transfer switch, documents, tests, and services by Cummins/Onan, Caterpillar, or Kohler and the authorized distributor or approved equivalent. Accessories, including silencer, wall thimble,

flexible exhaust piping connectors, insulation, etc., shall be by Industrial Acoustic Co., HARCO Manufacturing, Silex, Inc. or equal.

- B. Engage the services of an authorized manufacturer's distributor capable of providing equipment as specified, maintaining parts inventory; performing initial start-up, warranty and 24 hour emergency service.
- C. Warranty for all products against defects in material and workmanship for a period of 1 year from the date of start up. Warranty coverage shall include parts, labor, travel expenses, and labor to remove/re-install equipment. Engage supplier capable of administering the warranty service on all components of the emergency system specified herein.

2.2 RATINGS

- A. The generator set shall be natural gas powered, 1800 RPM, minimum rated for standby operation at 350 KW, 0.80 P.F., 277,480 volt, 3-phase 4 wire.
 - B. The generator set shall be capable of picking up 100% load in one step in accordance with NFPA Standard 110.
 - 1. Generator set shall be capable of starting the following loads with a 20% maximum voltage dip:
 - a. Step 1: 12 kw, 16 Skva, 1-phase auxiliary load plus (1) plus (2) 3 Hp FANS (FVNR)
 - b. Step 1: (1) 150 Hp centrifugal pump (solid state starting, 400% current limit).
 - c. Step 2: (1) 150 Hp centrifugal pump (solid state starting, 400% current limit).
- Centrifugal pumps are low starting inertia loads.

2.3 ENGINE AND EQUIPMENT

- A. Engine shall be four cycle, spark-ignited natural gas fueled, water cooled and turbocharged/aftercooled.
- B. Positive displacement, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick.
- C. Replaceable dry element air cleaner with restriction indicator.
- D. Engine mounted battery charging alternator, 40 ampere minimum, and solid-state voltage regulator.
- E. Jacket water heater, 115/230 volt.
- F. Air Fuel Ratio Controller with O2 Sensor
- G. Non Selective Catalytic Reactor (NSCR) installed so as to reduce Oxides of Nitrogen, CO and UHC to those levels as required by the latest standards of the San Diego Air Pollution Control District.

- H. Thermal Insulation blanket shall be installed, at a minimum, on the expansion joint, exhaust piping and NSCR in order to maintain a sufficiently high exhaust temperature for effective operation of the NSCR in conversion of controlled pollutants. Thermal Insulation blanket shall be placed on the silencer and exhaust piping to protect personnel from exhaust temperatures. The blankets shall be removable without damage or requiring replacement parts.
- I. Electronic governor with adjustable control. Frequency regulation shall be isochronous under varying loads from no load to full load. Frequency variation shall be + 0.25 percent of rated speed.
- J. Provide engine mounted radiator including belt-driven pusher fan, water pump and thermostat. Cooling system shall be rated for full rated load operation in 104 F ambient conditions. Guard rotating parts against accidental contact.
- K. The engine and generator shall be mounted on a heavy duty steel base with a battery tray with battery hold-down clamps within the base. Electrical and fuel stub up shall be within the base rails.
- L. Provide DC fuel solenoid valve powered from the engine batteries. The fuel solenoid shall interface with the gas detection system such that the solenoid will close and shut off fuel if combustible gas is detected in the generator room. The solenoid valve shall have a ¼-turn manual bypass valve. The solenoid valve shall be supplied loose for installation under Division 15.
- M. Provide a residential “critical” engine silencer (Section 2.7) with associated wall penetration and rain cap.
- N. Provide all directional double acting earthquake snubber spring vibration isolation supports in accordance with Section 15050, Vibration Isolation.
- O. Supplier shall design and certify the engine radiator housing, ductwork, and louver pressure drop is adequately accounted for in the radiator fan sizing performance.

2.4 ENGINE STARTING

- A. Electric starter.
- B. Control cranking with three crank attempts with rest periods, 75 second minimum. Lock out controls after third attempt.
- C. Battery, 12 VDC, lead acid type. Batteries shall provide sufficient capacity to provide 100 seconds cranking. Provide insulated stranded copper conductors to connect batteries to generator starter.
- D. Battery charger, 120 VAC, 10 amp 12 VDC, voltage regulated mounted in generator enclosure. Equip with adjustable float and manual equalize charge settings, and DC voltmeter and ammeter. Provide contact and wiring for indication of low battery voltage on control panel. Charger voltage regulator shall be temperature compensated to prevent thermal damage to batteries.

2.5 GENERATOR

- A. The generator shall be single bearing, four pole, two-thirds pitch, drip-proof, and air cooled. The rotor shall have amortisseur windings and be dynamically balanced.

- B. THD shall not exceed 5% of rated voltage at full load and no single harmonic shall exceed 3% of rated voltage at full load.
- C. The exciter shall be brushless, three phase, with full wave silicon diodes, surge suppressor and exciter circuit breaker.
- D. Provide permanent magnet generator (PMG) for isolation and sustained 300% short circuit current for 10 seconds. Electronic current boost methods or CT boost methods are not acceptable.
- E. The insulation system for rotor, stator, exciter and PMG shall be Class H. Temperature rise at rated load shall not exceed 125C.
- F. The voltage regulator shall be 3 phase RMS sensing, temperature compensated, pulse width modulated and + 0.5% regulation with overvoltage and overexcitation protection. Overvoltage protection shall shut down regulator output on a sustained overvoltage of one (1) second; overexcitation protection shall shutdown regulator output if overloads exceed ten (10) seconds. The regulator shall allow frequency output to decline to 58-59 Hz before correcting the output voltage. The regulator shall allow frequency to decline to 58 Hz before correcting the output voltage in a linear volts/hertz manner.
- G. Shield generator, exciter and regulator to prevent radio frequency interference per provisions of BS.800 and VDE Class G and N.

2.6 GENERATOR CONTROL

- A. Provide NEMA 1 enclosed control panel mounted on the generator with vibration isolators. Solid state components shall have surge suppression for protection. Provide panel lighting with ON/OFF switch. Indicating meters (2%) and devices shall include:
 - 1. AC ammeter
 - 2. AC voltmeter
 - 3. Frequency meter
 - 4. Phase selector switch with OFF position for meter display of current and voltage in each generator phase.
 - 5. Voltage adjustment 5%
 - 6. Running time meter
 - 7. Oil pressure gauge
 - 8. Water temperature gauge
 - 9. DC voltmeter
- B. Controls shall shut down and lock out the engine upon:
 - 1. Overcrank
 - 2. Overspeed

3. Low oil pressure
 4. High engine temperature/low coolant level
- C. Provide DC powered engine monitor with the following lights on the control panel:
1. Run green
 2. Low oil pressure (pre-alarm) amber
 3. High engine temp (pre-alarm) amber
 4. Low engine temp (pre-alarm) amber
 5. Low oil pressure (shutdown) red
 6. High engine temp (shutdown) red
 7. Overcrank (shutdown) red
 8. Overspeed (shutdown) red
 9. Not in Automatic red (flashing)
 10. Spare red
- D. Operation of shut down circuits shall be independent of pre-alarm circuits. Panel mounted switches shall reset the engine monitor and test all the lamps. Provide individual signals to a remote telemetry cabinet for generator run, generator fail, and low battery voltage.
- E. Provide three position panel mounted switch (RUN-STOP-AUTO) to stop the engine in the STOP position, start and run the engine in the RUN position, and allow the engine to start and run by closing a remote contact, and stop by opening the remote contact when in the AUTO position.
- F. Provide cranking cycle function, consisting of three crank attempts followed by rest periods. Failure to start after three attempts (75 seconds) shall shut down and lockout engine. Two means of cranking termination after engine start shall be provided, one as a backup to the other.
- G. Provide distribution circuit breaker as shown on drawings. Breaker shall U.L. listed molded case, with overcurrent trip. Provide shunt trip on breaker where indicated.
- ## 2.7 EXHAUST SYSTEM
- A. Provide horizontal mounted critical silencer. Size considering the NSRC and critical silencer to assure full load operation without excessive backpressure. Make provisions as required for pipe expansion and contraction. Provide the following:
1. Stainless steel flexible connection between the engine and exhaust line.
 2. Condensation drain with manual valve to prevent water from entering the engine.
 3. Rain cap.

4. The exhaust piping extending through the wall shall be of the double-wall insulated and vented factory-built type.
5. Relief valve to relieve excessive backpressure. Valve must not relieve toward combustible materials.
6. Insulation and cladding for critical exhaust silencer and exhaust piping.
7. All portions of the exhaust system and supports below an elevation that is 8 feet above finished floor shall be insulated to reduce the operating temperature to prevent injury to personnel.

2.8 AUTOMATIC TRANSFER SWITCH (ATS)

- A. Provide 480 volt, 600 amp, 3 pole, U.L. 1008 listed automatic transfer switch with close and withstand rating not less than 30,000 RMS symmetrical amperes when fed with a circuit breaker. Rating shall be obtained without contact welding. The close and withstand rating shall be verified by UL witnessed test on representative test samples and shall be the rating in UL listing procedures for the transfer switches supplied.

2.9 ATS CONSTRUCTION

- A. 480 volt, contactor type, over-center mechanism, double-throw construction, positive electrically and mechanically interlocked to prevent simultaneous closing, and mechanically held in both normal and emergency positions. Transfer switches using interlocked circuit breakers or molded case switches are not acceptable. Provide NEMA 1 floor mount enclosure.
- B. Automatic transfer switch shall be capable of full load manual transfer in either direction. Provide insulated manual operating handle. Manual handles shall be permanently attached.
- C. Contacts shall be high-pressure, silver alloy with separate arcing contacts. Arc chutes shall be made of heat absorbing material and include metal leaves and arc chutes insulating covers.
- D. Provide fully rated lugs for normal, emergency, and load conductors inside cabinet. Power switching contacts and cable connections shall have transparent protective covers for protection and visual inspection.

2.10 ATS AUTOMATIC CONTROLS

- A. Provide electronic controls, front accessible, mounted inside the cabinet door. All adjustable voltage sensors and time delays shall be solid state. Provide control disconnect plugs to de-energize control circuits for service and testing. Controls shall meet IEEE C62.41.1 and C62.41.2 requirements for surge withstand.
- B. Utility voltage sensors shall be close differential type that monitor each phase individually. Voltage averaging is not acceptable. Monitors shall be temperature compensated; pick-up shall be adjustable from 85% to 98% of nominal voltage, set at 90%; dropout shall be adjustable from 75% to 98% of pick-up, set at 85%.
- C. Generator voltage sensors shall be close differential type that monitor each phase individually; Frequency sensors shall monitor emergency source with pick-up set at 95% of nominal frequency.

- D. Operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred. Maximum transfer time in either direction shall be six (6) cycles, unless otherwise specified.
- E. Provide the following time delays and components:
 - 1. Start delay 0 to 5 seconds set at 2.
 - 2. Transfer to emergency delay set at 0.
 - 3. Retransfer to normal delay 0 to 30 minutes set at 10.
 - 4. Retransfer delay bypass, key operated.
 - 5. Unloaded running delay, 0 to 10 minutes set at 5.
 - 6. Delay transition, both directions, isolating load from both sources, 0.5 - 7.5 seconds, set at 1 second.
 - 7. Test switch, key operated with and without transfer. Provide feature for future peaking run use via remote contact closure.
 - 8. Four pilot lights for ATS position and source available.
 - 9. Engine start contacts wired to terminal block.
 - 10. Auxiliary contacts on both normal and emergency wired to terminal block.
 - 11. Electronic exerciser 7 day, load/no load transfer.
 - 12. Controls shall automatically retransfer the load from emergency source to normal source if emergency source fails and normal source is available.
 - 13. Transfer switch shall be solid state type, Onan OT III or equal by Kohler, or Caterpillar.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which generator and transfer switch are to be installed and notify of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 DELIVERY, STORAGE AND HANDLING

- A. Deliver equipment properly packaged and mounted on skids to facilitate handling. Deliver with recommended oil and coolant installed.
- B. Store equipment to protect from weather and construction traffic. Wherever possible, store indoor; where necessary to store outdoors, store above grade with weather protective enclosure or plastic wrapping.
- C. Handle equipment carefully to prevent physical damage. Do not install damaged equipment; remove from site and replace damaged equipment with new.

3.3 INSTALLATION OF GENERATOR SET AND TRANSFER SWITCH

- A. Install generator and transfer switch as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that the unit fulfills requirements. Comply with NFPA and NEMA standards pertaining to installation of engine generator sets and accessories.
- B. Install generator on restrained spring type vibration isolators suitable for seismic conditions. Furnish certified anchor calculations.
- C. Coordinate with other work, including raceways, electrical boxes and fittings, exhaust piping, fuel connection, piping, radiator shroud, and accessories, as necessary to interface installation of engine generator equipment work with other work.

3.4 GROUNDING

- A. Provide equipment grounding connections for generator as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

3.5 PRODUCTION TESTS

- A. Provide certified factory production tests on the equipment performed at rated load and 0.8 PF. Tests shall include:
 - 1. Steady-state voltage and frequency analysis.
 - 2. Rated load at rated PF.
 - 3. Maximum power analysis.

3.6 FIELD TEST

- A. Engage the services of the supplier's factory trained technicians to perform testing including furnishing all test equipment. Owner's personnel shall be notified in advance of this test. Coordinate testing witnessing, and documentation requirements with San Diego APCD.
 - 1. Verify all electrical, exhaust, fuel and water connections for proper size, continuity, phase rotation, and tightness of fittings. Check all fluids for appropriate levels.
 - 2. Verify operation of jacket water heater, battery charger and automatic transfer switch.
 - 3. Start up engine and make initial check of voltage, frequency, battery charging, oil pressure, water temperature and safety shutdowns.
- B. Connect a load bank at 100% of generator rating at unity power factor.
 - 1. Generator set shall be run for 4 hours at 100%. Record every 15 minutes water temperature, oil pressure, ambient air temperature, voltage, current, frequency, and kilowatts. Test all safety devices using methods recommended by the manufacturer. At conclusion of test allow 10 minute unloaded cool-down before shutdown.
- C. Test generator controls in Remote position using the building load. Simulate failure of the normal power source by opening normal source breaker. Engine generator shall start and assume load within 10 seconds.

1. Run the generator for 30 minutes on building load.
 2. Adjust and verify ATS time delay settings.
- D. Any failure or malfunction of equipment or controls during any time of test procedure shall be corrected and re-tested at no additional cost to Owner.
- E. Production and field test results shall be documented and forwarded to the Engineer. Include test reports in O & M manuals.
- F. Provide operator training at conclusion of testing to personnel designated by the Owner. Training shall cover proper starting, testing and operation of the genset, required preventive maintenance and appropriate record keeping methods. Train personnel in periodic maintenance of the batteries.

**** END OF SECTION ****

SECTION 16700 - SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) AND INTRUSION SYSTEM

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The work of this section includes providing the following:
1. Supervisory Control and Data Acquisition (SCADA)/Telemetry:
 - a. The Supervisory Control and Data Acquisition System (SCADA) for the City of San Diego Metropolitan Wastewater Collection Department consists of master monitoring and control stations located at Central Operations and Maintenance Center (COMC). COMC is located at Metropolitan Operations Center in Building II (MOC II). The SCADA equipment is a Westinghouse Ovation System and associated communication hardware and software to communicate to remote PLC/DCS stations throughout the City of San Diego.
 - b. The pump station programmable logic control (PLC) system shall communicate to SCADA system remotely via Spread Spectrum Radios located at each pump station. This radio communication will be channeled through an intermediate Master Radio/PLC system located at the nearest mountain top. These will be used for re-transmission to/from COMC SCADA system. The Contractor shall provide and install the pump station radio and provide interface (software/hardware) connections to the pump station control PLC system.
 2. Backup Telemetry: The Contractor shall provide backup communication link from the pump station to COMC with a public switched telephone network (PSTN). This shall include a modem at the pump station and interface to the PLC.
 3. Intrusion System: The intrusion/security alarm system shall consist of switches located at the station doors. The Contractor shall provide the switches and alarm panel with key-pad for enabling and disabling of the intrusion system.

1.2 RELATED SECTIONS

- A. The work of the following sections applies to the work of this section. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
1. Section 01300 Contractor Submittals
 2. Section 16000 General Electrical Provisions

1.3 CODES

The work of this section shall comply with the current edition of the National Electrical Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

A. GENERAL

1. Submittals shall comply with the requirements of Section 01300 and Section 16000.
2. Submittals for all instrumentation and control equipment shall be submitted to the Owner. The submittal package for each individual equipment or groups of related equipment shall be complete.
3. The Contractor shall submit the manufacturers' statements accepting unit responsibility.
4. Refer to Section 01660 - Equipment Testing and Start-Up and Section 01999 - Reference Forms for testing and startup documentation requirements.

B. SHOP DRAWINGS AND OTHER SUBMITTAL DATA

1. Contract Drawings:
 - a. The drawings are generally diagrammatic unless detailed or dimensioned. The exact locations and routing or wiring, conduit and pipe shall be governed by structural conditions, physical interferences and location of terminations of equipment.
 - b. The Contractor shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment in order to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.
2. Deviations from Specifications: Should Contractor's proposed system designs deviate from the specifications, such deviation shall be documented and submitted to the Owner for approval. All deviations shall be stated on the submittal transmittal sheet.
3. Organization and Binding of Submittals:
 - a. The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the maintenance manuals required under Part 1.5.C. Therefore, the initial submittal of drawings and data, and all copies of subsequent submittals, shall be bound in standard size, 3 ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage, except as noted. Binder size shall not exceed 3-inch rings.
 - b. Cabinet, panel and console detail drawings shall be prepared and submitted on a uniform size paper not in excess of 22 by 34 inches; these drawings shall be submitted by roll, in order by subject, and shall neither be folded, nor bound. Other details and drawings to be bound in the 3 ring binders shall be prepared on 8-1/2 by 11-inch, or on 11 by 17-inch paper.

- c. The submittal shall be organized in three parts, not including preliminary administrative material such as table of contents, as follows:
 - (1) Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.
 - (2) Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.
 - (3) Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

C. Submittals:

- 1. General: The Contractor shall submit to the City for review, five sets of detailed drawings and data prepared and organized by the systems organization designated at the time of bidding. These drawings and data shall be submitted as a complete package at one time within 30 calendar days of the Notice to Proceed with the Project. The content, organization and binding of this submittal shall be as specified below.
- 2. Data Sheets: These data sheets shall be in a standardized format and shall include the following:
 - a. Component name used herein and on the drawings.
 - b. Manufacturers' model number or other product designation.
 - c. Project tag number.
 - d. System of which component is a part.
 - e. Location or assembly at which the component is to be installed.
 - f. Input and output characteristics.
 - g. Scale range and units (if any) and multiplier (if any).
 - h. Requirements for electric supply (if any).
 - i. Requirements for air supply (if any).
 - j. Materials of component parts to be in contact with, or otherwise exposed to, process media.
 - k. Reference to Manufacturer's descriptive technical bulletin or brochure.
 - l. Reference to other features so that all specified features are stated on the data sheet.
- 3. Technical Product Bulletins or Brochures: Following each data sheet, a technical product bulletin, or brochure (or clear Xerox copy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheets. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue.
- 4. Data Sheets and Catalog Data for Accessories: Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear Xerox copies thereof). These shall be arranged in a logical sequence and shall cover such items as:
 - a. Control circuit devices, components and wiring.

5. Cabinets, Panels, and Consoles: Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough other details, to clearly establish the style and overall appearance of each assembly.

A. OPERATION AND MAINTENANCE MANUALS

1. General:

- a. Before payment of the 75 percent progress payment, the Contractor shall provide final sets of maintenance manuals. Prior to this, two sets of preliminary manuals shall be submitted to the City within 60 days after return of favorably reviewed shop drawings and data required above.
- b. Following the review of the preliminary manuals, one set will be returned to the Contractor with comments. The final five (5) sets shall be prepared and submitted to the City at least 30 days prior to start-up of systems and shall reflect as-built conditions.

2. Content:

- a. A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
- b. In addition to the requirements set forth elsewhere, the instruction manuals shall consist of at least the following:
 - (1) Table of contents.
 - (2) System block and schematic diagrams.
 - (3) Component schematic diagrams.
 - (4) Written, verbal, step-by-step operating, trouble-shooting and calibrating instructions for each of the systems and each of the components of each system.
 - (5) As-built electrical and control drawings.
 - (6) Letter from Contractor that as-builts have been checked for proper indication of equipment, wiring numbers etc.
 - (7) Warranty contracts, warranty service information for all equipment.

1.6 QUALITY ASSURANCE

A. ACCEPTABLE MANUFACTURERS

1. Furnish instruments, devices, control and SCADA equipment by the named manufacturers.
2. The named manufacturers have been specified to establish a City wide standard for quality and performance of the equipment supplied.

3. Obtain all instruments or devices of a given type from the same manufacturer.

B. VERIFICATION PROCESS

At least one level of verification processes shall be provided to insure consistency and to avoid mismatch. This will be for all procured equipment and designs developed for a specific project.

C. UNIT RESPONSIBILITY

Equipment systems made up of two or more components shall be provided as a unit by the responsible manufacturer. Unless otherwise indicated, the Contractor shall obtain each system from the supplier of the driven equipment, which supplier shall provide all components of the system to enhance compatibility, ease of construction, and efficient system performance and maintenance. The Contractor shall be responsible to the OWNER for performance of all systems indicated.

PART 2 - PRODUCTS

2.1 RADIO/TELEMETRY SYSTEM AND COMPONENTS

- A. The Radio System at the pump station shall be capable of interfacing to the PLC and processing the data for transmission via the antenna system to the remote Master Radio located at the nearest mountain top. Contractor shall install the radio equipment in the PLC/control cabinet at the pump station. The radio equipment and accessories shall be mounted on a single panel supplied by the manufacturer and the Contractor shall install this panel inside the control cabinet. The radio is an MDS 9810 with D60 package (less D60 enclosure).
- B. Contractor shall provide and install all necessary cables and connections from the radio equipment to the PLC interface. Proper power supply shall be provided.
- C. Provide radio/antenna components as shown on the drawings.

2.2 INTRUSION/SECURITY SYSTEM

- A. The Contractor shall provide and install the intrusion/security system per scope requirements described above. The hardware provided shall be per the description given below.
 1. Security System:
 - a. Type: Microprocessor-based self-contained security system, suitable for panel mounting, with integral keypad.
 - b. Electrical:
 - (1) Input Voltage: 10 to 14 VDC.
 - (2) Power Consumption: 100 mA maximum.
 - (3) Relay Output: Form C, 1A at 24 VDC.
 - c. Required Features:
 - (1) Dimensions: 2.75" x 4.5".
 - (2) Operating Temperature: 86 ° F to 132 ° F.
 - (3) Keypad programmable.

- (4) Request-to-exit input.
 - (5) Door Input.
 - (6) Audible key beep for data entry.
 - (7) 30 user codes.
 - (8) Door ajar function.
 - (9) Time cancel.
 - (10) Provided with gasketed protective cover.
- d. Product and Manufacturer: K-30 as manufactured by Kantech.
2. Magnetic Contacts:
- a. Type: Hermetically sealed reed switch designed for industrial environments, suitable for metal doors, overhead doors, fences and gates.
 - b. Electrical:
 - (1) Voltage: 30 VAC/VDC maximum.
 - (2) Current: 0.25 Amps maximum.
 - (3) Power: 3W maximum.
 - (4) Contacts: Form C, SPDT, normally open and normally closed.
 - (5) Gap Distance: Up to 3-inches.
 - c. Construction:
 - (1) Contacts sealed in polyurethane potting compound.
 - (2) High strength extruded aluminum housing.
 - (3) Three-foot flex stainless steel armored cable permanently attached to contact.
 - (4) Dimensions (LxHxD): 3" x 1" x 0.5".
 - (5) Provide right angle bracket for mounting.
 - d. Product and Manufacturer: Model No. 2707A as manufactured by Sentrol Incorporated.
3. Proximity Sensors:
- a. Type: Self-contained, solid-state sensors designed to sense the presence of metal objects without touching them.
 - b. Electrical:
 - (1) Sensor shall be designed for low load current PLC applications.
 - (2) Two wire operation with 2 conductor #22 AWG PVC 5 meter length cable.
 - (3) Load Current: 2 to 25 mADC.
 - (4) Leakage Current: Less than or equal to 1.7 mADC at 120 VAC.
 - (5) Operating Voltage: 20-250 VAC/VDC.
 - (6) Voltage Drop: 8V at 25 mADC, 10V at 25 mAac.
 - (7) Switching Frequency: 20 Hz.
 - (8) Normally open output, with red LED indicating output energized.
 - (9) Proximity sensor shall have false pulse, transient noise and radio frequency protection.

- c. Environmental:
 - (1) Operating Temperature: -77 ° F to +158 ° F.
 - (2) Shock and Vibration: 5G, 30-120 Hz.
- d. Construction:
 - (1) Sensor shall be abrasion, impact and vibration resistant.
 - (2) Sensor shall be NEMA 6P, 1200 PSI wash down.
 - (3) Enclosure and barrel shall be stainless steel.
 - (4) Barrel diameter shall be 30 mm, length 58 mm.
 - (5) Sensor shall be unshielded type.
- e. Product and Manufacturer: Model No. XS2-M30MA250 as manufactured by Square D.

PART 3 - EXECUTION

3.1 GENERAL

- A. All analog instruments shall be installed so that taps and parts, etc., are available for in-place calibration and test without removal. They shall be field calibrated and tested. Installation testing shall provide the verification of contract requirements and pertinent manufacturer published performance specifications for performance parameters essential to the proper operation of the system.
- B. Elements such as controllers, electronic function modules, etc., shall be tested and exercised to demonstrate correct operation, first individually and then collectively as functional analog networks. Each analog system shall be tested to verify proper performance. Individual component uncertainty requirements shall be as specified by the Manufacturer.
- C. Field instruments shall be mounted on 2-inch pipe stands unless shown adjacent to a wall or otherwise noted. Instruments attached directly to concrete shall be spaced out from the mounting surface no less than ½-inch by use of phenolic spacers or framing channel. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.
- D. Control panels shall be mounted as shown and shall be accurately leveled to ensure that panel structure is not distorted. The panel shall be installed so as to clean all obstructions and provide ample working space from it.
- E. Refer to Section 01660 - Equipment Testing and Start-Up and Section 01999 - Reference Forms for testing and startup documentation requirements.

**** END OF SECTION ****

SECTION 16900 - CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. GENERAL

1. This section provides specifications for control equipment and instrumentation. This section specifies the functional operation of pump station controls, and necessary interfaces, but do not necessarily enumerate detailed specification for all hardware components and devices that are necessary for complete system operation. Please refer to other sections in this specification (example Section 16160, for cabinets, devices, etc.; or Section 16700 for SCADA, telemetering) as required. The Contractor shall furnish and install all required components and devices to provide complete and operable system, capable of providing the functions and meeting performance set forth in this section.
2. The following materials shall be furnished for the pump station controls. Section B below describes requirements for pump control systems.
 - a. Section 2.1: Wetwell tipping float.
 - b. Section 2.2: Gas detection system.
 - c. Section 2.3: Beacons.
 - d. Section 2.4: Proximity sensors.
 - e. Section 2.5: Level switches.
 - f. Section 2.6: Programmable logic controllers
 - g. Section 2.7: Undercurrent relays.
 - h. Section 2.8: Intrusion switches

B. PUMP CONTROL SCHEMES

1. General Description:
 - a. The following is a description of pump control schemes to be implemented as part of this scope unless otherwise specified elsewhere. The Owner, at its option, can provide these control scheme programs to be implemented into the programmable logic controller (PLC).
 - b. There shall be two sewer pumps at the station.
 - c. Pump control and telemetry is achieved utilizing a PLC. Except as shown for hardwired start/stop of each pump, all other controls and monitoring functions shall be implemented into the PLC.
 - d. The following schemes as a minimum shall be implemented into the PLC for each pump:

- (1) Automatic start/stop.
 - (2) Pump called to start.
 - (3) Pump failure.
 - (4) Pump sequence failure.
 - (5) Check valve failure.
2. Pump Start/Stop Manual: Each pump shall be able to start/stop from local (MCC location) hand/auto (HOA) switch.
3. Pump Control Automatic:
 - a. Pump control is achieved by monitoring wet well level. This is achieved by an ultrasonic transducer providing an analog signal to the PLC. A float backup circuit calls the pumps sequentially based on timers.
 - b. There shall be a pump call sequence for both pumps at various wet well levels. There shall also be a low and high level alarms initiated by these signals. Both motors will be stopped upon low-low level.
 - c. Pumps shall start separately.
 - d. Pump call sequence: Once a pump is called to start the following permissives shall be monitored. If these permissives are not met, after a time delay, or if the pump failed to start/run, after a time delay, a sequence failure signal will be generated for alarm and the other pump will be called to start. The permissives are:
 - (1) No check valve failure.
 - (2) H-O-A in Auto.
 - (3) No pump failure.
 - e. Pump available/failure: For the purpose of automatic control the following permissives constitute pump availability. If these conditions are not met the program shall generate a pump failure:
 - (1) Check valve closes while pump running.
 - (2) Pump breaker not tripped.
 - (3) Pump motor not overloaded.
 - f. Check valve failure: The following conditions will generate a check valve failure:
 - (1) Pump start initiated and check valve failed to open after time delay.
 - (2) Check valve does not close after a time delay following pump stop.
 - (3) Check valve closes while pump is running.
4. PLC Program:
 - a. The Contractor shall develop programs to implement the control and communication functions. The program shall include all housekeeping functions, parameters, control blocks, output and input functions for both control and alarm purposes. The program shall be written in ladder logic with proper partitioning of program files for easy understanding and troubleshooting purposes. A standard PLC program will be assigned to the Contractor to serve as a programming guide.

- b. The PLC program shall include proper DF-1 communication protocols for handshaking with remote Master PLC via spread spectrum radio link. The remote Master PLC is located on the nearest mountain top. Section 16700 describes the requirements for telemetry via radio links.
- c. The PLC program shall also include standby communication to the central operations and maintenance center (COMC) upon radio link failure at the pump station PLC. Refer to Section 16700 for description on the alternate standby modem communication.

1.2 RELATED SECTIONS

The work of Section 16000 - General Electrical Provisions, applies to the work of this section. Other sections of the specifications, not referenced in this section, shall also apply to the extent required for proper performance of this work.

1.3 CODES

The work of this section shall comply with the current edition of the National Electric Code as adopted by the City of San Diego Municipal Code.

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the specifications and standards for this work shall include the current editions of the specifications and standards of Section 16000, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

- A. A sample of each type of wire and cable shall be submitted to the Owner. The cable samples shall be of sufficient length to determine their rating and quality. Additionally, the submittals shall comply with the provisions set forth in Section 16000 – General Electrical Provisions, and Section 01300 – Contractor Submittals.
- B. GENERAL
 - 1. Submittals for all instrumentation and control equipment provided under this project manual shall be prepared and submitted to the City. The submittal package for each individual equipment or groups of related equipment shall be complete.
 - 2. As a condition precedent to the review of submittals required under these specifications, the Contractor shall furnish the manufacturers' statements accepting unit responsibility. The purpose of this provision is to both insure compatibility of all components specified under the specific technical specifications, but, also to provide sole source responsibility for system performance and maintenance. Notwithstanding these provisions, however, the Contractor is not relieved of his responsibility for the indicated portions of work. The following submittal data shall be provided for each item of equipment. Additional data specific to individual equipment sections will be listed under individual specifications on an as-needed basis.

C. PLC PROGRAM

1. Contractor shall submit three hard copies of all control programs developed for implementation. These shall include, as a minimum, the ladder logic program and associated reports such as: processor information, communication channel configuration, input/output configuration, cross reference report, and address/symbol data base.
2. Contractor shall submit one electronic copy of the PLC program on a compact disk (CD).

D. SHOP DRAWINGS AND OTHER DATA

1. Contract Drawings:
 - a. The drawings are generally diagrammatic unless detailed or dimensioned. The exact locations and routing or wiring, conduit and pipe shall be governed by structural conditions, physical interferences and location of terminations of equipment.
 - b. The Contractor shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment in order to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.
2. Deviations from Specifications: Should Contractor's proposed system designs deviate from the specifications, such deviation shall be documented and submitted to the City for approval. All deviations shall be stated on the submittal transmittal sheet.
3. Organization and Binding of Submittals:
 - a. The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the maintenance manuals required herein. Therefore, the initial submittal of drawings and data, and all copies of subsequent submittals, shall be bound in standard size, 3 ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage, except as noted. Binder size shall not exceed 3-inch rings.
 - b. Cabinet, panel and console detail drawings shall be prepared and submitted on a uniform size paper not in excess of 22 by 34 inches; these drawings shall be submitted in a roll, in order by subject, and shall neither be folded, nor bound. Other details and drawings to be bound in the 3 ring binders shall be prepared on 8-1/2 by 11-inch, or on 11 by 17-inch paper.
 - c. The submittal shall be organized in three parts, not including preliminary administrative material such as table of contents, as follows:
 - (1) Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.
 - (2) Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.
 - (3) Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

4. Submittal:

- a. General: The Contractor shall submit to the City for review, five sets of detailed drawings and data prepared and organized by the systems organization designated at the time of bidding. These drawings and data shall be submitted as a complete package at one time within 30 calendar days of the Notice to Proceed with the Project. The content, organization and binding of this submittal shall be as specified below.
- b. Data Sheets: These data sheets shall be in standardized format and shall include the following:
 - (1) Component name used herein and on the drawings.
 - (2) Manufacturer's model number or other product designation.
 - (3) Project tag number.
 - (4) System of which the component is a part.
 - (5) Location or assembly at which the component is to be installed.
 - (6) Input and output characteristics.
 - (7) Scale range and units (if any) and multiplier (if any).
 - (8) Requirements for electric supply (if any).
 - (9) Requirements for air supply (if any).
 - (10) Materials of component parts to be in contact with, or otherwise exposed to, process media.
 - (11) Reference to Manufacturer's descriptive technical bulletin or brochure.
 - (12) Reference to other features so that all specified features are stated on the data sheet.
- c. Technical Product Bulletins or Brochures: Following each data sheet, a technical product bulletin, or brochure (or clear Xerox copy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue.
- d. Data Sheets and Catalog Data for Accessories: Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear Xerox copies thereof). These shall be arranged in a logical sequence and shall cover such items as:
 - (1) Control circuit devices, components and wiring.
- e. Cabinets, Panels, and Consoles: Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough other details, to clearly establish the style and overall appearance of each assembly.

E. OPERATION AND MAINTENANCE INFORMATION

1. General:

- a. Before payments of the 75 percent progress payment, the Contractor shall provide final sets of maintenance manuals. Prior to this, two sets of preliminary manuals shall be submitted to the City within 60 days after return of favorably reviewed shop drawings and data required above.

- b. Following the review of the preliminary manuals, one set will be returned to the Contractor with comments. The final five (5) sets shall be prepared and submitted to the City at least 30 days prior to start-up of systems and shall reflect as-built conditions.

2. Content:

- a. A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.
- b. In addition to the requirements set forth elsewhere, the instruction manuals shall consist of at least the following:
 - (1) Table of contents.
 - (2) System block and schematic diagrams.
 - (3) Component schematic diagrams.
 - (4) Written, verbal, step-by-step operating, trouble-shooting and calibrating instructions for each of the systems and each of the components of each system.
 - (5) As-built electrical and control drawings.
 - (6) Letter from contractor that as-builts have been checked for proper indication of equipment, wiring numbers etc.
 - (7) Warranty contracts, warranty service information for all equipment.

1.7 QUALITY ASSURANCE

A. ACCEPTABLE MANUFACTURERS

- 1. Furnish instruments, devices and control equipment by the named manufacturers.
- 2. The named manufacturers have been specified to establish a City-wide standard for quality and performance of the equipment supplied.

B. VERIFICATION PROCESS

At least one level of verification process shall be provided to insure consistency and to avoid mismatches. This will be for all procured equipment and designs developed for a specific project.

PART 2 - PRODUCTS

2.1 WETWELL TIPPING FLOAT LEVEL SWITCH

- A. Tipping float level switches shall consist of a switch, a moving float, and a connecting cable. As the level rises and falls the float rights itself or inverts causing switching actions. The cable shall be tethered with a weight. The hermetically sealed switches shall be SPDT with a minimum rating of 10 amps at 120 VAC.

B. Manufacturer shall be Warrick Series M with 40 feet of cable.

2.2 GAS DETECTION SENSORS/MONITORING SYSTEM

- A. The gas detection equipment shall be manufactured by Sierra for standardization of this safety equipment with other existing pump stations. Combustible sensors shall be infrared type which does not require periodic calibration.
- B. The gas detector shall be calibrated to alarm at the following set point gas concentrations:
- | | |
|------------------|---------|
| Hydrogen sulfide | 10 ppm |
| Carbon monoxide | 35 ppm |
| Combustible | 10% LEL |
- C. Provide multiple channel hazardous gas monitors for continuously monitoring hazardous gas concentrations at locations indicated. The system shall consist of remote sensing assemblies and a solid state controller for each system. Each channel shall be completely independent and have its own constant current sensor drive circuit.
- D. Monitor shall automatically display the higher reading channel on digital LED meter display from 0 to 100% LEL (lower limit). Manual override switching shall be provided to permit read-out of the low channel at any time. Low and high alarm channel set points shall be common to both channels. Portable purge calibrator shall be furnished for field calibration of monitor. Monitor controller shall be Sierra Sentry Model 5000. Sensors shall be Model 5100 series. The monitors shall be installed at the location, as show on the drawings. The system shall be capable of interfacing with PLC as required.
- E. The generator room combustible gas sensor shall shutdown the engine-generator fuel solenoid. The sensor shutdown shall have the ability to be overridden with an override selector switch.

2.3 BEACONS

A. TYPE

The beacon shall be comprised of a parabolic reflector which rotates and flashes a minimum of 80 times per minute.

B. ELECTRICAL

1. Voltage: 24 VDC and 120 VAC.
2. Beacon shall be 50 Watt incandescent.
3. Lamp Life: 40,000 hours.

C. ENVIRONMENTAL

Operating Temperature: 32° F to + 120° F.

D. CONSTRUCTION

1. Beacon shall have a parabolic reflector which rotates around the lamp providing 80 flashes per minute in all directions.

2. Polycarbonate dome shall be red with an aluminum retaining ring.
3. Beacon shall be designed for permanent corner of wall mounting.

E. PRODUCT AND MANUFACTURER

24 VDC Beacon Model No. 121A, 120 VAC Beacon Model No. 121S, as manufactured by Federal Signal Corporation.

2.4 PROXIMITY SENSORS

- A. Type: Self-contained, solid-state sensors designed to sense the presence of metal objects without touching them. Proximity sensors shall be used for pump check valve position sensing.
- B. Electrical:
 1. Sensor shall be designed for low load current PLC applications.
 2. Two wire operation with 2 conductor #22 AWG PVC 5 meter length cable.
 - a. Load Current: 2 to 25 mADC
 - b. Leakage Current: Less than or equal to 1.7 mADC at 120 VAC.
 - c. Operating Voltage: 20-250 VAC/VDC.
 - d. Voltage Drop: 8V at 25 mADC, 10V at 25 mAac.
 - e. Switching Frequency: 20 Hz
 - f. Normally open output, with red LED indicating output energized.
 - g. Proximity sensor shall have false pulse, transient noise and radio frequency protection.
 3. Environmental:
 - a. Operating Temperature: -77° F to +158° F.
 - b. Shock and Vibration: 5G, 30-120 Hz.
 4. Construction:
 - a. Sensor shall be abrasion, impact and vibration resistant.
 - b. Sensor shall be NEMA 6P, 1200 PSI wash down.
 - c. Enclosure and barrel shall be stainless steel.
 - d. Barrel diameter shall be 30 mm, length 58 mm.
 - e. Sensor shall be unshielded type.

5. Product and Manufacturer: Model No. 871TM-BH15N30-A5 as manufactured by Allen-Bradley.

2.5 LEVEL SWITCHES

Switch shall be a stem mounted float device with 304 stainless steel stem, Buna N float material, Lucite slosh shield, IMO/GEMS Model LS-270 or approved equal.

2.6 PROGRAMMABLE LOGIC CONTROLLER (PLC)

The PLC shall be Allen Bradley SLC 500 Series. Refer to the Drawings for part numbers. No substitutions allowed.

2.7 UNDERCURRENT RELAYS

- A. Provide undercurrent relays for supply and exhaust fans, where indicated, to indicate a loss of ventilation to the station.
- B. Undercurrent relays shall have integral current transformer and calibrated settings to monitor one leg of the fan power circuit. The relay shall have 120 vac Form C output contacts. Sensitivity shall range from 1/5 hp to 50 hp. Adjust per manufactures recommendations.
- C. Undercurrent relay shall be Model H609 by Veris Industries or approved equal.

2.8 INTRUSION SWICHES

A. Magnetic Contacts:

1. Type: Hermetically sealed reed switch designed for industrial environments, suitable for metal doors, overhead doors, fences and gates.
2. Electrical:
 - a. Voltage: 30 VAC/VDC maximum.
 - b. Current: 0.25 Amps maximum.
 - c. Power: 3W maximum.
 - d. Contacts: Form C, SPDT, normally open and normally closed.
 - e. Gap Distance: Up to 3 inches.
3. Construction:
 - a. Contacts sealed in polyurethane potting compound.
 - b. High strength extruded aluminum housing.
 - c. Three foot flex stainless steel armored cable permanently attached to contact.
 - d. Dimensions (LxHxD): 3" x 1" x 0.5".
 - e. Provide right angle bracket for mounting.
4. Product and Manufacturer: Model No. 2707A as manufactured by Sentrol Incorporated.

PART 3 - EXECUTION

3.1 GENERAL

- A. All analog instruments shall be installed so that taps and parts, etc., are available for in-place calibration and test without removal. They shall be field calibrated and tested. Installation testing shall provide the verification of contract requirements and pertinent manufacturer published performance specifications for performance parameters essential to the proper operation of the system. However, should the proper operation of any instrument be considered suspect by the City, the Contractor shall provide for the implementation of all tests required to verify the proper performance.
- B. Elements such as controllers, electronic function modules, etc., shall be tested and exercised to demonstrate correct operation, first individually and then collectively as functional analog networks. Each analog system shall be tested to verify proper performance. Individual component uncertainty requirements shall be as specified by the Manufacturer.
- C. Field instruments shall be mounted on 2-inch pipe stands unless shown adjacent to a wall or otherwise noted. Instruments attached directly to concrete shall be spaced out from the mounting surface no less than ½-inch by use of phenolic spacers or framing channel. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.
- D. Control panels shall be mounted as shown and shall accurately leveled to ensure that panel structure is not distorted. The panel shall be installed so as to clear all obstructions and provide ample working space in front of it.
- E. In accordance with manufacturer's instructions, and the specified functional requirements.
- F. Refer to Sections 01660 – Equipment Testing and Start-Up and Section 01999 – Reference Forms for testing and startup documentation requirements.

**** END OF SECTION ****

APPENDIX A

**RESERVED FOR CEQA DOCUMENT BEING PREPARED BY THE CITY'S
DEVELOPMENT SERVICES DEPARTMENT (DSD)**

(This Appendix will be issued via addendum)

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.)

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 2 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principle 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.

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 3 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
 12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
 13. The outlet shall have a 2 ½ "National Standards Tested (NST) fire hydrant male coupling.
 14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.
- 4.6 **Conditions and Processes for Issuance of a Fire Hydrant Meter**
- Process for Issuance
- a. Fire hydrant meters shall only be used for the following purposes:
 1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
 - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
 - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
 - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
 - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
 - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
 - g. After the fees have been paid and an account has been created, the

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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as "Hotline"), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter's relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a "Notice of Discontinuation of Service" (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

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for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:
 - a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

- b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. **FEE AND DEPOSIT SCHEDULES**

- 7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. **UNAUTHORIZED USE OF WATER FROM A HYDRANT**

- 8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.
- 8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.
- 8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.
- 8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

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- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

Water Department Director

- Tabs: 1. Fire Hydrant Meter Application
2. Construction & Maintenance Related Activities With No Return To Sewer
3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index: Construction Meters
Fire Hydrant
Fire Hydrant Meter Program
Meters, Floating or Vehicle Mounted
Mobile Meter
Program, Fire Hydrant Meter

Distribution: DI Manual Holders



Application For Fire Hydrant Meter

(EXHIBIT A)

For Office Use Only

Department **METER SHOP** 619 527 7449
 2797 Camino Chiles • San Diego, California 92105-5097 • FAX 619 527 3125

WS Req:	Fee #:
Date:	By:

Meter Information	Application Date:	Requested Install Date:
--------------------------	-------------------	-------------------------

Fire Hydrant Location: (Attach detailed map, Thomas Bros. map location or construction drawing.)

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 Code:	Phone: ()
*Business License #:		*Contractor License #:	
*A copy of the Contractor's License and/or Business License is required at the time of meter issuance.			
Name and Title of Agent:		Phone: ()	
Site Contact Name and Title:		Phone: ()	
Pager #:		Cell: ()	
Responsible Party Name:		Title:	
Social Security or 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

<input type="checkbox"/> Check Box to Request Removal of Above Meter	Requested Removal Date:	
Provide current Meter location if different from above:		
Signature:	Title:	Date:
Phone: ()	Pager: ()	

For Office Use Only

<input type="checkbox"/> City Meter	<input type="checkbox"/> Private Meter	
GIS Account #:	Deposit Amount: \$	Fees Amount: \$
Meter Serial #:	Meter Size:	Meter Make & Style:
Backflow #:	Backflow Size:	Meter Make & Style:
Name:	Signature:	Date:

\$1,108.45 - FOR 24 HR INSTALLATION
 \$1,052.26 - FOR 48 HR INSTALLATION

FHM App Created: 11/2/00-htp

"Exhibit B"

CONSTRUCTION AND MAINTENANCE RELATED ACTIVITIES WITH NO 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 Seeding
Irrigation (for establishing irrigation only; not continuing irrigation)
Mixing Concrete
Mobile Car Washing
Special Events
Street Sweeping
Water Tanks
Water Trucks
Window Washing

Note: If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charged.

"Exhibit C"

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 refer to the Water Departments', Department Instruction (D.I.) 55.27 for further information and procedure.

Mail your request for an extension to :

City of San Diego, Water Department
Attn: Meter Services
2797 Caminito Chollas
San Diego, Ca. 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant "Hot Line" at: (xxx) xxx-xxxx.

Sincerely,

City of San Diego Water Department



Fire Hydrant Meter Relocate/Removal Request

(EXHIBIT D)

<i>For Office Use Only</i>	
NS Req:	FHM Fac #:
Date:	By:

Date:

Instruction: Complete pertinent information then FAX both form and map to (xxx) xxx-xxxx, mail, or hand-deliver to the City of San Diego, Water Department/Meter Shop at: 2707 Caminito Chollas San Diego, CA 92105

Meter Information

Billing Account #:	Requested Move Date:
Current Fire Hydrant Meter Location:	
New Meter Location: (Attach a detailed map, Thomas Bros map location or construction drawing.)	

Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip Code:	Phone: ()
Name and Title of Requestor:			Phone: ()
Site Contact Name and Title			Phone: ()
Pager #:			Cell : ()
Responsible Party Name authorizing relocation fee:			
Signature:	Title:	Date:	

Fire Hydrant Meter Removal Request

<input type="checkbox"/> Check Box to Request Removal of Above Meter	Requested Removal Date:	
Provide current Meter location if different from above:		
Signature:	Title:	Date:
Phone: ()	Pager: ()	

For Office Use Only

CIS Account #:	Fees Amount: \$	
Meter Serial #:	Size:	Make/Style
Backflow #:	Size:	Make/Style
Name:	Signature:	Date:

FHM Relocate_Removal Form

FHM App Created: 11/2/00-htp

APPENDIX C
SAMPLE CITY INVOICE

City of San Diego, Field Engineering Div., 9485 Aero Drive, SD CA 92123					Contractor's Name:						
Project Name:					Contractor's Address:						
SAP No. (WBS/IO/CC)											
City Purchase Order No.					Contractor's Phone #:			Invoice No.			
Resident Engineer (RE):					Contractor's Fax #:			Invoice Date:			
RE Phone#:			RE Fax#:		Contract Name:			Billing Period:			
Item #	Item Description	Contract Authorization				Previous Estimate		This Estimate		Totals to Date	
		Unit	Qty	Price	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1	2 Parallel 4" PVC C900	LF	1,380	\$34.00	\$46,920.00						
2	48" Primary Steel Casing	LF	500	\$1,000.00	\$500,000.00						
3	2 Parallel 12" Secondary Steel	LF	1,120	\$33.00	\$369,360.00						
4	Construction and Rehab of PS 49	LS	1	\$150,000.00	\$150,000.00						
5	Demo	LS	1	\$14,000.00	\$14,000.00						
6	Install 6' High Chain Link Fence	LS	1	\$5,600.00	\$5,600.00						
7	General Site Restoration	LS	1	\$3,700.00	\$3,700.00						
8	10" Gravity Sewer	LF	10	\$292.00	\$2,920.00						
9	4" Blow Off Valves	EA	2	\$9,800.00	\$19,600.00						
10	Boards	LS	1	\$16,000.00	\$16,000.00						
11	Field Orders	AL	1	\$80,000.00	\$80,000.00						
11.1	Field Order 1	LS	5,500	\$1.00	\$5,500.00						
11.2	Field Order 2	LS	7,500	\$1.00	\$7,500.00						
11.3	Field Order 3	LS	10,000	\$1.00	\$10,000.00						
11.4	Field Order 4	LS	6,500	\$1.00	\$6,500.00						
12	Certified Payroll	LS	1	\$1,400.00	\$1,400.00						
CHANGE ORDERS											
Change Order 1			4,890								
Items 1-4					\$11,250.00						
Item 5-Deduct Bid Item 3			LF	120	-\$53.00	(\$6,360.00)					
Change Order 2			160,480								
Items 1-3					\$95,000.00						
Item 4 Deduct Bid Item 1			LF	380	-\$340.00	(\$12,920.00)					
Item 5-Increase bid Item 9			LF	8	\$9,800.00	\$78,400.00					
Change Order 3 (Close Out)			-121,500								
Item 1 Deduct Bid Item 3				53	-500.00	(\$26,500.00)					
Item 2 Deduct Bid Item 4			LS	-1	45,000.00	(\$45,000.00)					
Items 3-9					1	-50,500.00	(\$50,500.00)				
SUMMARY								Total			
								This	\$ -	Total Billed	\$0.00
A. Original Contract Amount					Retention and/or Escrow Payment Schedule						
B. Approved Change Order 1 Thru 3					Total Retention Required as of this billing						
C. Total Authorized Amount (A+B)					Previous Retention Withheld in PO or in Escrow						
D. Total Billed to Date					Add'l Amt to Withhold in PO/Transfer in Escrow:						
E. Less Total Retention (3% of D)					Amt to Release to Contractor from PO/Escrow:						
F. Less Total Previous Payments											
G. Payment Due Less Retention					Contractor Signature and Date:						
H. Remaining Authorized Amount											

APPENDIX D
ARCHAEOLOGY FORM

(FOR ARCHAEOLOGY ONLY)

Company Name

Address, telephone, fax

Date: Insert Date

To: Name of Resident Engineer
City of San Diego
Field Engineering Division
9485 Aero Drive
San Diego, CA 92123-1801

Project Name: Insert Project Name

SAP Number (WBS/IO/CC): Insert SAP Number

Drawing Number: Insert Drawing Number

Invoice period: Insert Date to Insert Date

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Monitoring Bid item. See Note 1 below.

Summary of charges:

Description of Services	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist	Joe Smith	8/29/2011	9/2/2011	40	\$84	\$3,360
Laboratory Assistant	Jane Doe	8/29/2011	9/2/2011	2	\$30	\$60
Subtotal						\$3,420

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Curation/Discovery Bid item. See Note 2 below.

Summary of charges:

Description of Services	Where work occurred (onsite vs. offsite/lab)	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist		Joe Smith	8/29/2011	9/2/2011	40	\$84	\$3,360
Laboratory Assistant		Jane Doe	8/29/2011	9/2/2011	2	\$30	\$60
Subtotal							\$3,420

Total this invoice: \$ _____

Total invoiced to date: \$ _____

Note 1:

For monitoring related bid items or work please include summary of construction work that was monitored from Station to Station, Native American monitors present, MMC coordination, status and nature of monitoring and if any discoveries were made.

Note 2:

For curation/discovery related bid items or work completed as part of a discovery and curation process, the PI must provide a response to the following questions along with the invoice:

1. Preliminary results of testing including tentative recommendations regarding eligibility for listing in the California Register of Historical Resources (California Register).
 - a. Please briefly describe your application (consideration) of all four California Register criteria.
 - b. If the resource is eligible under Criterion D, please define the important information that may be present.
 - c. Were specialized studies performed? How many personnel were required? How many Native American monitors were present?
 - d. What is the age of the resource?
 - e. Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the San Diego Archaeological Center (SDAC). How many personnel were required? How many Native American monitors were present?
2. Preliminary results of data recovery and a definition of the size of the representative sample.
 - a. Were specialized studies performed? Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the SDAC. How many personnel were required? How many Native American monitors were present?
3. What resources were discovered during monitoring?
4. What is the landform context and what is the integrity of the resources?
5. What additional studies are necessary?
6. Based on application of the California Register criteria, what is the significance of the resources?
 - a. If the resource is eligible for the California Register, can the resource be avoided by construction?
 - b. If not, what treatment (mitigation) measures are proposed? Please define data to be recovered (if necessary) and what material will be submitted to the SDAC for curation. Are any specialized studies proposed?

(After the first invoice, not all the above information needs to be re-stated, just revise as applicable).

APPENDIX E

LONG-TERM REVEGETATION MAINTENANCE CONTRACT

LONG-TERM REVEGETATION MAINTENANCE CONTRACT

This Long-Term Maintenance Contract [Contract] is made and entered into by and between the City of San Diego [City], a municipal corporation, and [insert name of the Contractor, to be identified after award] [Contractor], who may be individually or collectively referred to herein as a “Party” or the “Parties.”

RECITALS

- A. Concurrent with the Contract execution, the Parties entered into an agreement [Agreement] for the construction of City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment [Project], SAP No. (WBS/IO/CC) S-00308, Bid No. K-12-5525-DBB-C.
- B. In accordance with the Agreement, the Contractor shall enter into this contract with the City for the purpose of implementing and fulfilling long-term revegetation maintenance and monitoring requirements in accordance with the City of San Diego Municipal Code and the Contract Documents for the specified elopement(s) of City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment [Maintenance Requirements].
- C. The Contractor is ready and willing to fulfill its maintenance requirements in accordance with the terms of this contract i.e., Maintenance Requirements.

NOW, THEREFORE, in consideration of the above recitals and the mutual covenants and conditions set forth herein, and for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby set forth their mutual covenants and understandings as follows:

INTRODUCTORY PROVISIONS

- 1. **Recitals Incorporated.** The above referenced Recitals are true and correct and are incorporated into this contract by this reference.
- 2. **Exhibits Incorporated.** All Exhibits and Attachments referenced in this contract are incorporated into this contract by this reference.
- 3. **Contract Term.** This contract shall be effective on the date the Notice of Completion for the Agreement is executed, and it shall be effective until completion of the Work, described in Section 1.1 below.
- 4. **Terms and Conditions.** This contract is subject to the terms and conditions of the Agreement included in The GREENBOOK and The WHITEBOOK i.e., Part 1, Sections 212, 308, and 801 through Section 808 and The WHITEBOOK EOCP Section except as follows.

SECTION 1: SCOPE OF WORK

- 1.1 General.** The Contractor shall fulfill the Project's Maintenance Requirements [Work] as identified in the scope of work attached as Exhibit A in a manner satisfactory to the City.

The Contractor shall provide all equipment, labor, and materials necessary to perform the **Work** as described in the written in Exhibit A, at the direction of the City.

- 1.2 Work Schedule.** After receiving notification from the City, the Contractor shall create a comprehensive schedule of Work for performance of this contract [Schedule] for the City's approval. The Schedule shall include routine work and inspection and infrequent operations such as repairs, fertilization, aerification, watering, and pruning.

The City will approve the Schedule prior to the commencement of the Work. The City may require the Contractor to revise the Schedule. The Contractor shall not revise the Schedule unless the revisions have received the prior written approval of the City.

- 1.3 Commencement of Work & Maintenance Period.** The Contract shall begin on the date indicated in the field notification to be issued by City to the Contractor in accordance with the Project's Agreement [Field Notification], and shall continue for **25** consecutive months after the 120 calendar day plant establishment period. A copy of the Field Notification shall be attached hereto as Exhibit B.

- 1.4 Performance of Work.** The Work shall be performed in accordance with the manufacturer's recommendations.

- 1.5 License.** The Contractor shall hold the following licenses in good standing:

- a) C-27 State Contractor's License. Alternatively, the Contractor shall retain the services of a Subcontractor with a C-27 State Contractor's License.
- b) Pest Control Advisor's License. Alternatively, the Contractor shall retain the services of a licensed Pest Control Advisor.
- c) Registration with the County Agriculture Commission.
- d) Qualified Applicator's Certificate for Category B. This shall apply to any person supervising the use of pesticides, herbicides, or rodenticides.
- e) City of San Diego Business License.

Prior to performing the Work, the Contractor shall complete and submit to the City the License Data Sheet. See Exhibit C.

- 1.6 Hours of Performance.** The Contractor shall perform the Work between the hours of 6:00 a.m. and 6:00 p.m., Monday through Friday [Working Hours]. The City may, in its sole discretion, grant permission to Contractor to perform Work during non-Working Hours. Maintenance functions that generate excess noise, e.g., operations of power equipment which would cause annoyance to area residents, shall not begin before 7:00 a.m.

SECTION 2: ADMINISTRATION

- 2.1 Contract Administrator.** The Engineering and Capital Projects Department is the Contract Administrator for the Contract. The Contractor shall perform the Work under the direction of a designated representative of the Engineering and Capital Projects Department. The City will

communicate with the Contractor on all matters related to the administration of this contract and the Contractor's performance of the Work rendered hereunder. When this contract refers to communications to or with City, those communications shall be with the City, unless the City or this contract specifies otherwise. Further, when this contract requires an act or approval by City, that act or approval will be performed by the City.

- 2.2 Local Office.** The Contractor shall maintain a local office with a competent company representative who can be reached during Normal Working Hours and who is authorized to discuss matters pertaining to this contract with the City. A local office is one located in San Diego County that can be reached by telephone and facsimile. An answering service in conjunction with a company email address for the designated company representative would fulfill this requirement. A mobile telephone shall not fulfill the requirement for a local office.
- 2.3 Emergency Calls.** The Contractor shall have the capability to receive and to respond immediately to calls of an emergency nature. The City shall refer emergency calls to Contractor for immediate disposition. The Contractor shall provide City with a 24 hour emergency telephone number for this purpose.
- 2.4 Staffing.** The Contractor shall furnish sufficient supervisory and working personnel capable of promptly accomplishing on schedule, and to the satisfaction of City, all Work required under this contract.
- 2.5 Contractor Inspections.** The Contractor shall perform inspections of the Work site and prepare and submit to the City a Punchlist and dates of correction. The Punchlist shall include a comprehensive report of Work performed at the Work site to ensure 100% cover.

PART 3: WORK SITE MAINTENANCE

- 3.1 Use of Chemicals.** The Contractor shall submit to City for approval sample labels and MSDS for all chemical herbicides, rodenticides and pesticides proposed for use under this contract. Materials included shall be limited to chemicals approved by the State of California Department of Agriculture.

The use of any chemical shall be based on the recommendations of a licensed pest control advisor. Annual PCA Pesticide Recommendations are required for each pesticide proposed to be used for the Work site covered by this contract. The use of chemicals shall conform to the current San Diego County Department of Agriculture regulations.

No chemical herbicide, rodenticide, or pesticide shall be applied until its use is approved, in writing, by City as appropriate for the purpose and area proposed.

The Contractor shall submit a monthly pesticide use report to City along with Contractor's invoices for payment. This report shall include a statement of all applications of herbicides, rodenticides, and pesticides, detailing the chemical used, undiluted quantity, rate of application, applicator's name, and the date and purpose of the application. For months in which no pesticides are applied, state "No Pesticide Used" on the report.

- 3.2 Irrigation Water.** The Contractor shall diligently practice water conservation, including minimizing run-off or other waste. The Contractor shall turn off irrigation systems, if any, during periods of rainfall and at such other times when suspension of irrigation is desirable to conserve water and to remain within the guidelines of good horticulturally acceptable landscape maintenance practices. The Contractor's failure to properly manage and conserve water may result in deductions or other penalties.

If Contractor causes excessive use or waste of irrigation water, the estimated cost of that water shall be deducted from the monthly payment. Further, any monetary fines or other damages assessed to City for Contractor's failure to follow water conservation regulations imposed by the City, the State of California, the County Water Authority, or other legal entity shall be Contractor's responsibility and may be deducted from the monthly payment.

- 3.3 Payment for Water.** The Contractor shall pay for the water used in the maintenance of the Work site unless specified otherwise.
- 3.4 Satisfactory Progression.** If the Revegetation Area is not progressing towards the required 100% Cover, as defined in the Scope of Work, in accordance with the Work Schedule, as determined by City, City may adjust monthly payments to Contractor accordingly.

SECTION 4: COMPENSATION

- 4.1 Maximum Compensation.** The compensation for this contract shall not exceed \$[the Contractor's lump sum bid amount for this long-term maintenance contract will be established during the award process] [Contract Price].
- 4.2 Wage Rates.** Refer to the Agreement for Prevailing wages requirements for this contract.
- 4.3 Method of Payment and Reports.** The payments will be made monthly as a linear percentage of the Contract Price. As conditions precedent to payment, the Contractor shall submit every month a detailed invoice and report of maintenance work performed. The Contractor's failure to submit the required reports or certified payrolls as described in the Agreement shall constitute a basis for withholding of payment by the City.
- 4.4 Final Payment.** The Contractor shall not receive the final payment until the following conditions have been completed to the City's satisfaction:

The item(s) of the work subject to this maintenance coverage as specified in Exhibit A [Maintenance Items] have been determined to be in compliance with the Agreement and this contract.

The Contractor has provided to the City a signed and notarized Affidavit of Disposal, a copy of which is attached to the Agreement (Attachment C, Specifications, Front End Volume 1), stating that all brush, trash, debris, and surplus materials resulting from the Work have been disposed of in a legal manner.

The Contractor has performed comprehensive and successful testing and checks of the Maintenance Items.

- 4.5** Notwithstanding sections 3.3 and 3.4, the Contractor may request that the City pay all or some of the compensation for the Contract at a time earlier than provided in those sections if the Contractor provides a surety bond acceptable to the City which secures performance of the Contract for the full remaining term. Early payment under this section and acceptability of such bond shall be at the City's sole discretion.

SECTION 5: BONDS AND INSURANCE

- 5.1 Contract Bonds.** Prior to commencement of the Work, Contractor, at its sole cost and expense, shall provide to City the following bonds issued by a surety authorized to issue bonds in California and otherwise satisfactory to City:

A Payment Bond (Material and Labor Bond) in an amount not less than the Contract Price, to satisfy claims of material suppliers and mechanics and laborers employed by it on the Work. The Payment Bond shall be maintained by the Contractor in full force and effect until the Work is accepted by City and until all claims for materials and labor are paid, and shall otherwise comply with the California Civil Code.

A Performance Bond in an amount not less than the Contract Price to guarantee faithful performance of all Work, within the time prescribed, in a manner satisfactory to the City, and that all materials and workmanship will be free from original or developed defects. The Performance Bond shall remain in full force and effect until performance of the Work is completed as set forth in this contract.

- 5.2 Insurance.** At all times during the term of this contract, the Contractor shall maintain insurance coverage as specified in the Agreement, Section 7-3, "LIABILITY INSURANCE."

The Contractor shall not begin the Work under this contract until it has complied with the following:

- a) Obtain insurance certificates reflecting evidence of insurance as specified in the Agreement, Section 7-3, "LIABILITY INSURANCE" for:
 1. Commercial General Liability
 2. Commercial Automobile Liability
 3. Worker's Compensation

The Contractor shall submit copies of any policy upon request by the City.

- b) Confirm that all policies contain the specific provisions required in Section 7-3, "LIABILITY INSURANCE."

The Contractor shall not modify any policy or endorsement thereto which increases the City's exposure to loss for the duration of this contract.

SECTION 6: SPECIAL PROVISIONS

- 6.1 Illness and Injury Prevention Program.** The Contractor shall comply with all the mandates of Senate Bill 198 and specifically shall have a written Injury Prevention Program on file with the City in accordance with all applicable standards, orders, or requirements of California Labor Code, Section 6401.7. This Program shall be on file prior to performance of any Work.
- 6.2 Drug-Free Workplace.** The Contractor agrees to comply with the City's Drug-Free Workplace requirements set forth in Council Policy 100-17, adopted by Council Resolution No. R-277952 and incorporated into this contract by this reference. The Contractor has certified to the City that it will provide a drug-free workplace by submitting a Certification for a Drug-Free Workplace form.

- a) **Contractor’s Notice to Employees.** The Contractor shall publish a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the work place, and specifying the actions that will be taken against employees for violations of the prohibition.
- b) **Drug-Free Awareness Program.** The Contractor shall establish a drug-free awareness program to inform employees about all of the following:
 - 1. The dangers of drug abuse in the work place.
 - 2. The policy of maintaining a drug-free work place.
 - 3. Available drug counseling, rehabilitation, and employee assistance programs.
 - 4. The penalties that may be imposed upon employees for drug abuse violations.
 - 5. Posting the Statement. The Contractor shall post the drug-free policy in a prominent place.
 - 6. Subcontractor’s Contracts. The Contractor further certifies that each contract for Subcontractor Services for this contract shall contain language that binds the Subcontractor to comply with the provisions of Section 7.1 of this contract, as required by Sections 2.A.(1) through (3) of Council Policy 100-17. The Contractors and Subcontractors shall be individually responsible for their own drug-free work place program.
 - 7. Program Requirements Satisfaction. The requirements of a drug-free awareness program can be satisfied by periodic “tailgate sessions” covering the various aspects of drug-abuse education. Although an in-house employee assistance program is not required, the Contractor shall be expected to provide a listing of drug rehabilitation and counseling programs available in the community at large.

6.3 Americans with Disabilities Act. The Contractor is responsible as an employer, contractor, and the City representative to comply with all portions of Title 24 and the ADA. (For specific services and public accommodations, the Contractor may contact the Office of the Americans with Disabilities Act, Civil Rights Division, U.S. Department of Justice, P.O. Box 66118, Washington, D.C. 20035-6118; phone number (202) 514-0301.)

The Contractor acknowledges and agrees that it is aware of and will comply with Council Policy 100-04, incorporated herein by this reference, adopted by Resolution No. R-282153, relating to the federal mandated ADA. The policy applies equally to the Contractor and all Subcontractors.

The Contractor shall include in each subcontract agreement language which requires Subcontractor to abide by these provisions. The Contractor and all Subcontractors shall be individually responsible for administering their own ADA and Title 24 program.

6.4 Taxpayer Identification Number. I.R.S. regulations require the City to have the correct name, address, and Taxpayer Identification Number (TIN) or Social Security Number (SSN) on file for businesses or persons who provide services or products to the City. This information is necessary to complete Form 1099 at the end of each tax year. As such, the Contractor shall provide the City with a Form W-9 upon execution of this contract.

SECTION 7: GENERAL PROVISIONS

- 7.1 Assignment.** The Contractor shall not assign the obligations under this contract, whether by express assignment or by sale of the company, nor any monies due or to become due, without City's prior written approval. Any assignment in violation of this Section shall constitute a Default and is grounds for immediate termination of this contract, at the sole discretion of City. In no event shall any putative assignment create a contractual relationship between City and any putative assignee.
- 7.2 Independent Contractors.** The Contractor and any Subcontractors employed by Contractor shall be independent contractors and not agents of City. Any provisions of this contract that may appear to give City any right to direct Contractor concerning the details of performing the Work, or to exercise any control over such performance, shall mean only that Contractor shall follow the direction of City concerning the end results of the performance.
- 7.3 Covenants and Conditions.** All provisions of this contract expressed as either covenants or conditions on the part of the City or the Contractor shall be deemed to be both covenants and conditions.
- 7.4 Jurisdiction, Venue, and Attorney's Fees.** The venue for any suit or proceeding concerning this contract, the interpretation or application of any of its terms, or any related disputes shall be in the County of San Diego, State of California. The prevailing Party in any such suit or proceeding shall be entitled to a reasonable award of attorney's fees in addition to any other award made in such suit or proceeding.
- 7.5 Successors in Interest.** This Contract and all rights and obligations created by this contract shall be in force and effect whether or not any Parties to the Contract have been succeeded by another entity, and all rights and obligations created by this contract shall be vested and binding on any Party's successor in interest.
- 7.6 Integration.** This Contract and the exhibits, attachments, and references incorporated into this contract fully express all understandings of the Parties concerning the matters covered in this contract. No change, alteration, or modification of the terms or conditions of this contract, and no verbal understanding of the Parties, their officers, agents, or employees shall be valid unless made in the form of a written change agreed to in writing by both Parties or an amendment to this contract agreed to by both Parties. All prior negotiations and agreements are merged into this contract.
- 7.7 Counterparts.** This Contract may be executed in counterparts, which when taken together shall constitute a single signed original as though all Parties had executed the same page.
- 7.8 No Waiver.** No failure of either the City or the Contractor to insist upon the strict performance by the other of any covenant, term or condition of this contract, nor any failure to exercise any right or remedy consequent upon a breach of any covenant, term, or condition of this contract, shall constitute a waiver of any such breach or of such covenant, term or condition. No waiver of any breach shall affect or alter this contract, and each and every covenant, condition, and term hereof shall continue in full force and effect to any existing or subsequent breach.
- 7.9 Severability.** The unenforceability, invalidity, or illegality of any provision of this contract shall not render any other provision of this contract unenforceable, invalid, or illegal.

- 7.10 Drafting Ambiguities.** The Parties agree that they are aware that they have the right to be advised by counsel with respect to the negotiations, terms and conditions of this contract, and the decision of whether to seek advice of counsel with respect to this contract is a decision which is the sole responsibility of each Party. This Contract shall not be construed in favor of or against either Party by reason of the extent to which each Party participated in the drafting of the Contract.
- 7.11 Signing Authority.** The representative for each Party signing on behalf of a corporation, partnership, joint venture or governmental entity hereby declares that authority has been obtained to sign on behalf of the corporation, partnership, joint venture, or entity and agrees to hold the other Party or Parties hereto harmless if it is later determined that such authority does not exist.

Project Manager: To ensure that all signatures and at least one section of contract appear on the same page.

IN WITNESS WHEREOF, this Contract is executed by the City of San Diego, acting by and through its Public Works Department Director in accordance with Resolution No. R-**[*insert number of Resolution authorizing advertising and award of underlying construction contract*]**, and by Contractor.

Dated this _____ day of _____, **[insert year]**.

THE CITY OF SAN DIEGO

By: _____

Mayor or designee

I HEREBY CERTIFY I can legally bind **[name of Contractor to be determined during RFP award process]** and that I have read this entire contract, this _____ day of _____, **[insert year]**.

By: _____

Printed Name: _____

Title: _____

I HEREBY APPROVE the form and legality of the foregoing Contract this _____ day of _____, **[*insert year*]**.

Jan I. Goldsmith, City Attorney

By: _____

Printed Name: _____

Deputy City Attorney

EXHIBIT A

SCOPE OF WORK

I. Location of Work. The location of the Work to be performed [Revegetation Area] is shown on those Specifications and Drawings numbered [36196-31-D] through [36196-39-D] [Specifications], which are incorporated into this contract by this reference as though fully set forth herein.

II. Description of Work. The Contractor shall maintain and monitor the Revegetation Area during the Monitoring Program in accordance with this contract and the Specifications such that the Revegetation Area meets the success criteria specified in the Revegetation Plan at each of the milestones listed and on the last date of the Monitoring Program as set forth in the Work Schedule. The Work includes complete landscape maintenance consisting of irrigation, pruning, shaping and training of trees, shrubs, and ground cover plants; fertilization; weed control; control of all plant diseases and pests; and trash removal, and all other maintenance listed in this contract and as required to maintain the Revegetation Area in a safe, attractive and useable condition and to maintain the plant material in good ecologically healthy and viable condition.

The work does not include biological monitoring of the Revegetation Area according to the schedule and methods specified in the Revegetation Plan. The City will hire the Project Biologist.

III. Method of Performing Work.

A. Irrigation. Irrigation shall be applied to container and salvaged plants at the discretion of the Project Biologist. Delivery techniques and schedules will vary depending on the availability of a sprinkler irrigation system and weather patterns. Timing of implementation is intended to use natural precipitation, but supplemental watering shall be applied when needed. Failure of the irrigation system to provide full and proper coverage shall not relieve Contractor of the responsibility to provide adequate irrigation with full and proper coverage to all areas.

1. In areas where an automatic sprinkler system is installed, Contractor shall periodically inspect the operation of the system for any malfunction. The maximum interval between inspections shall not exceed seven (7) days. The Contractor shall maintain all sprinkler systems in such a way as to guarantee sufficient coverage and full working capability, and shall make whatever adjustments may be necessary to prevent excessive run-off into streets, rights-of-way, or other areas not meant to be irrigated. The cost of wasted water may be charged to Contractor.

2. All areas not adequately covered by a sprinkler system shall be irrigated by a portable irrigation method. The Contractor shall furnish all hoses, nozzles, sprinklers, etc. necessary to accomplish this supplementary irrigation. Care shall be exercised to prevent water waste, erosion, and/or detrimental seepage into existing underground improvements or structures.

3. Irrigation shall be accomplished as follows:

a) Turf (if any) shall be irrigated Monday through Friday, as required, to maintain horticulturally acceptable growth and color, and to encourage deep rooting. Daily watering should be avoided wherever possible, in favor of scheduling applications every other night or twice each week. Additional irrigations shall be performed in the event of unusually hot/dry weather conditions (as are present

during Santa Ana conditions, or other times of low humidity or high winds, or during a prolonged high temperature period during summer months).

- b) Landscaped improved banks and slopes (if any) shall be irrigated Monday through Friday as required to maintain horticulturally acceptable growth and color, and to encourage deep rooting.
 - c) Shrub beds (if any) shall be irrigated as required to maintain horticulturally acceptable growth and color, and to promote deep rooting. Shrub areas shall be irrigated at a rate which keeps surface runoff to a minimum. The irrigation rate shall be adjusted to the needs of shrub types, seasons and weather conditions.
 - d) Planted and seeded areas shall be irrigated as required to maintain ecologically acceptable growth, form and health, and to promote deep rooting. Planted and seeded areas shall be irrigated at a rate which keeps surface runoff to a minimum. The irrigation rate shall be adjusted to the needs of plant types, seasons and weather conditions.
4. Maintenance of Irrigation System. The Contractor shall keep controller and valve boxes (if any) clear of soil and debris and shall maintain the irrigation system at no additional cost to City, including replacement, repair, adjustment, raising or lowering, straightening and any other operation required for the continued proper operation of the system from the “cold” side of the water meter throughout the Revegetation Area. The Contractor shall also be responsible for maintaining the painted surfaces of irrigation and lighting controller cabinets as well as the corresponding automatic irrigation battery numbers on the lids of the automatic control valve boxes (if any). The Contractor shall be responsible for light bulb replacements in controller cabinets as necessary.
- a) Repair or replacement includes: sprinkler system laterals (piping), sprinkler mains (pressure lines), vacuum breakers, sprinkler control valves, sprinkler controllers, sprinkler heads, sprinkler caps, sprinkler head risers, valve covers, boxes and lids (including electrical pull boxes and lids), valve sleeves and lids, quick coupler valves and hose bibs. Any replacement shall conform to the type and kind of existing system. Any deviation shall be approved in writing by City.
 - b) Contractor shall repair irrigation systems which are damaged or altered in any way, including by acts of God, vandalism, vehicular damage, or theft.
5. Operation of Automatic Irrigation Controllers. Where the operation of automatic irrigation controllers is required as part of this contract, Contractor shall: i) Not duplicate any coded City key furnished by City for access and operation of the controller; ii) surrender all keys furnished by City, promptly at the end of the Contract term, or at any time deemed necessary by City to prevent serious loss to City; iii) protect the security of City’s property by keeping controller cabinet and building doors locked at all times; and iv) refrain from using premises behind locked doors for storage of materials, supplies, or tools except as approved by City.
- B. Pruning Shrubs and Ground Cover Plants.] Contractor shall prune all shrubs and ground cover plants growing in the Revegetation Area as required to: i) maintain plants in a healthy, growing condition; ii) maintain plant growth within reasonable bounds; iii) prevent encroachment of passage ways, walks, streets, or view of signs; and iv) prevent encroachment in any manner deemed objectionable by City.

The Contractor shall remove dead or damaged limbs with sharp pruning tools, with no stubs remaining. The Contractor shall seal any pruning cut which exceeds two inches in diameter with an approved pruning paint when required by City. The Contractor shall perform pruning to permit plants to grow naturally in accordance with their normal growth characteristics except where box hedging is required by City. The Contractor shall not shear, hedge, or severely prune plants, unless authorized by City. The Contractor shall not use growth regulators.

- C. Tree Maintenance. Contractor shall maintain all trees in the revegetation area in their natural shapes. The Contractor shall perform pruning to promote the best growth habits, appearance, and health of the tree, and to prevent encroachment which blocks vision or is in any manner deemed undesirable by City. The Contractor is responsible for tree pruning that can be accomplished with a 12' pole saw by a worker standing on the ground. The Contractor shall not top trees.
1. Potential Hazards. The Contractor shall notify City within 24 hours of any tree that shows signs of root heaving or leaning, or is in any manner a potential safety hazard. The Contractor shall immediately reestablish trees and shrubs that are uprooted due to storms, if possible. If trees or shrubs cannot be reestablished, Contractor shall remove them immediately (including roots) and fill the holes until replacement planting is complete.
 2. Replacement. The Contractor shall completely remove and replace trees lost due to Contractor's faulty maintenance or negligence, as determined by City. The Contractor shall replace trees in kind and size as determined by City. If there is a difference in value between the tree lost and the replacement tree, City will deduct the difference from the Contract payment. The City shall determine the value of the tree lost using the latest International Society of Arboriculture (I.S.A.) guidelines for value determination.
 3. Staking. The Contractor shall securely stake any newly planted trees and other trees needing support with 2 "lodge pole" type stakes placed on opposite sides of the tree outside the root ball and secured to the tree with at least two flexible rubber tree ties. The Contractor shall regularly inspect tree ties and stakes and reposition them as necessary to ensure against girdling and abrasion.
- D. Fertilization. Contractor shall fertilize the Revegetation Area as necessary to meet the success criteria specified in the Revegetation Plan at each of the milestones listed and on the last date of the Monitoring Program as set forth in the Work Schedule Prior to any fertilization, Contractor shall submit to City Material Safety Data Sheets and a schedule of application showing the site, date, and approximate time of fertilizer application [Fertilizer Schedule]. The Fertilization Schedule, regardless of its intensity, timing, or the number of sites covered daily or weekly, shall not excuse Contractor from performing any other Work regularly required under this contract. All fertilization shall first be approved by the Project Biologist.
1. Contractor shall notify City at least forty-eight (48) hours before beginning any fertilization. Fertilizer shall be delivered to the site only in the original unopened containers bearing the manufacturer's guaranteed analysis. Damaged packages shall not be accepted. The Contractor shall furnish City with duplicate signed, legible copies of all certificates and invoices for all fertilizer to be used for this contract. The invoices shall state the grade, amount and quantity received. Both the copy to be retained by City and Contractor's copy shall be signed by City, on site, before any fertilizer may be used.

2. Fertilizers, if necessary, shall be applied at the direction of the Project Biologist and according to manufacturer's product specifications.
 3. If deemed necessary by City to achieve required results, Contractor shall apply other materials as directed by City, including i) iron chelate; ii) soil sulfur; iii) gypsum; or iv) surfactant enzymes such as Sarvon or Naiad.
 4. Contractor shall adequately irrigate the fertilized area(s) immediately following the application of fertilizers and/or amendments to force fertilizer material to rest directly on the soil surface. Drip irrigated areas shall be adequately hand watered using quick coupler valves and hoses to dissolve fertilizer.
- E. Weed Removal. Contractor shall completely remove weeds from the Revegetation Area, including all turf grass areas, shrub and ground cover areas, planters, tree wells, and cracks in paved areas, including sidewalks, parking lot, gutters and curbs, as shown on the Work Schedule. For the purposes of this Section, "Weed" means any undesirable or misplaced plant. The Contractor shall control Weeds by manual, mechanical, or chemical methods. The City or Project Biologist may restrict the use of chemical weed control in certain areas.
- F. Disease and Pest Control. The Contractor shall regularly inspect the Revegetation Area for the presence of disease and insect or rodent infestation. The Contractor shall notify City within four (4) days if disease or insect or rodent infestation is discovered. In its notice to City, Contractor shall identify the disease, insect, or rodent and specify the control measures to be taken. Upon approval of City, Contractor shall implement the approved control measures, exercising extreme caution in the application of all sprays, dusts, or other materials utilized. The Contractor shall continue the approved control measures until the disease, insect, or rodent is controlled to the satisfaction of City.
1. All individuals who supervise the mixing and application of herbicides, pesticides, and rodenticides on behalf of Contractor shall possess valid Qualified Applicators Certificate for Category B issued to them by the State Department of Food and Agriculture.
 2. Contractor shall utilize all safeguards necessary during disease, insect or rodent control operations to ensure safety of the public and the employees of Contractor, in accordance with current standard practices accepted by the State of California Department of Food and Agriculture. If Contractor is unable to control the pest or disease, a pest control company will be hired and the cost shall be deducted from Contractor's monthly payment.
- G. Plant Replacement. Except as provided in Section H below, Contractor shall notify City within four (4) days of the loss of plant material due to any cause.
1. Contractor shall at no cost to City replace any tree, shrub, ground cover, or other plant which is damaged or lost as a result of Contractor's faulty maintenance or negligence. The size and species of replacement plant materials shall be as directed by City.
 2. If so directed by City, Contractor shall replace any plant damaged or lost that is not a result of Contractor's faulty maintenance or negligence. The size and species of replacement plant materials shall be as directed by City. The City will pay for materials and labor.

3. City may determine that certain plants should be replaced in order to ensure maximum ecological health and overall aesthetic appearance of planting in the Revegetation Area. When City determines such replacement should occur, Contractor shall replace the plants as directed by City. City will pay for materials and labor.
- H. Damage Reports. The Contractor shall notify City within 24 hours of any damage to the Work Area caused by accident, vandalism or theft.
- I. Litter. The Contractor shall promptly dispose of all trash and debris at an appropriate City disposal site. The Contractor shall pay any and all fees associated with the disposal of debris or trash accumulated under the terms of this contract. The Contractor understands that disposal of refuse at City landfills is subject to a fee and that the Refuse Disposal Division can be contacted at (619) 573-1418 for fee information.
1. Contractor Generated Litter. The Contractor shall promptly remove all debris generated by Contractor's pruning, trimming, weeding, edging and other Work required by this contract. Immediately after working in streets, park walks, gutters, driveways, and paved areas, Contractor shall clean them in accordance with all applicable laws.
 2. Third Party Generated Litter. Upon discovery Contractor shall remove all litter, including bottles, glass, cans, paper, cardboard, fecal matter, leaves, branches, metallic items, and other debris, from the Work site.
- J. Monitoring: The Project Biologist (City employed) will oversee all maintenance operations and conduct qualitative and quantitative biological monitoring of the revegetation area according to the schedule and methods described in the Revegetation Plan. The Project Biologist will be responsible for preparing and submitting monitoring reports according to the schedule and instructions in the Revegetation Plan.

EXHIBIT B

FIELD NOTIFICATION

[Inset a copy of the Engineer's Field Notification which establishes the commencement date of the monitoring program, see City Supplement, section 800-2.12]

EXHIBIT C
LICENSE DATA SHEET

State Contractor License Classification and Number: _____

Name of License Holder: _____

Expiration Date: _____

Pest Control Applicator's Name: _____

License Number: _____

Expiration Date: _____

Pest Control Advisor's Name: _____

License Number: _____

Expiration Date: _____

City of San Diego Business License Number: _____

Expiration Date: _____

City of San Diego



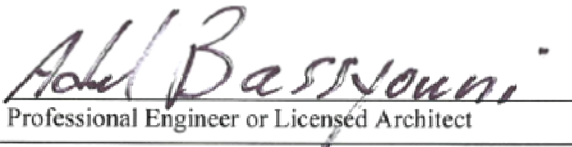
ADDENDUM "A"

FOR

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

BID NO.: _____ **K-12-5525-DBB-C**
SAP NO. (WBS/IO/CC): _____ **S-00308**
CLIENT DEPARTMENT: _____ **2011**
COUNCIL DISTRICT: _____ **1**
PROJECT TYPE: _____ **BP**

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


Professional Engineer or Licensed Architect

Seal:



A. CHANGES TO THE BID SUBMITTAL DUE DATE AND TIME

The bid opening date for this project has been extended to **2:00 PM on FEBRUARY 1, 2012.**

Proposals will be received at the Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California

B. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. All prospective bidders are reminded that they are required to acknowledge receipt of this addendum and all other addenda previously issued in their submittal. Failure to do so will result in the Bid to be deemed non-responsive.

C. BIDDER's QUESTIONS:

- Q1. I noticed that you call out a stipulated lump sum for bid item number three (3), yet it is blank. Why is it blank if it's designated as a stipulated lump sum?
- A1. Use the attached new bid schedule with a stipulated \$50,000.00 lump sum for Bid item number (3).
- Q2. Would the installation of multiple (\geq two) generator units be an acceptable substitution for the proposed single 350kW gaseous generator unit?
- A2. No, as there is insufficient space at the station for multiple units.
- Q3. What conditions have the Rancho De Los Penasquitos Planning Board placed upon the project?
- A3. The portion of the force main and sewer main near the school (station 54+00 to station 78+37.54 shall be constructed between June 07, 2012 and August 24, 2012. The driveway at station 62 (from the cul de sac on Paymogo) shall be removed and curb and gutter installed once the flow from station 62 has been transferred to station 84. Once the revegetation maintenance period has been completed, install two large (\geq 3.0 feet in diameter) decorative boulders to prevent traffic from attempting to go north on the ten-foot wide decomposed granite trail.
- Q4. Are the San Diego Gas and Electric (SDG&E) project numbers on sheet number 78 (drawing 84-E-1) under UTILITY COMPANY and on sheet number 79 (drawing 84-E-2) under NOTE number one (1) correct? Also, what are the SDG&E gas service project numbers?
- A4. Replace the electrical service SDG&E project number listed on sheet number 78 (drawing 84-E-1) under UTILITY COMPANY and on sheet number 79 (drawing 84-E-2) under NOTE number one (1) with 151408-020 and 151408-090. The gas service SDG&E project numbers are 151408-030 and 151408-040.
- Q5. Is there any reason to believe we may encounter asbestos or lead-based paint at station 84?
- A5. The City is not aware of any reasons.
- Q6. Did you find any asbestos or lead-based paint at station 62?
- A6. There was no asbestos found and the only lead-based paint found is on the small fire hydrant at the site. This will be stabilized by the City of San Diego prior to demolition through encapsulation. The value found was 0.9 mg/cmⁿ where n = 2.
- Q7. Where do you want the two generators relocated to?
- A7. The MOC complex in Kearny Mesa, which is located at 9150 Topaz Way, San Diego. Staff will determine exact location for placement.

- Q8. Can you share the pertinent San Diego Gas & Electric (SDG&E) communications with regards to the upgraded electrical and natural gas services at station 84 and the demo at station 62?
- A8. Refer to the attached documents, Pages 8 of 28 through 27 of 28 of this addendum.
- Q9. When is the ABSOLUTE last date for beneficial use of station 84?
- A9. June 30, 2013.
- Q10. Are unit-responsibility requirements applicable under this contract?
- A10. Yes. The form is in section 01999.
- Q11. What will be the frequency of the periodic construction progress meetings? Meetings such as this foster a pro-active partnering relationship and help in preventing potential future problems and issues from becoming problems and issues. They also assist in terms of maximizing potential for project success and project award procurement.
- A11. Refer to section 01039 – Coordination and Meetings with regards to meetings.
- Q12. Where can I find Project Master Record Document requirements?
- A12. Refer to Section 01050 – Field Engineering.
- Q13. Where is quality control addressed and is a Project Quality Control Plan required?
- A13. Quality control is addressed in Section 01400 – Quality Control and the Project. Quality Control Plan is addressed in Article 1.2.
- Q14. When are the submittals due for the new generator at station 84?
- A14. Refer to Section 2-5.3 Submittals.
- Q15. Are post-contractual award substitutions (“or equals”) allowed?
- A15. No.
- Q16. Can you share the Storm Water Pollution Prevention Division’s review?
- A16. See attached Storm Water Pollution Control information, page 28 of 28 of this Addendum. Pay particular attention to the inlet stamping requirement.

D. VOLUME 1

- D.1 To Contract Documents, **ADD** “SDG&E information and Storm Water Pollution Control Information”, Pages 8 of 28 through 28 of 28 of this Addendum.

E. VOLUME 2

E.1 To Bidding Documents, PROPOSAL (BID), Pages 10 through 12, **DELETE** in their entirety and **SUBSTITUTE** with Pages 5 of 28 through 7 of 28 of this Addendum.

F. PLANS

F.1 To Drawing number 36196-78-D, Utility Company, **DELETE** “151408-010” in its entirety and **SUBSTITUTE** with “151408-020”.

F.2 To Drawing number 36196-79-D, NOTES, **DELETE** “151408-010” in its entirety and **SUBSTITUE** with “151408-090”.

Tony Heinrichs, Director
Public Works Department

Dated: *December 29, 2011*
San Diego, California

TH/ca/ds/nb/egz

BIDDING DOCUMENTS

PROPOSAL (BID)

The Bidder agrees to the construction of **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**, 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 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	237110	01025	General Construction	 	\$
2.	1	LS	237110	01025	Sheeting, Shoring and Bracing	 	\$
3.	1	LS	237110	01025	Final Approval of Operation & Maintenance Manuals (or Owner's Manuals) and Master Record Documents (Stipulated Lump Sum)	 	\$50,000.00
4.	1	LS	541330	801-9.4	Water Pollution Control Program Development	 	\$
5.	1	LS	237990	801-9.4	Water Pollution Control Program Implementation	 	\$
6.	1	LS	237110	2-4.1	Bonds (Payment and Performance)	 	\$
7.	1	AL	237110	9-3.5	Field Orders	 	\$500,000.00
ESTIMATED TOTAL BASE BID:							\$

TOTAL BID PRICE FOR BID (Items 1 through 7 inclusive) amount written in words:

BIDDING DOCUMENTS

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: _____

BIDDING DOCUMENTS

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 shall 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. The Bid shall contain an acknowledgment of receipt of all addenda, the numbers of which shall be filled in on the Bid form. The following addenda have been received and are acknowledged in this bid: [.....]. If an addendum or addenda has been issued by the City and not noted above as being received by the Bidder, this proposal shall be rejected as being **non-responsive**.



ELECTRIC UNDERGROUND METER & SERVICE LOCATION

Customer Copy

A Sempra Energy utility™

T.B. 1169-G5

Date Prepared: 11/14/2011

Wanted Date: **On trench & City inspection** Service Type: **UG Service Rewire/Relocation**

Project No: 151408	Job No: 090
Project Title: CITY OF SD PUMP STN #84 - ELECTRIC SVC RELOC	
Project Address: 15706 CAMINO CRISALIDA B	
Project City: SAN DIEGO	Customer Phone #: 619-533-4660
Contact: ROLF LEE	Contact Phone #: 619-533-4660

Traffic Control Permit Required. Excavation/Encroachment Permits Required By **Customer**

Service Attachment Point and/or Meter Location:

Existing 3-inch service to be re-routed to new 3-phase transformer D211387/932-441 installed on 151408-010. Customer is to provide all excavation, trench, one 3-inch conduit, backfill, compaction, 3/4" pulling and measuring tape in conduit and surface repair from transformer to intercept existing 3-inch conduit. Take conduit to within distance as instructed by SDG&E inspector. Customer to pull all necessary permits from the City. Meter and equipment will not be changed.

SDG&E Application Required - Call:

Municipal Inspection Required By **City of San Diego**

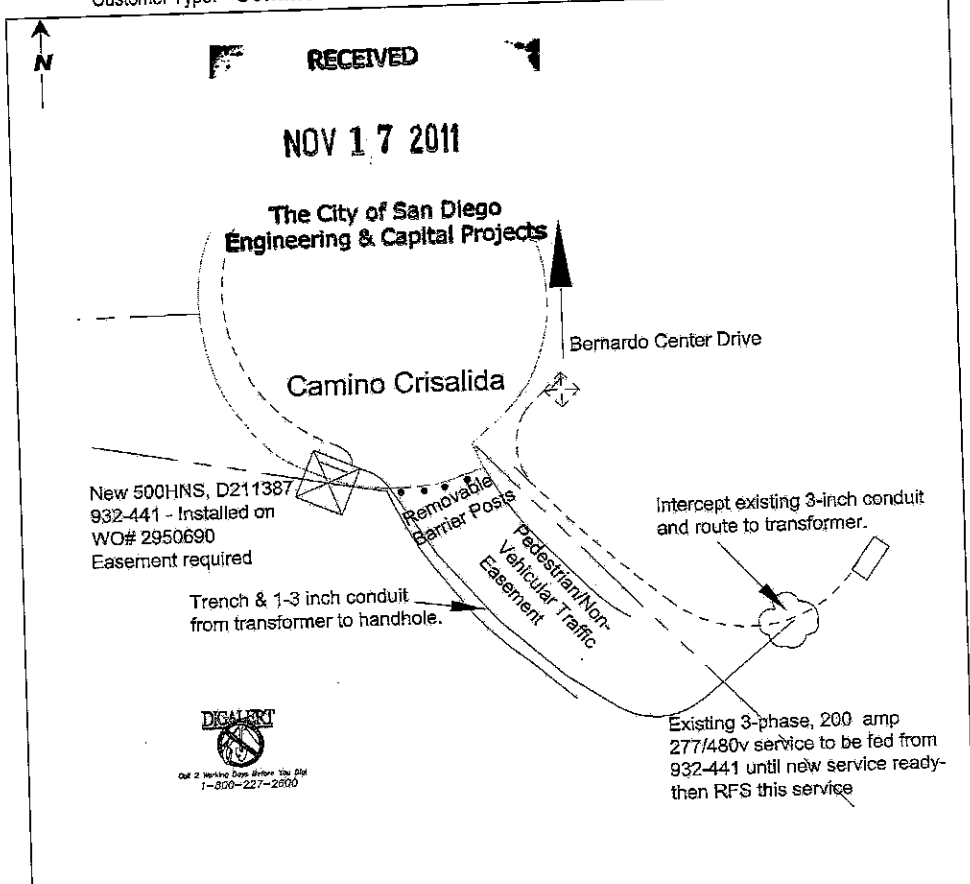
Meter height - 4'0" min. (3'0" min. for multiple meter installation) - 6'3" max. From finish grade to centerline of meter base. Meters are required to be readily accessible 24 hours per day. Meters must be located in a safe area free of any potentially hazardous or dangerous condition. Provide 3-ft. 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.

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 **760-432-5805** 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: 932-441	Structure Number: D211387
Joint Trench with: Electric Only	Handhole Installed by: CUSTOMER
Standards Page #: 3313	Handhole Lid Shall Read: ELECTRIC
Ladder Arms:	Stop Trench: from pole
Bend Installed by: SDG&E	Type: Transformer 3" 90 Deg 36"R DB60
Conduit Installed by: Customer	Conduit Size: 1 - DB 3"
Service Panel Rating: 400	Number/Size of Main Switch: 1 @ 400 amp
Voltage: 277/480	
# of Wires: 4 Phase: Three Utilities Maximum Contribution to Fault Current 30000 Amps	
Metering: CT	Meter Clips: 15
Temp Service Charge Due on First Bill \$	

Customer Type: **Commercial**



Additional Information: Right-of-way Required Assessor's Parcel Number:
Please call your Operations Assistant at 760-432-5805 with questions about 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.

Planner: **AMY E HAYASHI** Telephone: **760-480-7647**



ELECTRIC UNDERGROUND METER & SERVICE LOCATION

Customer Copy

A Semptra Energy utility

T.B. 1169-G5

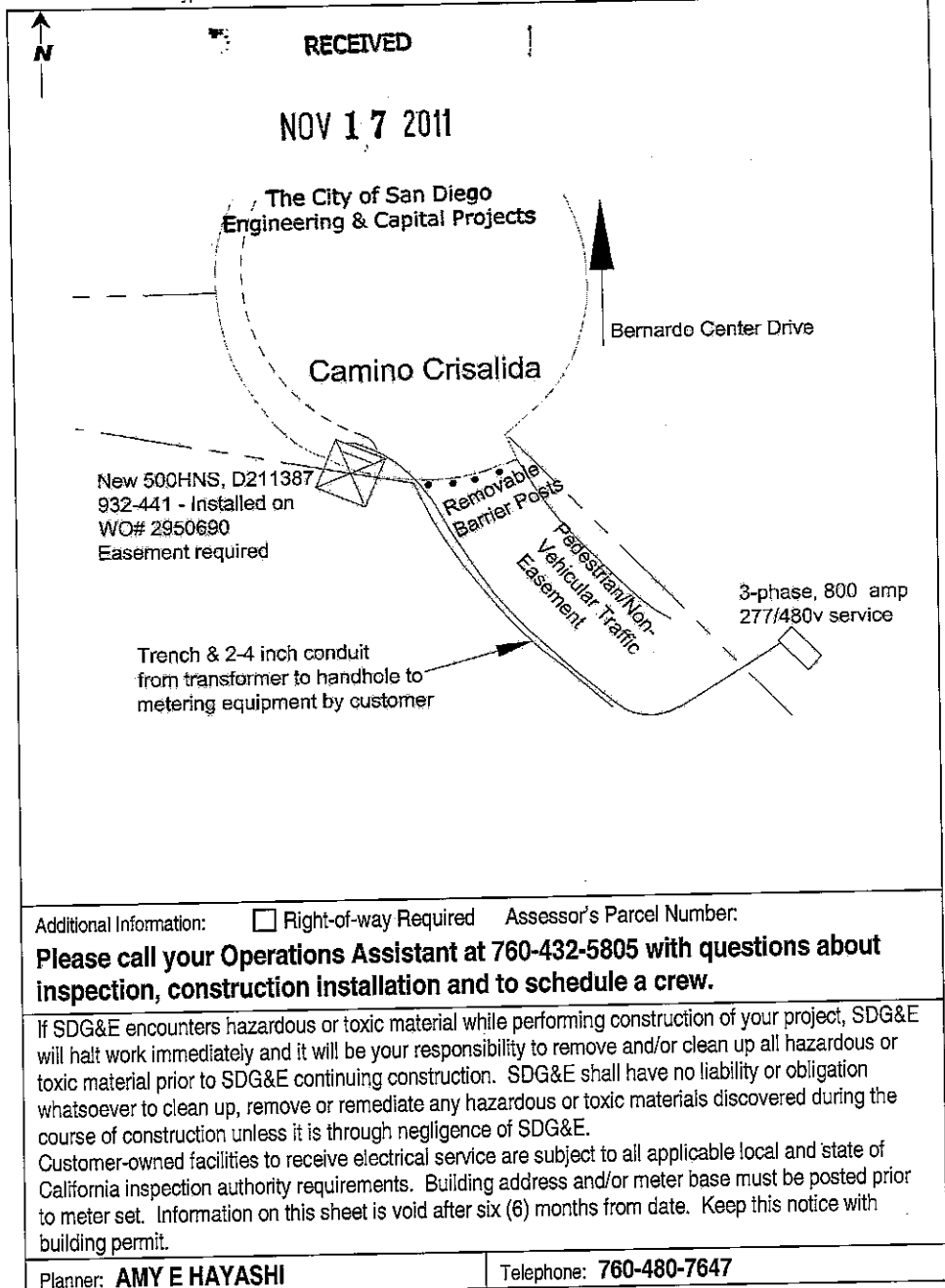
Wanted Date: **On Trench & City Inspection**

Service Type: **UG Service New**

Customer Type: **Commercial**

Date Prepared: **11/14/2011**

Project No: 151408	Job No: 020	
Project Title: CITY OF SD PUMP STN #84 - ELECTRIC SERVICE		
Project Address: 15706 CAMINO CRISALIDA #B		
Project City: SAN DIEGO	Customer Phone #: 619-533-4660	
Contact: ROLF LEE	Contact Phone #: 619-533-4660	
<input type="checkbox"/> Traffic Control Permit Required. Excavation/Encroachment Permits Required By Customer		
Service Attachment Point and/or Meter Location: Locate new 800 amp panel at new NEMA 3R equipment. Customer is to provide all excavation, trench, 2-4 inch conduit, backfill, compaction, 3/4" pulling and measuring tape in conduit and surface repair from transformer D211387 to new meter panel. Take conduit to within distance as instructed by SDG&E inspector. Customer to pull all necessary permits from the City of San Diego. Upon completion of work, contact the City inspector for final release on metering equipment.		
<input type="checkbox"/> SDG&E Application Required -- Call:		
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.		
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 760-432-5805 for the following: <ul style="list-style-type: none"> • 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: 932-441	Structure Number: D211387	
Joint Trench with: Electric Only	Handhole Installed by:	
Standards Page #:	Handhole Lid Shall Read:	
Ladder Arms:	Stop Trench: from pole	Riser Quad:
Bend Installed by: SDG&E	Type: Transformer 4" 90 Deg 36"R DB100	
Conduit Installed by: Customer		Conduit Size: 2 - DB 4"
Service Panel Rating: 800	Number/Size of Main Switch: 1 @ 800 amp	Voltage: 277/480
# of Wires: 4	Phase: Three	Utilities Maximum Contribution to Fault Current 30000 Amps
Metering: CT	Meter Clips: 15	
Temp Service Charge Due on First Bill \$		





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The City of San Diego
Engineering & Capital Projects

Notification of Emergency/Standby Generator Installation

Dear Valued Customer,

San Diego Gas & Electric Company (SDG&E) thanks you in advance for taking the time to provide us with information regarding your emergency/standby generator installation. The information you provide us will serve two important functions:

- 1) It will provide SDG&E with the generator installation notification required by the California State Health and Safety Code, and
- 2) It will allow SDG&E's Electric Distribution Engineering personnel to check for *apparent* design attributes that could allow the generator to inadvertently connect with and back-feed the SDG&E electrical grid. Such an occurrence, if not properly designed for, could create a serious safety hazard for utility and customer personnel, and may result in substantial damage to utility and customer equipment and facilities. This review is performed at no cost to the customer.

Applicable installations are those that:

- 1) Supply electrical power to emergency and standby loads only during utility power outages, and
- 2) are permanently or temporarily connected to a customer's electrical system, which is normally supplied electricity by SDG&E, and
- 3) are not intended to become electrically interconnected with the SDG&E electrical grid.

The following equipment and installations are not covered by this document:

- 1) Small, portable electrical generators that provide power to individual, isolated appliances or equipment via integrally-mounted receptacles.
- 2) Permanently installed generators dedicated to isolated loads, with no physical connections to the customer facility's electrical system or SDG&E's electrical grid.
- 3) Generators that can become interconnected to, and operate in parallel with, the SDG&E electrical grid, regardless of application. For those installations, a Generating Facility Interconnection Application must be submitted, and an Interconnection Agreement must be signed, before connection will be allowed (per CPUC Rule 21). There is a fee required with the application. Refer to www.sdge.com/business/interconnection.shtml for more information.

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The notification process is as follows:

- 1) Complete the attached notification form(s) and provide the requested documentation. Mail to:

Steve Abeyta
San Diego Gas & Electric Company
8316 Century Park Court, CP52F
San Diego, CA 92123-1582

- 2) SDG&E will review the notification package and advise the submitter of any missing information or corrections required.
- 3) After SDG&E review, the submitter will be notified of any areas of concern discovered, and will receive instructions on how to request SDG&E inspection after project installation.

The SDG&E Service Standards & Guide, Section 800, entitled Self Generation, describes installation requirements for backup generators and other types of self-generation facilities. This document should be reviewed prior to designing and installing a backup generator in SDG&E's service territory. A copy of Section 800 can be requested through SDG&E's Customer Service Center by calling 1-800-411-SDGE (7343).

It is the customer's responsibility to install and operate their generating systems in accordance with all applicable laws, codes, and rules. Notification to SDG&E does not relieve the customer of obligations due, or exempt the customer from the requirements of, any other authorities having jurisdiction (Building Department, Air Pollution Control District, etc.). SDG&E's review of the supplied information is of a cursory nature and for specific purpose; SDG&E assumes no liability with the respect to the design, installation, operation, or use of customer- or third party-owned generation systems.

Again, thank you for your cooperation. If you have any questions, or require additional information, please call me at (858) 654-8212.

Sincerely,

Steve Abeyta
Electric Distribution Engineering

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ATTACHMENTS

The following form needs to be completed and returned for all installations:

Emergency/Standby Generator Installation Notification Form *Please note that this form requires two additional pieces of documentation to be supplied. See form for details.*

The following forms need to be completed and returned only under certain circumstances:

AUTHORIZATION TO: RECEIVE CUSTOMER INFORMATION OR ACT ON A CUSTOMER'S BEHALF *Complete and return only if a third-party (someone other than the utility customer) will need to receive the customer's utility account information from SDG&E for use in connection with this generator installation.*

Emergency/Standby Generator Natural Gas Service Datasheet *Complete and return only if the generator will be fueled with natural gas. This information will help SDG&E to determine if the existing gas service is adequate to support generator operation.*

The following document is provided for your reference:

Sample drawing for a power source directory plaque as required by Section 800 of the SDG&E Service Standards & Guide. Fabricate and install plaque in accordance with directions prior to inspection by SDG&E's Electric Distribution Services personnel.

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SDG&E Information Resources Related to Emergency/Standby Generation

Outage Information Webpage (<http://www.sdge.com/safety/powerOutages.shtml>)

Contains links to numerous fact sheets and recommended practices.

Electrical Reliability Webpage (<http://www.sdge.com/reliability>)

Intended for large and small businesses. Provides a large collection of informational resources dealing with electrical reliability, including backup generation and power outage concerns.

Peak Generation Program (<http://www.sdge.com/business/RBRPFactSheet.pdf>)

Offers customers with backup generation the opportunity to help mitigate the incidence and severity of rolling blackouts during periods of potential electricity shortages. Incentives paid for participation. Subject to eligibility requirements.

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Emergency/Standby Generator Installation Notification Form

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SDG&E Electric Service Account Information

Requested information should be written exactly as it appears on your SDG&E bill.

Meter Number

Electric Account Number

Customer Name

Street Address

City

State

ZIP

Contact Information

Who should we contact if we have any questions about the design of the generator installation?

Information Contact Name

Information Contact Company

Phone

E-Mail

Fax

Street Address

City

State

ZIP

Who will be responsible for the on-going operation of the generator? This should be the person that we would contact in case of an emergency or other operational problem.

Emergency/Operational Contact Name

Emergency/Operational Contact Company

Phone

E-Mail

Fax

Street Address

City

State

ZIP

Revision Date: 7/9/07

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Emergency/Standby Generator
Installation Notification Form

The City of San Diego
Engineering & Capital Projects

Transfer Switch Information

This is the device that is used to manually or automatically disconnect your electrical loads from utility power, and then re-connect them to your generator.

Manufacturer	Model Number
<input type="text"/>	<input type="text"/>

Generator Information

The requested information can usually be found on the generator's nameplate or spec' sheet. Be aware that individual components of larger generators may have their own nameplates - the information requested here should be for the overall generator assembly.)

Manufacturer	Model Number
<input type="text"/>	<input type="text"/>

Fuel Type

Diesel <input type="checkbox"/>	Natural Gas <input checked="" type="checkbox"/>	Propane <input type="checkbox"/>	Gasoline <input type="checkbox"/>	Other <input type="checkbox"/>
---------------------------------	---	----------------------------------	-----------------------------------	--------------------------------

kW Rating	Output Voltage	Wiring Configuration
<input type="text"/>	<input type="text"/>	Single-Phase <input type="checkbox"/> Three-Phase <input type="checkbox"/>

Documentation Needed

1. A one-line diagram(s) showing, as a minimum, the electrical path from the generator and transfer switch back to the SDG&E meter which normally supplies power to the loads supported. The diagram should include all significant electrical components in the path, such as panelboards, transformers, and switchgear.
2. A Sequence of Operation description for the transfer switch or equipment. Such a description can often be found in the operating manual provided by the switch's manufacturer. For non-standard or custom-built transfer systems, or for systems utilizing controls to alter or otherwise influence the normal operation of off-the-shelf load transfer equipment, additional descriptive information specific to those systems will be needed.

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The City of San Diego
Engineering & Capital Projects

Emergency/Standby Generator
Installation Notification Form

Submitted By

Company

Phone

E-Mail

Fax

Street Address

City

State

ZIP

Signature

Date

Revision Date: 7/9/07

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Emergency/Standby Generator
Natural Gas Service Datasheet



The City of San Diego
Engineering & Capital Projects

SDG&E Gas Service Account Information

(Requested information should be written exactly as it appears on your SDG&E bill)

Meter Number

Gas Account Number

Customer Name

Street Address

City

State

ZIP

Generator Gas Service Requirements

If more than one generator is being installed, give the total for all generators.

Generator Gas Delivery Pressure Required

Min.:	in. w.c.	Max.:	in. w.c.
-------	----------	-------	----------

Generator Gas Consumption @ Rated Load

CFH

Current Gas Load Requirements

For major gas-fired equipment that is fed from the same gas service as your new generator(s). SDG&E will use this information to verify that your current gas service capacity can support the addition of your new generator(s). Note: 1000 BTUH is approximately equivalent to 1 CFH.

Gas-Fired Equipment Type & Rated-Natural Gas Consumption at Full Load

Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):
Type:	Gas Consumption (CFH):

Note: Standard natural gas delivery pressure is 7" water column (1/4 psig). Additional information and documentation will be needed if the required gas delivery pressure is greater than 7" w.c., or if the total service gas consumption exceeds 1000 CFH. Contact SDG&E for information regarding additional items required. SDG&E does not guarantee gas pressure.

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AUTHORIZATION TO: RECEIVE CUSTOMER INFORMATION OR ACT ON A CUSTOMER'S BEHALF	SUBMITTED TO THE FOLLOWING:	
	Please check all that apply:	
<input type="checkbox"/> PG&E	<input type="checkbox"/> SoCalGas	
<input type="checkbox"/> SCE	<input type="checkbox"/> SDG&E	

THIS IS A LEGALLY BINDING CONTRACT—READ IT CAREFULLY
(Please Print or Type)

I, _____ NAME _____ TITLE (IF APPLICABLE) _____
of _____ (Customer) have the following mailing address _____
NAME OF CUSTOMER OF RECORD _____, and do hereby appoint _____
MAILING ADDRESS _____ CITY _____ STATE _____ ZIP _____
of _____
NAME OF THIRD-PARTY _____ MAILING ADDRESS _____
CITY _____ STATE _____ ZIP _____

to act as my agent and consultant (Agent) for the listed account(s) and in the categories indicated below:

ACCOUNTS INCLUDED IN THIS AUTHORIZATION:

1.	SERVICE ADDRESS: _____	CITY _____	SERVICE ACCOUNT NUMBER _____
2.	SERVICE ADDRESS: _____	CITY _____	SERVICE ACCOUNT NUMBER _____
3.	SERVICE ADDRESS: _____	CITY _____	SERVICE ACCOUNT NUMBER _____

(For more than three accounts, please list additional accounts on a separate sheet and attach it to this form.)

INFORMATION, ACTS AND FUNCTIONS AUTHORIZED – This authorization provides authority to the Agent. The Agent must thereafter provide specific written instructions/requests (e-mail is acceptable) about the particular account(s) before any information is released or action is taken. In certain instances, the requested act or function may result in cost to you, the customer. Requests for information may be limited to the most recent 12 month period.

I (Customer) authorize my Agent to act on my behalf to perform the following specific acts and functions (initial all applicable boxes):

- 1. Request and receive billing records, billing history and all meter usage data used for bill calculation for all of my account(s), as specified herein, regarding utility services furnished by the Utility¹.
- 2. Request and receive copies of correspondence in connection with my account(s) concerning (initial all that apply):
 - a. Verification of rate, date of rate change, and related information;
 - b. Contracts and Service Agreements;
 - c. Previous or proposed issuance of adjustments/credits; or
 - d. Other previously issued or unresolved/disputed billing adjustments.
- 3. Request investigation of my utility bill(s).
- 4. Request special metering, and the right to access interval usage and other metering data on my account(s).
- 5. Request rate analysis.
- 6. Request rate changes.
- 7. Request and receive verification of balances on my account(s) and discontinuance notices.

¹ The Utility will provide standard customer information without charge up to two times in a 12 month period per service account. After two requests in a year, I understand I may be responsible for charges that may be incurred to process this request.

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The City of San Diego
Engineering & Capital Projects

AUTHORIZATION TO: RECEIVE CUSTOMER INFORMATION OR ACT ON A CUSTOMER'S BEHALF

I (CUSTOMER) AUTHORIZE THE RELEASE OF MY ACCOUNT INFORMATION AND AUTHORIZE MY AGENT TO ACT ON MY BEHALF ON THE FOLLOWING BASIS² (Initial one box only):

One-time authorization only (limited to a one-time request for information and/or the acts and functions specified above at the time of receipt of this Authorization).

One year authorization - Requests for information and/or for the acts and functions specified above will be accepted and processed each time requested within the twelve month period from the date of execution of this Authorization.

Authorization is given for the period commencing with the date of execution until _____ (Limited in duration to three years from the date of execution.) Requests for information and/or for the acts and functions specified above will be accepted and processed each time requested within the authorization period specified herein.

RELEASE OF ACCOUNT INFORMATION:

The Utility will provide the information requested above, to the extent available, via any one of the following. My (Agent) preferred format is (check all that apply):

- Hard copy via US Mail (if applicable).
- Facsimile at this telephone number: _____
- Electronic format via electronic mail (if applicable) to this e-mail address: _____

I (Customer), _____ (print name of authorized signatory), declare under penalty of perjury under the laws of the State of California that I am authorized to execute this document on behalf of the Customer of Record listed at the top of this form and that I have authority to financially bind the Customer of Record. I further certify that my Agent has authority to act on my behalf and request the release of information for the accounts listed on this form and perform the specific acts and functions listed above. I understand the Utility reserves the right to verify any authorization request submitted before releasing information or taking any action on my behalf. I authorize the Utility to release the requested information on my account or facilities to the above Agent who is acting on my behalf regarding the matters listed above. I hereby release, hold harmless, and indemnify the Utility from any liability, claims, demands, causes of action, damages, or expenses resulting from: 1) any release of information to my Agent pursuant to this Authorization; 2) the unauthorized use of this information by my Agent; and 3) from any actions taken by my Agent pursuant to this Authorization, including rate changes. I understand that I may cancel this authorization at any time by submitting a written request. [This form must be signed by someone who has authority to financially bind the customer (for example, CFO of a company or City Manager of a municipality).]

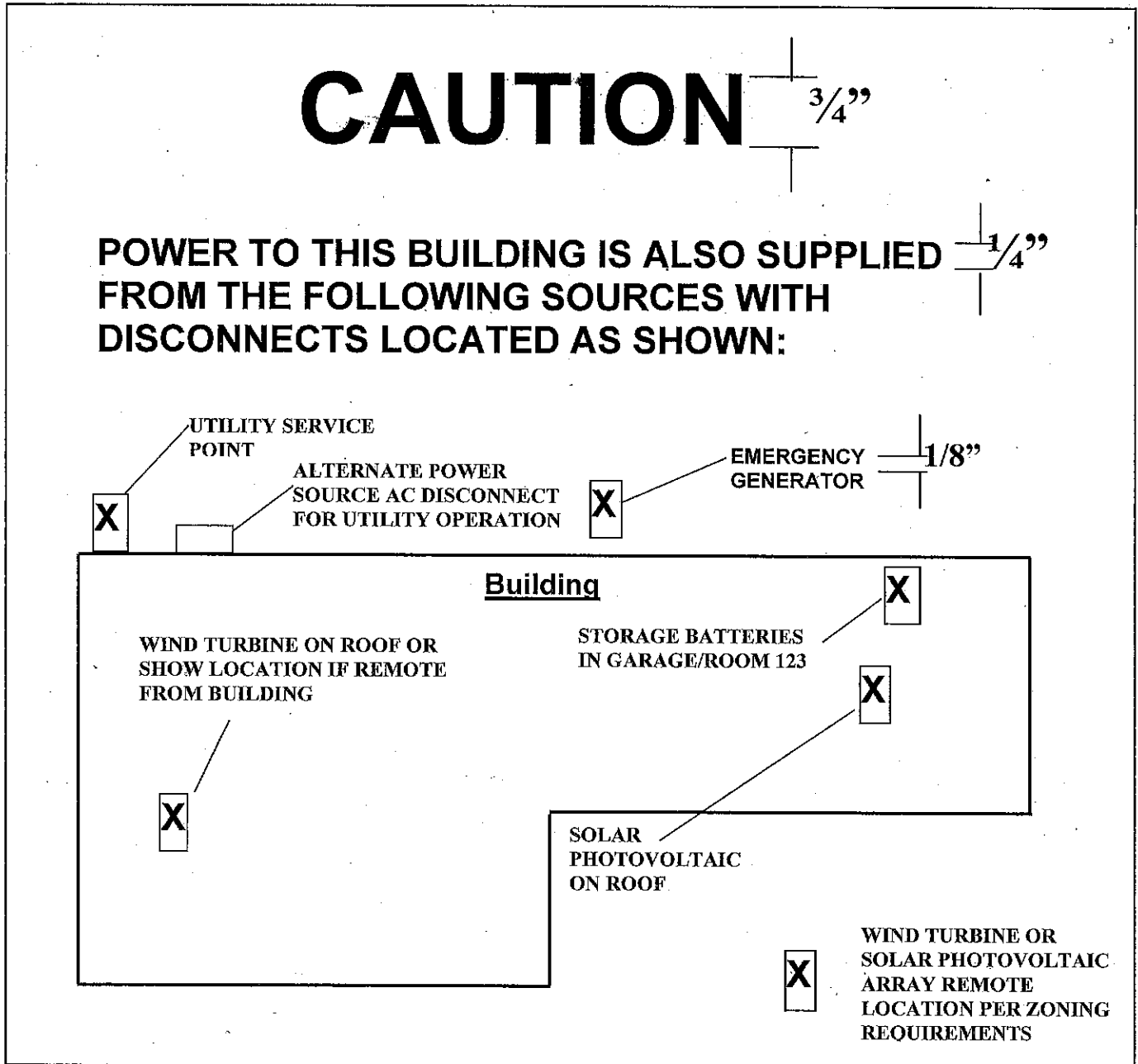
AUTHORIZED CUSTOMER SIGNATURE TELEPHONE NUMBER
Executed this _____ day of _____ at _____
MONTH YEAR CITY AND STATE WHERE EXECUTED

I (Agent), hereby release, hold harmless, and indemnify the Utility from any liability, claims, demand, causes of action, damages, or expenses resulting from the release of customer information obtained pursuant to this authorization and from the taking of any action pursuant to this authorization, including rate changes.

AGENT SIGNATURE TELEPHONE NUMBER

COMPANY
Executed this _____ day of _____
MONTH YEAR

THIS IS A SAMPLE OF THE PLAQUE OR DIRECTORY REQUIRED WHEN THERE IS ANY ALTERNATE SOURCE OF POWER CONNECTED TO THE PREMISES WIRING SYSTEM. THE EXAMPLE BELOW SPECIFIES PHOTOVOLTAIC OR WIND GENERATION. MODIFY AS REQUIRED FOR THE TYPE OF GENERATING FACILITY TO BE INSTALLED.



THE PLAQUE OR DIRECTORY SHALL BE METAL OR PLASTIC, WITH ENGRAVED OR MACHINE PRINTED LETTERS, OR ELECTRO-PHOTO PLATING, IN A CONTRASTING COLOR TO THE PLAQUE, AND SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVOTS, SCREWS, OR EPOXY.



PROJ# 151408-030/040

December 1, 2011

Rolf H. Lee
City of San Diego
600 B Street, Ste. 800
San Diego, CA 92101

RECEIVED
DEC 05 2011
The City of San Diego
Engineering & Capital Projects

Dear Mr. Lee:

Subject: **YOUR PROJECT HAS BEEN ISSUED TO CONSTRUCTION**

The gas service/construction orders to serve your project have been issued to our Construction Department. The electric is pending right-of-way. Please feel free to call 760-432-5805 (Northern Projects) to arrange a pre-construction meeting or to discuss any construction-related questions.

PROJECT IDENTIFIERS

When calling our Construction Department, the following will identify your project:

Project Name: **City of SD Pump Station #84**
Address: 15706 Cm Crisalida B
Work Order #: Gas: 1736080
Service Order #: Gas: 151408-040

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).

CHECKLIST

The following items must be completed before meters can be set:

- Your work must be completed and accepted, and SDG&E's portion of the work must be completed.
- Ensure that the address on your building permit is the same address you provided to SDG&E for your project. If not, delays in meter set(s) and any applicable refunds may result.
- We must receive either permanent or temporary inspection clearances from the City of San Diego.

RATES

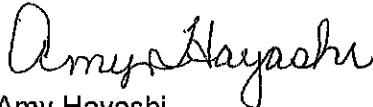
Based on the information provided to your Planner, your project has been assigned a rate of GN3 for gas. Other optional rates may be available. If you are interested in talking with someone regarding your options, please contact the SDG&E Call Center at 1-800-411-7343.

Please be advised that prior to construction, City approval is required for your meter and/or service. Once the authority having jurisdiction notifies us that your equipment has been inspected and passed, and SDG&E's work is complete, it will take approximately three days to set the meters. This assumes we already have an approved address list and application from whomever is to have the service in their name. These last few items can cause unfortunate delays if not attended to in a timely manner.

THANK YOU

We appreciate your business and hope you are very satisfied with our service. 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. For additional general information, please visit our website at <http://sdge.com/index.html>.

Sincerely,



Amy Hayashi
Customer Project Planner
Telephone: (760) 480-7647

RECEIVED

DEC 05 2011

The City of San Diego
Engineering & Capital Projects

AH:sc



A  Sempra Energy utility®

PROJ# 151408-010/020/090

December 13, 2011

RECEIVED

DEC 20 2011

The City of San Diego
Engineering & Capital Projects

Rolf H Lee
City of San Diego
600 B St., Suite 800
San Diego, CA 92101

Dear Mr. Lee:

Subject: **YOUR PROJECT HAS BEEN ISSUED TO CONSTRUCTION**

The electric service/construction orders to serve your project have been issued to our Construction Department. Please feel free to call 760-432-5805 (Northern Projects) to arrange a pre-construction meeting or to discuss any construction-related questions.

PROJECT IDENTIFIERS

When calling our Construction Department, the following will identify your project:

Project Name:	City of SD Pump Station #84
Address:	15706 CM Crisalida B, SD
Work Order #:	Electric: 2950690
Service Order #:	Electric: 151408-020/090

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).

CHECKLIST

The following items must be completed before meters can be set:

- Your work must be completed and accepted, and SDG&E's portion of the work must be completed.
- Ensure that the address on your building permit is the same address you provided to SDG&E for your project. If not, delays in meter set(s) and any applicable refunds may result.
- Whoever is going to be responsible for the billing needs to call our Customer Contact Center and make application. The Center is open 24/7 and 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.

RATES

Based on the information provided to your Planner, your project has been assigned a rate of ALTOU for electric. Other optional rates may be available. If you are interested in talking with someone regarding your options, please contact the SDG&E Call Center at 1-800-411-7343.

Please be advised that prior to construction, City approval is required for your meter and/or service. Once the authority having jurisdiction notifies us that your equipment has been inspected and passed, and SDG&E's work is complete, it will take approximately three days to set the meters. This assumes we already have an approved address list and application from whomever is to have the service in their name. These last few items can cause unfortunate delays if not attended to in a timely manner.

THANK YOU

We appreciate your business and hope you are very satisfied with our service. 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. For additional general information, please visit our website at <http://sdge.com/index.html>.

Sincerely,

Amy Hayashi
Customer Project Planner
Telephone: (760) 480-7647

RECEIVED

DEC 20 2011

The City of San Diego
Engineering & Capital Projects

AH:sc



A  Sempra Energy utility®

PROJ# 157275-010,020
CERTIFIED 7010 3090 0001 0988 5881

December 2, 2011

Rolf H. Lee
City of San Diego
600 B Street, Ste. 800
San Diego, CA 92101

RECEIVED
DEC 06 2011
The City of San Diego
Engineering & Capital Projects

RECEIVED
DEC 06 2011
The City of San Diego
Engineering & Capital Projects

Dear Mr. Lee:

Subject: Removal of Facilities for City of San Diego Pump Station #62

You requested the removal of our electric underground facilities at the above project.

There will be no costs for the removal of these underground facilities. We will remove the cable (including cable from transformer to metering equipment), fuse cabinet, transformer and meter. The conduit will be abandoned in place.

The removal of these facilities will not be scheduled until the relocation and installation of new facilities is complete at City of San Diego Pump Station #84 **and** upon your request.

This does not include any work by the telephone company or cable T.V. company. Please call them for any charges they may have to relocate or remove their facilities.

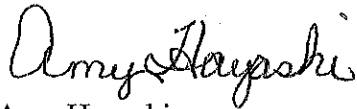
Whenever differences between the actual construction and final plans require a revision of the work order or additional relocation work, the applicant agrees to pay all engineering fees and associated construction costs incurred by SDG&E due to such differences. Such differences may also require rescheduling of SDG&E design and construction work provided for in this agreement

Before excavating in the vicinity of gas or underground electric facilities, please call Underground Service Alert System (USA) at 1-800-227-2600. Within 48 hours, we can indicate the location of SDG&E facilities on the job site.

It is the project applicant or landowner's responsibility to assure compliance with federal, state and local storm water regulations for construction soil disturbance activities. This includes the trenching and excavation required in conjunction with the installation of new gas and electric underground utilities.

If I may be of further assistance or if you have any questions, please call me at the number listed below. Our hours are 7:00 AM - 4:00 PM, Monday through Friday.

Sincerely,



Amy Hayashi
Customer Project Planner
Telephone: (760) 480-7647

Enclosures



DEC 06 2011

The City of San Diego
Engineering & Capital Projects



ELECTRIC UNDERGROUND METER & SERVICE LOCATION

Customer Copy

A Sempra Energy utility™

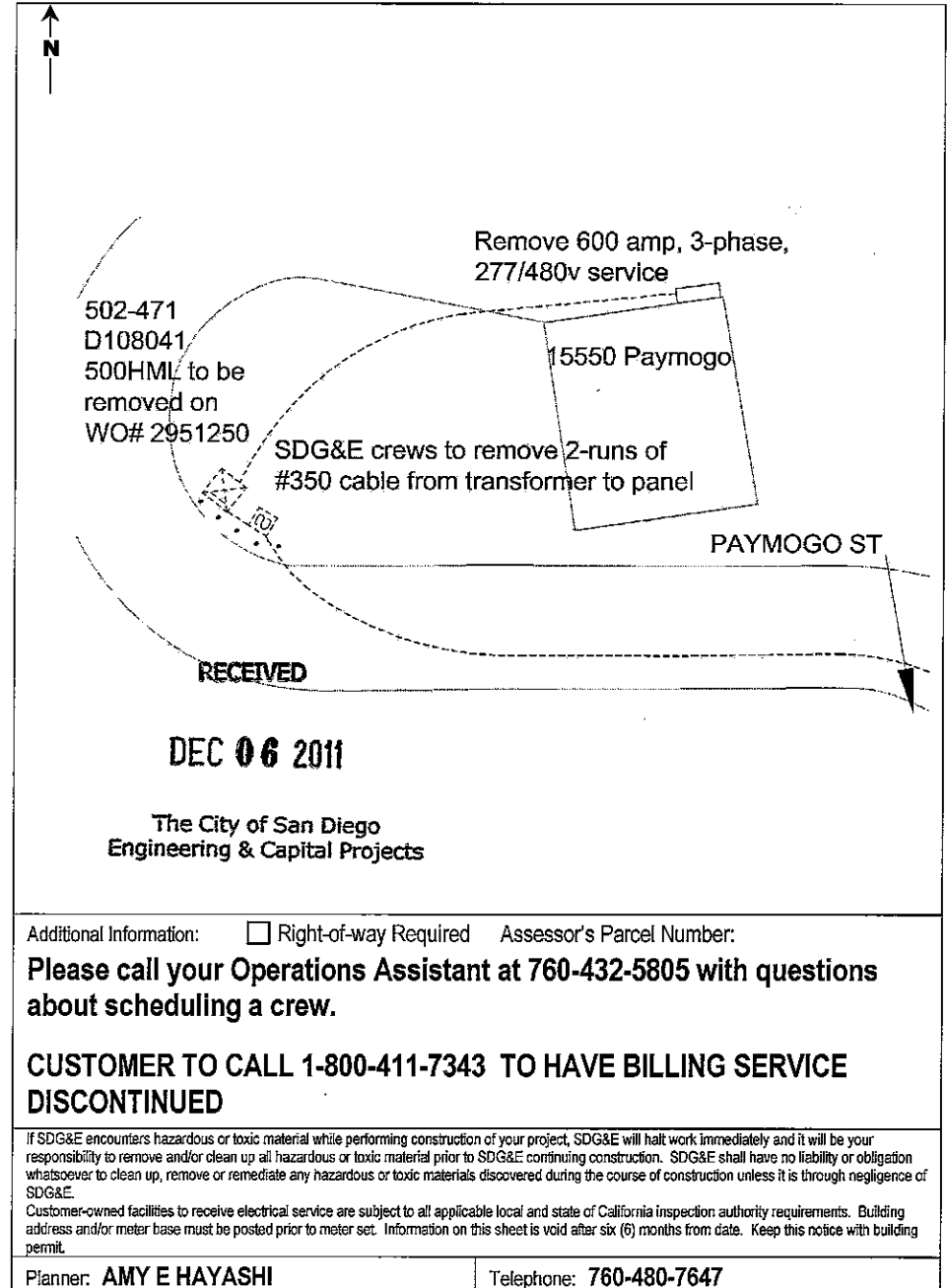
T.B. 1169-H6

Wanted Date: Service Type: **UG Service RFS**

Customer Type: **Commercial**

Date Prepared: **11/09/2011**

Project No: 157275	Job No: 020	
Project Title: CITY OF SD PUMP STN #62-RFS ELECT SVC		
Project Address: 15550 PAYMOGO ST		
Project City: SAN DIEGO	Customer Phone #: 619-533-4660	
Contact: ROLF LEE	Contact Phone #: 619-533-4660	
<input type="checkbox"/> Traffic Control Permit Required. Excavation/Encroachment Permits Required By N/A		
Service Attachment Point and/or Meter Location:		
SDG&E CREWS TO REMOVE CABLE FROM TRANSFORMER D108041 TO UGPS. REMOVE METER # 1571671		
<input type="checkbox"/> SDG&E Application Required – Call:		
Municipal Inspection Required By		
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 760-432-5805 for the following:		
<ul style="list-style-type: none"> • 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: 502-471	Structure Number: D108041	
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: 600	Number/Size of Main Switch: REMOVE-1@ 600 AMP	Voltage: 277/480
# of Wires: 4	Phase: Three	Utilities Maximum Contribution to Fault Current 30000 Amps
Metering: CT	Meter Clips: 15	
Temp Service Charge Due on First Bill \$		



CITY OF SAN DIEGO
M E M O R A N D U M

DATE: July 27, 2011

TO: Rolf Lee, Project Manager, AEP Division

FROM: James Hook, Storm Water Engineer, Storm Water Pollution Prevention Division

SUBJECT: SPS 84 Upgrade and SPS 62 Abandonment, WBS# S-00308.02.01.03

Thank you for providing the SWPP Division with the opportunity to review your project. The purpose of our service is to inform you whether your project has met the requirements of the City's Storm Water Standards Manual (www.sandiego.gov/development-services/news/pdf/stormwatermanual.pdf) and where necessary, to provide guidance in meeting requirements. We've reviewed your project for conformance with the City's Storm Water Standards Manual, and have identified the following issues that should be addressed and documented in the project file or on the plans.

Construction BMP's

1. Per Part D of the Storm Water Applicability Checklist (Appendix A on pg 33 of the Storm Water Standards Manual), the project is considered a Low priority project with regards to storm water inspection frequency. Please include the following statement on the plans "Construction Site Storm Water Priority (Inspection Frequency): Low."
2. This project is designed to maintain/upgrade the city's pump stations in order to "Maintain the original purpose of these facilities". Activities such as these are not subject to the Construction General Permit and as such do not require a SWPPP. A WPCP is required for this project however and guidance for this document may be found within the City's Storm Water Standards Document.

Permanent BMP's

1. As this project is purely pump station abandonment/upgrades and force mains, it is exempt from permanent BMP's with the exception of inlet stamping such as "No Dumping in Storm Drain". This should be done for all projects and a spec for this stamp is available.

If requested to resubmit your project within comments above, please send plans to "Storm Water CIP Review" MS 1900. Please clearly identify the project as a RESUBMITTAL since the Storm Water Section has already performed a review. For any questions on these comments, please feel free to contact me at (858) 541-4334.

City of San Diego



ADDENDUM "B"

FOR

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

BID NO.:	<u>K-12-5525-DBB-C</u>
SAP NO. (WBS/IO/CC):	<u>S-00308</u>
CLIENT DEPARTMENT:	<u>2011</u>
COUNCIL DISTRICT:	<u>1</u>
PROJECT TYPE:	<u>BP</u>

A. CHANGES TO THE BID SUBMITTAL DUE DATE AND TIME

The bid opening date for this project has been extended to **2:00 PM on FEBRUARY 23rd, 2012.**

Proposals will be received at the Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California 92101.

B. 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.

C. BIDDER'S QUESTIONS:

- Q1. Can you define the exact stationing where Archaeological / Paleontological / Native American monitoring will be required or should we assume it will be required over the entire project?
- A1. As of now, it will be required over the entire Project. If we get more definitive direction regarding this, we will issue another addendum to clarify.
- Q2. The soils report link on the City's ftp site isn't working. Can the City provide a copy of the report or fix the link?
- A2. It is working now. Refresh your computer; use F5 here to refresh. There is an automatic expiration date, and after they expire, we will repost them.
- Q3. Pg. 4 of the Specifications contains a required document schedule. Item 6 references DBE-MBE-WBE-DVBE Certifications. Is this required since this is a SLBE/ELBE job?
- A3. Item 6 on page 4, if the mandatory goal is not reached, the 'Good Faith Efforts' should include the certifications of subs. But emphasis' is on using and meeting 23.6% SLBE/ELBE and copies of those certifications/letters should also be

included. For item 6, those contractors wishing to receive participation credit for any certified DBE, DVBE, MBE or WBE firms, they need to provide a copy of the certification. For this particular project, however, it is required that the Contractor solicit to SLBE and ELBE's in order to try and achieve the mandatory SLBE/ELBE goal.

Q4. Will the City be utilizing the VPM system on this project? Are there any costs associated with the system that the contractor will have to bear?

A4. Yes. The use of the VPM system is free.

Q5. Pg. 61 Section 805 Water Discharges c) requires 24 hr. monitoring of the dewatering system. Is the City's intent to have a 24 hour physical presence monitoring this system?

A5. No.

Q6. When will the City provide the CEQA document?

A6. It will be provided as soon as it becomes available.

Q7. Pg. 175 3.3 Salvage and Disposal. A, Will the City provide a location for this topsoil to be stockpiled or should we assume we must export to store?

A7. Export to store.

Q8. Pg. 186 I 2. Allows for a change in the scope of work when encountering additional rock excavation. Will there be a determined rock quantity or should we assume that the Contractor will bear all of this risk?

A8. Refer to the 3 Project geotechnical reports which will also be used for the determination of the differing site conditions.

Q9. Pg. 194 1.4 A 3 and 4. Is it the intent of the City to require Contractors to submit stamped engineered drawings for thrust blocks on the force main piping?

A9. Yes.

Q10. Is it the intent of the City to require C-110 Ductile Iron Fittings rather than C-153?

A10. Yes.

Q11. I had a quick question regarding general contractors getting points for hiring subcontractors that are SLBE. If the SLBE subcontractor was to then hire an independent contractor, a hydrogeologist for example, that was not registered as SLBE, would the subcontractor's SLBE status cover the independent contractor, and would the general contractor still get the points?

A11. EOC evaluation is based on first tier Subcontractors.

Q12. I contacted Rolf with a question about SLBE status for subcontractors (1st and 2nd tier) and how they can help primes win contracts. I appreciate your quick response to my question. However, I just wanted to clarify. When you wrote: "*Sounds like a 2nd tier sub. EOC evaluation is based on first tier subs of the Prime*". Should that be interpreted that as the EOC only looking to see if Tier 1 subcontractors had SLBE, and

they do not look at 2nd or 3rd tier subs? If the 2nd tier sub was SLBE, would the prime then get more points? I guess we are just slightly confused on how these points get calculated as the work gets subbed out. I would appreciate any advice on this matter.

- A12. Subcontractors listed by the Contractor with the Bid submitted at Bid Opening are reviewed / evaluated by EOC. Refer to the EOC provisions in the Contract Documents for more details.
- Q13. At PS84 is there a force main connection located on site that the bypass lines will be able to connect to? If so, what is the size and type of connection?
- A13. No. Refer to Section 804.
- Q14. Will the discharge lines of the temporary primary and stand-by pumps be able to tie into the same connection point or are separate connection points required?
- A14. As this involves means and methods, it will be for the Contractor to determine. Refer to Section 804.
- Q15. Is an electrical power source available to use for the primary and stand-by bypass pumps at PS84? If so, what is the power source rated at (volts, phase and max amperage breakage)?
- A15. The City's service and meter may be used for this. Both the existing and the proposed power source ratings can be found on the drawings.
- Q16. I noticed the date on the Helix report on the ftp site does not match the date listed in the contract. Why is that?
- A16. The date on the report from the contract is the preliminary report while the one on the ftp site is the most recent report.
- Q17. Is the City Wide Pump Station Upgrades: PS 84 & PS 62 Abandonment Project a prevailing wage project?
- A17. No.

Tony Heinrichs, Director
Public Works Department

Dated: *January 10, 2012*
San Diego, California

TH/ca/nb/egz

- Q2. It is stated that there must be 2 advertisements published, 1 advertisement in a trade advertisement and 1 in a focus group publication. Please clarify the good faith efforts.
- A2. Yes. 1 advertisement must be published in a trade publication and 1 advertisement must be published in a focus group publication as indicated per the project specifications.
- Q3. What is the SLBE Program/Good Faith Effort policy for bid date changes in reference to notifying SLBE's of the change? Please advise if mass e-mailing would be acceptable from now on?
- A3. Bidders must provide copies of **ALL** bid date change notifications to SLBE-ELBE firms with one of the following forms of verification that the notices were sent: a) If mailed: provide copies of the metered envelopes or certified mail receipts b) If faxed: provide copies of the fax transmittal confirmation sheet(s) c) If emailed: provide copies of the email delivery confirmation sheet(s) Note: broadcast email is acceptable for date change notification. No credit shall be given for error messages, busy, cancelled, undeliverable, etc.
- Q4. Can you please clarify the mechanical seal language found in article 2.4 A. 7. of section 11175?
- A4. Mechanical seals shall be cooled internally using product water. The pump/impeller shall be designed to provide positive pressure above suction pressure to allow seal flush to function. Supply "Push Lock" type fittings with plastic hose since pressure is not an issue. The seal flush/vent line from the seal gland flush port to suction shall vent air out of the stuffing box. Supply with the Hose Kit, a 3-way valve which allows the pump to be vented completely upon initial install, then provides constant circulation from stuffing box back to suction in order to cool seal and vent any air that may become entrained. One flush port is sufficient.

Mechanical Seals shall be AESSEAL CURC (or pre-approved equal) or SCUSI(or pre-approved equal)-type, single cartridge, and if the CURC is used, built to AESSEAL ref. number: AZA7786. The seals shall be capable of operating in raw sewage without the addition of an outside source of cooling or flushing water. The metal parts shall be 316 L stainless steel, except the gland, which shall be 316 stainless steel, and the springs, which shall be hastelloy C. The rotating primary seal face shall be triple vacuum impregnated carbon. The stationary face shall be solid silicon carbide or solid tungsten carbide. The seal rotating element shall be hydraulically balanced. The stationary element shall be a fully-floating Universal Self-Aligning type (U.S.I.) using universal joint principal. Springs, of any kind, shall not be used in the stationary element. Elastomers shall be Viton. Seal shall be statically pressure tested and certified leak-free prior to shipment.

The Contractor shall install a seal vent/flush line, of no smaller than 1/4" I.D. tubing, from the seal flush connection, on the cartridge seal gland, through a 3-way valve, and into a connection on the suction side of the pump.

C. VOLUME 1

1. To SSP, Part 1 – General Provisions, Section 2 – Scope and Control of Work, Section 2-9.2 Survey Services, Page 33, **DELETE** in its entirety.

Tony Heinrichs, Director
Public Works Department

Dated: *January 26, 2012*
San Diego, California

TH/ca/nb/egz

City of San Diego



ADDENDUM "D"

FOR

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

BID NO.:	<u>K-12-5525-DBB-C</u>
SAP NO. (WBS/IO/CC):	<u>S-00308</u>
CLIENT DEPARTMENT:	<u>2011</u>
COUNCIL DISTRICT:	<u>1</u>
PROJECT TYPE:	<u>BP</u>

A. CHANGES TO THE BID SUBMITTAL DUE DATE AND TIME

The bid opening date for this project has been extended to **2:00 PM on MARCH 15TH, 2012.**

Proposals will be received at the Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California 92101.

B. 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.

C. BIDDER'S QUESTIONS

- Q1. I can't find a specification for the eight-foot by ten-foot overhead door called out on the door schedule?
- A1. It can be found in specification section 08360 – Overhead Doors (as provided in this Addendum D).
- Q2. Where can I get the community/association/agency resource list? And where are SLBE/ELBE firms listed?
- A2. The agency resource list is provided in this Addendum D. SLBE/ELBE firms are listed at <http://www.sandiego.gov/eoc/boc/slbe.shtml>

- Q3. Is the existing generator at station 84 going to be available for stand-by utility outage use during construction until we commission the new natural gas generator?
- A3. Yes. However, it shall not to be used as a primary source of power.
- Q4. Is the typical proximity sensor furnished by Surge Buster acceptable?
- A4. Yes.
- Q5. Is a Pulsar Ultra 5 with a dB6 transducer acceptable for purposes of wet well level monitoring/detection?
- A5. Yes.
- Q6. I noticed in article 2.2 of specification section 11005 you are asking for the alignment tool. Shall this be deleted?
- A6. Yes. The City does not need this particular device nor require equipment instruction as defined by article 1.3 A.1.
- Q7. What are the Development Services Department (DSD) issues that the bidders should be made aware of, pertaining to the second review cycle?
- A7. If any required landscape (including existing or new plantings, hardscape, landscape features, etc.) indicated on the approved construction document plans is damaged or removed during demolition or construction, it shall be repaired and/or replaced in kind and equivalent size per the approved documents to the satisfaction of the Development Services Department Mitigation Monitoring Coordination staff within 30 days of damage.
- Q8. Is the contractor prohibited to use their own portable generator on-site during construction?
- A8. The contractor may use their own portable generator during construction, but it must be registered with the Air Resources Board or the Air Pollution Control District (APCD).

D. VOLUME 1

1. To Technical Specifications, Section 08360 – Overhead Doors, pages 397 through 400, **DELETE** in their entirety and **SUBSTITUTE** with pages 3 of 12 through 6 of 12 of this Addendum D.

Tony Heinrichs, Director
Public Works Department

Dated: *February 14, 2012*
San Diego, California

TH/CA/NB/egz

SECTION 08360 - OVERHEAD DOORS

PART 1 - GENERAL

2. 1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing all overhead door assemblies and frames and all appurtenant work, complete and operable, including manual drive systems and power drive systems, locking hardware, and complete control systems.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 08110 Steel Doors and Frames
 - 2. Section 08710 Finish Hardware
 - 3. Section 09800 Protective Coating

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
 - 1. International Building Code
 - 2. International Fire Code
 - 3. National Electric Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. Commercial Standards:
 - NEMA National Electric Manufacturers' Association
 - NEC National Electric Code
 - 2. Trade Standards:
 - Aluminum Association Anodizing Systems
 - 4. Manufacturers' Standards: In addition to the standards listed above, the overhead doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 – Contractor Submittals:
 - 1. Manufacturer's specifications, literature, installation instructions, along with any engineering calculations that may be required elsewhere in this Section shall be submitted. Calculations by a registered civil or structural engineer shall be submitted which show that the overhead door systems and their structural connections are designed to meet code requirements and loads.
 - 2. Shop drawings showing details of the products and systems, fasteners, and connections to adjoining materials shall be submitted along with any manufacturer's installation instructions. Schedules showing sizes, types, and locations of louvers and glass shall be submitted.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300 – Contractor Submittals:
 - 1. Upon completion, the CONTRACTOR shall deliver to the CONSTRUCTION MANAGER complete book containing the manufacturer's operation and maintenance instructions for the overhead door assemblies.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: All materials shall be carefully stored in an area that is protected from deleterious elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

PART 2 - PRODUCTS

2.1 ROLL-UP DOORS

- A. General: Roll-up doors shall be of the metal slat curtain design, chain-operated, and shall be weather and dust-resistant. Doors shall be provided complete with slats, guides, hoods, reduction gears, galvanized hand chain, operating mechanism, brackets, gears, head, bottom and side weather stripping, hardware, and all other items necessary for their installation and operation.
- B. Wind Loading: The doors shall be designed to withstand a wind load of 20 lb/sq ft.
- C. Curtain Slats: Curtain slats shall be weather sealing, flat appearance designed slats.

1. Curtains shall be fabricated from roll-formed galvanized steel of not less than 20 gauge sheets with a height of approximately 2-1/4 inches.
- D. Endlocks: Endlocks shall be continuous malleable iron castings, designed to provide for curtain alignment and security against lateral movement.
- E. Bottom Bar: The bottom bar shall consist of 2 angles galvanized and bolted back-to-back on each side of the curtain or extruded aluminum section to suit the floor profile. A replaceable flexible vinyl or neoprene gasket or astragal shall be provided as a weather seal and cushion bumper.
- F. Guides and Stops: Guides shall consist of a galvanized steel angle assembly of proper size to retain the curtain and to resist the wind loads. Guides shall be provided with weatherstripping. Angle thickness shall be minimum 3/16-inch. Jamb angles shall be anchored to the supporting walls with not less than 3/8-inch bolts spaced at 30 inches on centers, and extending above door opening head to support the coil brackets. Removable stops on guides to prevent over-travel of curtain and a continuous bar for holding windlocks, where required, shall be provided.
- G. Counter Balanced Shaft Assemblies: The barrel shall be a steel pipe of sufficient diameter and thickness to support the roll-up curtain and its design loads without distortion of slats, and to limit deflection of the barrel to not more than 0.03-inch per foot of span under full load. The barrel shall have a minimum diameter of 4 inches. The spring balance shall consist of one or more helical torsion springs of oil-tempered heat-treated steel to transfer full load to a single steel torsion bar in the barrel. Rotating members shall turn on self-lubricating graphite or grease-sealed ball bearings, with adjustment for counterbalance springs accessible from outside barrel. Brackets shall be 5/16-inch-thick, cold-rolled steel plate, or equal strength cast iron, attached to the jamb angle guide with 1/2-inch bolts. Brackets shall have a bell-mouth guide groove for the curtain.
- H. Hood: The hood shall be manufactured of 24-gauge galvanized steel sheet with bonderized treatment. The hood shall fit over the end brackets. Top and bottom edges of hood shall be rolled and reinforced for stiffness, and intermediate supports shall be provided as necessary. The hood baffle shall be of neoprene and sheet metal.
- I. Chain Holder: A chain holder shall be provided on wall with provision for padlocking.
- J. Manual Operation Features: Manual operation shall be accomplished by endless chain, sprocket, and reduction gearing to the barrel, designed to require not more than a 35-lb pull on the chain to move the curtain. Sprockets and gears shall have machine cut teeth, or shall be machine-molded. Bearings shall be lubricated for life and self-aligning, and shall be either self-lubricating graphite bearings or grease-sealed precision ball bearings, depending on size of door. Operating chain shall be hot-dip galvanized, located at side of door as shown on the approved shop drawings, and shall be continuous loop design that extends to a point approximately 24 inches above the floor. Chain and gear guards shall be provided as necessary for protection against malfunction or personal hazard.
- M. Finishes: Galvanized steel curtains and wicket doors shall be provided with a baked acrylic which is compatible with the finish paint indicated in Section 09800 – Protective Coating. All other metal parts, exposed and concealed, and doors, shall be shop-primed with primer which is compatible with the finish paint indicated. The inside working area of the guides shall not be painted.

2.3 MANUFACTURERS

- A. Roll-up doors shall be of the following manufacturers and type or model (or equal):
 - 1. Weathertight standard door: Cookson "Weatherbar FC" or Wayne-Dalton Air-Bar Extr-Tite.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.2 INSTALLATION

- A. Doors shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be sized for loads imposed and shall be of sufficient length. Doors shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

** END OF SECTION **



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

Access to Independence (Resources for Disabled)

Contact: Elizabeth Turner
1295 University Avenue, #10
San Diego, CA 92103-3333
Tel. (619) 293-3500
Fax (619) 293-3508

Accessible San Diego

Contact: Wes Johnson
P.O. Box 124526
San Diego, CA 92112-4526
Tel. (858) 279-0704
Fax (208) 460-9487
Email: wes@accessandiego.org

American Council of Engineering Companies – CA (S.D. Chapter)

Contact: John Harris, President
P.O. Box 191310
San Diego, CA 92159-1310
Tel (619) 334-3083
Fax (619) 593-9989
Email: celsoc-sd@home.com

American Society of Professional Estimators San Diego Chapter 4 Membership

Contact: Richard Vallin
127 N. Westwind Drive
El Cajon, CA 92020-2955
Tel. (619) 749-1890
Fax (619) 593-9989
Email: asped4@cox.net
Web: www.aspechapter4.org

American Subcontractors Assn.

Contact: Mr. Rick Marshall
P.O. Box 968
La Mesa, CA 91942
Tel. (619) 462-2600
Fax (619) 465-3805

Asian Business Association

Contact: Joni Low, Pres. & CEO
5675 Ruffin Road, Ste. 305
San Diego, CA 92123
Tel. (858) 277-2822
www.abasd.org

Associated General Contractors of America (AGC) Plan Room- San Diego

Contact: Jessica Kovack
4355 Ruffin Road, #103
San Diego, CA 92123
Tel. (858) 874-8560
Fax (858) 874-8569
Resource for State, Federal & Local Guidelines for Building Industry
Email: PlanRoom@agcsd.org

Black Contractors Association, Inc.

Contact: Abdul-Rahim Hameed
6125 Imperial Avenue
San Diego, CA 92114
Tel. (619) 263-9791
Fax (619) 263-6865
www.NationalBCA@ad.com



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

California Southern Small Business Development Corp.

Contact: Michael McCraw
600 "B" Street #2450
San Diego, CA 92101
Tel. (619) 232-7771
Fax (619) 232-6743
Email: calsouth@pacbell.net

Catfish Club

Contact: Rev. George Walker Smith
7514 Mira Flores Drive
San Diego, CA 92114
Tel. (619) 266-7278
Email: Revgwsmith@aol.com

Chicano Federation of San Diego County, Inc.

Contact: Raymond Uzeta
3180 University Ave., Ste. 317
San Diego, CA 92104
Tel. (619) 285-5600
Fax (619) 285-5614
Email: scecena@chicanofederation.org

Contracting Opportunity Center

Contact: J. Gunnar Schalin, *Project Manager*
4007 Camino Del Rio South, Suite 210
San Diego, CA 92108
Tel. (619) 285-7020
Fax (619) 285-7030
www.ptac-sandiego.org

Council of Philippine American Organizations of San Diego County

Contact: Merly Ferrer, Pres.
832 E Street
National City, CA 91950
Tel. (619) 477-4090
Fax (619) 477-6052
Web: www.copao.sandiego.org

Disabled Businesspersons Association

Contact: Urban Miyares
C/O SDSU – Inter Work Institute
3590 Camino del Rio North #111
San Diego, CA 92108-1716
Tel. (619) 594-8805
Fax (619) 594-4208
Email: Info@disabledbusiness.com

Elite SDVOB

Contact: Bob Mulz
3829 University Ave
San Diego, CA 92105
Tel (619) 284-9922
Fax (619) 284 4567
Email: www.elitesdvob.org

Engineering & General Contractors

Contact: Debbie Day
P.O. Box 81798
San Diego, CA 92138-1798
Tel. (619) 692-0760
Fax (619) 692-0839
www.egca.org

Indian Human Resource Center

Contact: Juan Castellanos
4265 Fairmount Avenue, Ste. #140
San Diego, CA 92105
Tel. (619) 281-5964
Fax (619) 281-1466
Email: Juan@ihrc.sdcoxmail.com



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

Indian Voices

Contact: Rose Davis
111 S. 35th Street
San Diego, CA 92113
Tel: (619) 234-4753
Fax: (619) 512-4534
RDavis4973@aol.com
www.indianvoices.net

Resource for Subcontractors and Employment

Jackie Robinson Family YMCA

Contact: Michael Brunker, Director
151 YMCA Way
San Diego, CA 92102
Tel. (619) 264-0144
Fax (619) 264-7356
Email: MBrunker@ymca.org

Korean-American Association of San Diego

Contact: Young Sang Lim
7750 Daggett St., Ste 210
San Diego, CA 92111
Tel. (858) 467-0803
Fax (858) 467-0215
Email: N/A

Laborers' International Union Of North America, Local No. 89

Contact: Alex Mercado, President
4161 Home Avenue
San Diego, CA 92105
Tel. (619) 263-6661
Fax (619) 263-6660
Email: RMoreno@local89.org

Latin Business Owners Of America

*[Currently in Transition- Contact info to be updated by
once available]*

Tel. (858) 536-9042

Latino Builder's Industry Association

4636 Mission Gorge Place, Ste. 204
San Diego, CA 92120-4131
Tel. (619) 287-2397

MAAC Project

Contact: Antonio V. Pizano- Pres. & CEO
1355 Third Avenue
Chula Vista, CA 91911
Tel. (619) 426-3595
Fax (619) 426-2173
Web: www.maacproject.org

Metropolitan Transit Development Board

Contact: Mr. Ira Tillman, Procur. Dir.
1255 Imperial Avenue #1000
San Diego, CA 92101
Tel. (619) 557-4548
Fax (619) 234-3407
Email: Iraa.tilman@sdmts.com

Multi-Cultural Contractors Group (MCCG)

Contact: Rick Laster
1810 Gillespie Way
El Cajon, CA 92020-0917
Tel. (619) 596-0105
Fax (619) 596-0109

NAACP- SD

Contact: Lei-Chala Wilson, Esq., Pres.
5106 Federal Blvd., Suite 207
San Diego, CA 92105
Tel. (619) 263-7823
Fax (619) 263-7851
Email: sdnaacp@cox.net
Web: www.sandiegonaacp.org



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

Neighborhood House Association

Contact: Mr. Rudy Johnson
5660 Copley Drive
San Diego, CA 92111
Tel. (858) 715-2642
Fax (858) 715-2670

National Association of Women in Construction

San Diego Chapter 21
Contact: Anita Villani-Barnes
P.O. Box 880725
San Diego, CA 92168
Tel. (619) 462-3473
www.nawicsd.org
Email: anitafire@sbcglobal.net

Occupational Training Services

Contact: Robert Ito
8799 Balboa Ave., Suite 204
San Diego, CA 92123
Tel. (858) 560-0411 x206
Fax (858) 292-4523
www.ots-sdchc.org

Padilla & Associates – S.D.

Contact: Michelle Mumford
2725 Congress Street, Suite 1-D
San Diego, CA 92110
Tel. (619) 725-0843
Fax (619) 725-0854
Email: dbiconsultantsd@aol.com

RBF Consulting (Society of Woman Engineers-San Diego)

Contact: Terri Nolan
9755 Clairemont Mesa Blvd., Ste 100
San Diego, CA 92124-1324
Tel. (858) 614-5056
www.rbf.com

San Diego Association of Governments (SANDAG)

Contact: Tim Watson, Prog. Mgr.
401 "B" Street, #800
San Diego, CA 92101
Tel. (619) 699-1900
Fax (619) 699-1905
Email: tw@sandag.org

San Diego Chapter of the Elite SDVOB (Service Disabled Veteran Owned Business)

Contact: Mike Olivier, President
1521 Donita Dr.
El Cajon, CA 92020
(619) 368-5246

San Diego Chinese Center

Contact: K. Hui, Pres.
428 Third Avenue
San Diego, CA 92101-6803
Tel. (619) 234-4447
Fax (619) 234-0442
Email: sdcc1972@yahoo.com



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

San Diego Contracting Opportunity Center

Contact: Gunnar Schalin, Prog. Dir.
4007 Camino del Rio South, #210
San Diego, CA 92108-3913
Tel. (619) 285-7020, ext. 3005
Fax (619) 285-7030
Email: gschalin@ptac-sandiego.org

San Diego Convention Center

Contact: Ron King, Dir. Of Events
111 West Harbor Drive
San Diego, CA 92101
Tel. (619) 525-5605
Fax (619) 525-5025
Email: Ron.king@visitsandiego.com

San Diego County Hispanic Chamber of Commerce

Contact: Sergio Martinez
P.O. Box 131548
San Diego, CA 92170
Tel. (619) 702-0790
Fax (619) 521-6722
Email: sdchcc@sdchcc.com

San Diego Monitor News

Contact: Willie Morrow
3570 Olive Street
Lemon Grove, CA 91945
Tel. (619) 668-1007
Fax (619) 668-0778
Email: sdmnews@aol.com

San Diego Neighborhood House

Contact: Jean Smith
841 S. 41st Street
San Diego, CA 92113
Tel. (619) 263-7761
Fax (619) 263-6398
www.neighborhoodhouse.org
Employment and Job Placement

San Diego Regional Chamber of Commerce (aka Greater SD chamber of Commerce)

402 W. Broadway, Suite 1000
San Diego, CA 92101
Tel. (619) 544-1300
Fax (619) 744-7447
Web: www.sdchamber.org

San Diego Urban League

Contact: Maurice Wilson
720 Gateway Center Drive
San Diego, CA 92102
Tel. (619) 266-6244
Fax (619) 263-3660
Maurice@sdul.org
Employment & Training (Prefers e-mail)

SER/Jobs for Progress

Contact: Mr. Sal Martinez
4700 N. River Rd.
Oceanside, CA 92057
Tel. (760) 433-1000
Fax (760) 967-6357



THE CITY OF SAN DIEGO

Community/Association/Agency Resource List

Southeast Economic Development Corp.

Contact: Kimberly King
4393 Imperial Avenue, Suite 200
San Diego, CA 92113
Tel. (619) 527-7345
Fax (619) 262-9845
Email: King@sedcinc.net
Web: Sedicinc.com

Southern California Carpentry - Joint Apprenticeship Training Committee (JATC)

Contact: Doug Hogue
8595 Miralani Drive
San Diego, CA 92126
Tel. (858) 621-2667
Fax (858) 621-2669
Email: dhogue@californiacarpenters.org
Resource for Apprenticeship and Training Programs

Union of Pan Asian Communities

Contact: Margaret Panrose
1031 25th Street
San Diego, CA 92102
Tel. (619) 232-6454
Fax (619) 235-9002
Email: MPanrose@upacsd.com

Women Construction Owners & Executives USA

Contact: Rebecca Llewellyn (Payco)
120 North Second Avenue
Chula Vista, CA 91910
Tel. (619) 422-9204
Fax (619) 427-1620
Email: payco@sprintmail.com

Contact: Candace Friedman
(Acme Safety & Supply Corp)
3422 Sutherland Street
San Diego, CA 92110
Tel. (619)299-5100
Fax. (619) 542-0763
Email: candace@acmesafetysupply.com

City of San Diego

ADDENDUM "E"



FOR

CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

BID NO.: _____ **K-12-5525-DBB-C**
SAP NO. (WBS/IO/CC): _____ **S-00308**
CLIENT DEPARTMENT: _____ **2011**
COUNCIL DISTRICT: _____ **1**
PROJECT TYPE: _____ **BP**

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

Adel Bassyouni
Professional Engineer or Licensed Architect

Seal:



A. CHANGES TO THE BID SUBMITTAL DUE DATE AND TIME

The bid opening date for this project has been extended to **2:00 PM on APRIL 11TH, 2012.**

Proposals will be received at the Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California

B. 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.

C. BIDDER'S QUESTIONS:

Q1. With regards to standard drawing SDG-107, are you requiring type A or B?

A1. Type A only.

- Q2. Sheet 84–D-100 shows an existing SDG&E Transformer to be replaced. Please confirm if SDG&E is to replace or is it by the GC.
- A2. SDG&E will be placing the actual transformer, meter, and related conductors. Demolition, trenching, conduits, and appurtenance work shall be provided by the Contractor. Refer to the attached SDG&E design drawing of this Addendum.
- Q3. Note 10 on 84-D-100 shows 17 bougainvilleas to be transplanted. Sheet 84-L-100 shows 16 bougainvilleas to be planted. Please confirm that the existing bougainvilleas to be transplanted are to same bougainvilleas being planted per the Landscape drawing.
- A3. See section D, “Plans”, item 1 of this Addendum.
- Q4. Please indicate the concrete pad thickness for the new Bioxide tank.
- A4. Bioxide pad is part of the emergency storage tank top. Thickness varies with slope of the tank top. Top of bioxide slab is at elevation 573.00, as indicated on 84-C-100.
- Q5. Please indicate the thickness of the pea gravel and gravel for the new SPS 84 site.
- A5. As indicated on 84-C-100, the pea gravel shall to be embedded into the emergency storage tank top concrete slab surface during construction. Site work gravel shall be 6-inches thick.
- Q6. If a lag and beam system is used for the shoring of the new pump station will it be acceptable to bury the lag and beam system in place?
- A6. Yes. However, shoring outside the pump station property (within utility easements, right of ways, and construction easements) may not be buried in place.
- Q7. Per the contract documents the City is going to contract a third party biologist. Please confirm this is the City’s intent.
- A7. Yes.
- Q8. Can you please share the SDG&E drawings associated with station 62 and the natural gas main extension at station 84?
- A8. SDG&E drawings are attached of this Addendum.
- Q9. Question: Spec section 11212 2.1.B.6 calls for the minimum flywheel moment of inertia to be 600 lb-ft². Then in 2.4.A it discusses the total moment of inertia of the pumping system (pump, flywheel, motor, etc) add up to the total moment of inertia specified... yet they don't specify a number.
Do they mean to say that 600lb-ft² is the moment of inertia for the system? If not, I need that value to continue.
- A9. Yes. The total moment of inertia for each pump/motor unit shall be at least 600 lb-ft²

D. VOLUME 1

1. To Required Documents Schedule, page 4, **DELETE** in its entirety and **SUBSTITUTE** with pages 4 of 14 through 5 of 14 of this Addendum.
2. To SLBE-ELBE Program Special Notice, page 6, **DELETE** in its entirety and **SUBSTITUTE** with pages 6 of 14 through 11 of 14 of this Addendum.
3. To Invitation to Bids, page 11, section 3. Engineer's Estimate, **DELETE** in its entirety and **SUBSTITUTE** with the following:
 3. **ENGINEER'S ESTIMATE:** The Engineer's estimate of the most probable price for this contract is in the range \$8,000,001 to \$9,000,000.
4. To the Contract Documents, **ADD** "SDG&E Plans", pages 12 through 14 of this Addendum.

E. PLANS

1. To Drawing number 36196-11-D (84-D-100), KEYNOTES, **DELETE** "10. Prune And Transplant 17 Bougainvillea To Temporary Planters." in its entirety and **REPLACE** with the following:

"10. Remove and Dispose of Existing Plants. Bougainvilleas to be planted on 84-L-100 are new plants."

Tony Heinrichs, Director
Public Works Department

Dated: *March 6, 2012*
San Diego, California

TH/nb/ca/egz

REQUIRED DOCUMENTS SCHEDULE

This table is intended to serve as a convenient tool for listing forms and documents required at different times. It is neither exhaustive nor must be considered a Contract Document by itself. Therefore, the users must review the entire Contract Documents and become familiar with the required documentation and the submittal schedule associated with each document.

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

The specified EOC forms are all available for download from the EOC Program's web site at:

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

ITEM	WHEN	BY	WHAT
1.	BID DUE DATE/TIME	ALL BIDDERS	Proposal (Bid)
2.	BID DUE DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID DUE 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 DUE DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions
5.	BID DUE DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	BID DUE DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
7.	BID DUE DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
8.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
9.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	SLBE-ELBE Good Faith Documentations
10.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	Form AA60 – List of Work Made Available
11.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER'S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	Pre-Award Schedule
12.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principle individual owners of the Apparent Low Bidder - In the event the firm is employee owned or publicly held, then the fact should be stated and the names of the firm's principals and officers shall be provided.
13.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report
14.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture, the following information must be submitted: <ul style="list-style-type: none"> o Joint Venture Agreement o Joint Venture License

REQUIRED DOCUMENTS SCHEDULE

ITEM	WHEN	BY	WHAT
15.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER'S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	List of Proposed Substitutions for "an equal" ("or equal") item along with data substantiating the substitution(s)
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
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
22.	WITHIN 21 CALENDAR DAYS AFTER RECEIPTS OF THE OWNER'S NOTICE OF INTENT TO AWARD	APPARENT LOW BIDDER	Phased Funding Schedule Agreement
23.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC20 - Monthly Employment Report
24.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC25 - Monthly Invoicing Report
25.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC10 - Contract Change Order (CCO)
26.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC15 - Final Summary Report
27.	PRIOR TO ACCEPTANCE	CONTRACTOR	Affidavit of Disposal

SPECIAL NOTICE
SMALL LOCAL BUSINESS ENTERPRISES (SLBE)
AND
EMERGING LOCAL BUSINESS ENTERPRISES (ELBE)
PROGRAM

1. **INTRODUCTION.** This contract is subject to the requirements of the SLBE Program as specified in the SLBE-ELBE section of the City's EOCP Requirements included in The WHITEBOOK.

1.1. The Bidders are required to review The WHITEBOOK and become familiar with the detailed specifications including the required documentation and the submittal schedule as related to SLBE-ELBE program.

2. **AMENDMENTS TO THE CITY'S GENERAL EOCP REQUIREMENTS.**

III. Equal Employment Opportunity Outreach Program (A). DELETE in its entirety and **SUBSTITUTE** with the following:

A. Competitive Bids. If a contract is competitively solicited, the Apparent Low Bidder shall submit a *Work Force Report (Form BB05)* or an Equal Employment Opportunity (EEO) Plan, 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. **AMENDMENTS TO THE CITY'S EOCP SLBE-ELBE REQUIREMENTS.**

VIII. Subcontracting Efforts Review and Evaluation (2b). DELETE in its entirety and **SUBSTITUTE** with the following:

b) "Make information of forthcoming opportunities available to SLBE-ELBE firms and arrange time for contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by SLBE-ELBE firms in the competitive process. This includes posting solicitations for bids or proposals for a minimum of 10 Working Days before the Bid or Proposal due date."

VIII. Subcontracting Efforts Review and Evaluation (3) and (4). DELETE in their entirety and **SUBSTITUTE** with the following:

3. Good Faith Effort Documentation Requirements

If the stated SLBE-ELBE subcontractor participation percentages are not met, the Bidder shall submit, within 3 Working Days of the Bid opening, information necessary to establish adequate good faith efforts were taken to meet the contract subcontractor participation percentages. The required documentation includes the following:

A. ADVERTISEMENT REQUIREMENTS

Advertisements for subcontract work must comply with the following requirements:

1. Advertisements must be published at least 10 Working Days prior to bid opening. Provide the names and dates of each publication of where the advertisement was published.

Note: The advertisement is not required to be published everyday for the 10 Working Days prior to bid opening.

2. There must be at least 2 advertisements published, 1 advertisement in a trade publication and 1 in a focus group publication. Additional advertising for SLBE-ELBE participation may be placed in newspapers, trade papers and on the Internet. For a listing of publications accepting advertisements, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>
 - 2.1. Newspaper advertisements must be in the Bids Wanted, Legal Notices section of the Classified Ads, Subcontracting Opportunities or Business Opportunities **NOT** the Employment Opportunities Section.
3. Advertisements must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 3.1. It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet specified subcontracting participation percentage and at a minimum an amount of work equal to the specified subcontracting participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces or supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
4. Advertisements must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
5. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders **MUST** provide proof of publication of each advertisement by providing the publication affidavit which must include a legible copy of the entire advertisement and the original ENTIRE page of the publication in which the advertisement appears.

B. SLBE-ELBE WRITTEN SOLICITATION REQUIREMENTS

Bidders must directly solicit SLBE-ELBE firms on the City's approved SLBE-ELBE list. Solicitations for Subcontractor or Supplier work must comply with the following requirements:

1. The solicitation must be dated and list the name of the SLBE-ELBE firm. Solicitations must be made to the SLBE-ELBE firms at least 10 Working Days prior to bid opening.
2. Solicitation must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 2.1. It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the specified subcontractor participation percentage and at a minimum an amount of work equal to the subcontractor participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
3. Solicitation must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
4. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE subcontractors in obtaining necessary equipment, supplies, or materials.
5. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
6. Bidder must solicit **ALL** SLBE-ELBE firms on the City's approved list, who have the NAICS code for the subcontract work sought by the Contractor.
7. Bidders must provide copies of **ALL** solicitations with one of the following forms of verification that the solicitations were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

C. SLBE-ELBE WRITTEN SOLICITATION FOLLOW-UP REQUIREMENTS

Bidders must follow-up with all SLBE - ELBE firms that were notified of the subcontracting opportunities to determine their level of interest and commitment to bid the Project. When following up with the SLBE - ELBE firms, the Bidder must do the following:

1. Follow up communications must start no less than 5 Working Days prior to bid opening.
2. Bidders must follow up with all SLBE-ELBE firms in writing. Bidders must provide copies of **ALL** written follow up notices with one of the following forms of verification that the follow up notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

3. Bidders must make at least 3 follow-up telephone calls to each SLBE – ELBE firm at least 5 days prior to bid opening date. Bidders must submit a telephone log as identified below.
 - 3.1. Submit a telephone log, as proof of telephone call, with the following requirements: project name, name of person making the phone call, name of firm contacted, contact person's name, date of call, time of call, and details of conversation.

D. SUBCONTRACT AWARD SUMMARY

Bidders must act in good faith with interested SLBE-ELBE firms and may only reject bids for legitimate business reasons. The Bidder must submit the following documentation:

1. A **DETAILED** summary sheet which includes Bid item number, scope of work, Subcontractor or Supplier name, bid amount, certification type, Subcontractor or Supplier selection and reason for selection or non-selection of all the Subcontractor or Supplier that responded.
2. Copies of all Subcontractor or Suppliers bids received including bids for areas of work that were not included in the outreach and quotes from both certified and non-certified Subcontractors or Suppliers. Subcontractor bid amounts **MUST** match the bid-listed dollar amounts on form AA35 and AA40 submitted with Bidders sealed bid and the summary sheet dollar amounts **MUST** also match these amounts. If the Bidder decides to self-perform a scope of work, the Bidder **MUST** submit a detailed quote to show that the Bidder's price is competitive to the price of the subcontractors that responded to outreach efforts. All dollar amounts and scopes of work on the Subcontractor or Supplier bid must not be altered by the prime Bidder. If a revision is necessary, a revised quote must be obtained and provided. All verbal quotes **MUST** be substantiated by corresponding written quote from the Subcontractor or Supplier.

E. OUTREACH ASSISTANCE REQUIREMENTS

Written notice of subcontractor opportunities must be forwarded to local organizations or groups to assist with outreach efforts. When contacting local organizations or groups, the Bidder **must do** the following:

1. Contact a minimum of 5 local organizations or groups to provide assistance in contacting, recruiting and using SLBE-ELBE firms by written notice. For a listing of organizations or groups offering assistance, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>
2. Written notice must indicate the date of the notice and name of the local organization or group. Written notices must be forwarded to the organizations or groups at least 10 Workings Days prior to bid opening.
3. Written notice must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 3.1. It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the subcontractor participation percentage, and at a minimum an amount of work equal to the subcontracting participation amount. If necessary to reach the subcontractor participation percentage, the work should include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
4. Written notice must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
5. Written notice must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Written notice must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders must provide copies of **ALL** notices with one of the following forms of verification that the notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

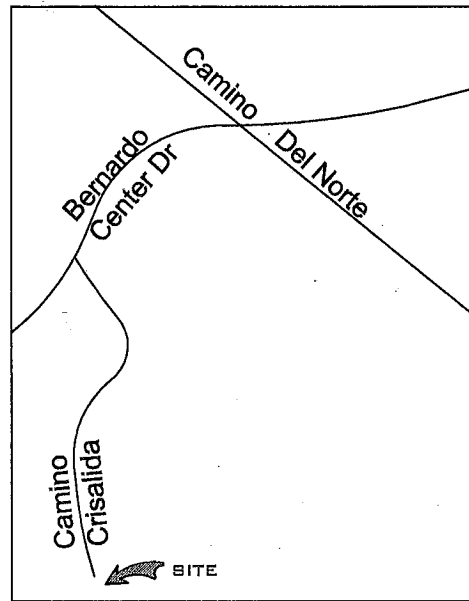
4. **SUBCONTRACTING PARTICIPATION PERCENTAGES.** The Bidders are encouraged to take positive steps to diversify and expand their subcontractor solicitation base and to offer contracting opportunities to all certified SLBE and ELBE Subcontractors.
- 4.1. The City has incorporated **mandatory** SLBE-ELBE 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 | 9.6% |
| 2. ELBE participation | 14.0% |
| 3. Total mandatory participation | 23.6% |
- 4.2. For the purpose of achieving the subcontractor participation level (percentage), Additive, Deductive, and Allowance Bid Items will not be included in the calculation.
5. **PRE-BID CONFERENCE.** A Pre-Bid Conference is scheduled for this contract as specified in the Invitation to Bids. The purpose of this meeting is to inform Bidders of the submittal requirements and provisions relative to the SLBE Program. Bidders are strongly encouraged to attend the Pre-Bid Conference to better understand the Good Faith Effort requirements of this contract.
6. **MANDATORY CONDITIONS.** Bid will be declared **non-responsive** if the Bidder fails the following mandatory conditions.
- 6.1. Bidder's inclusion of SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**
- 6.2. Bidder's submission of Good Faith Effort documentation 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.
7. **BID DISCOUNT.** This contract **is not** subject to the Bid Discount program as described in The WHITEBOOK, SLBE-ELBE Program Requirements, Section IV(2).
8. **RESOURCES.** The current list of certified SLBE-ELBE firms can be found on the EOC Department website.

CITY OF SAN DIEGO PUMP STATION #84 RELOCATION & UPGRADE PRELIMINARY

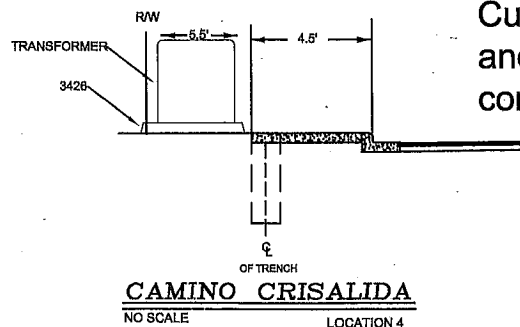
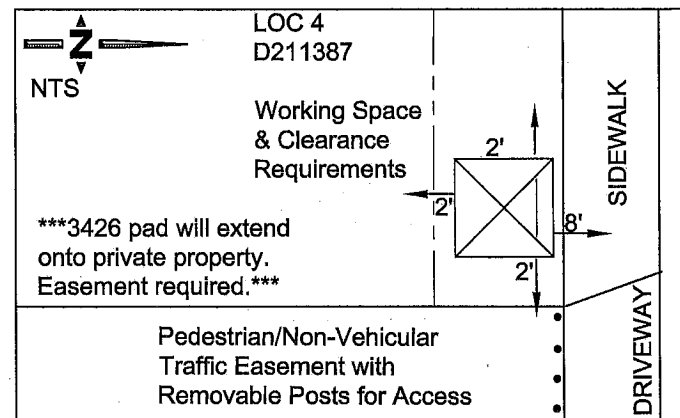


SCALE

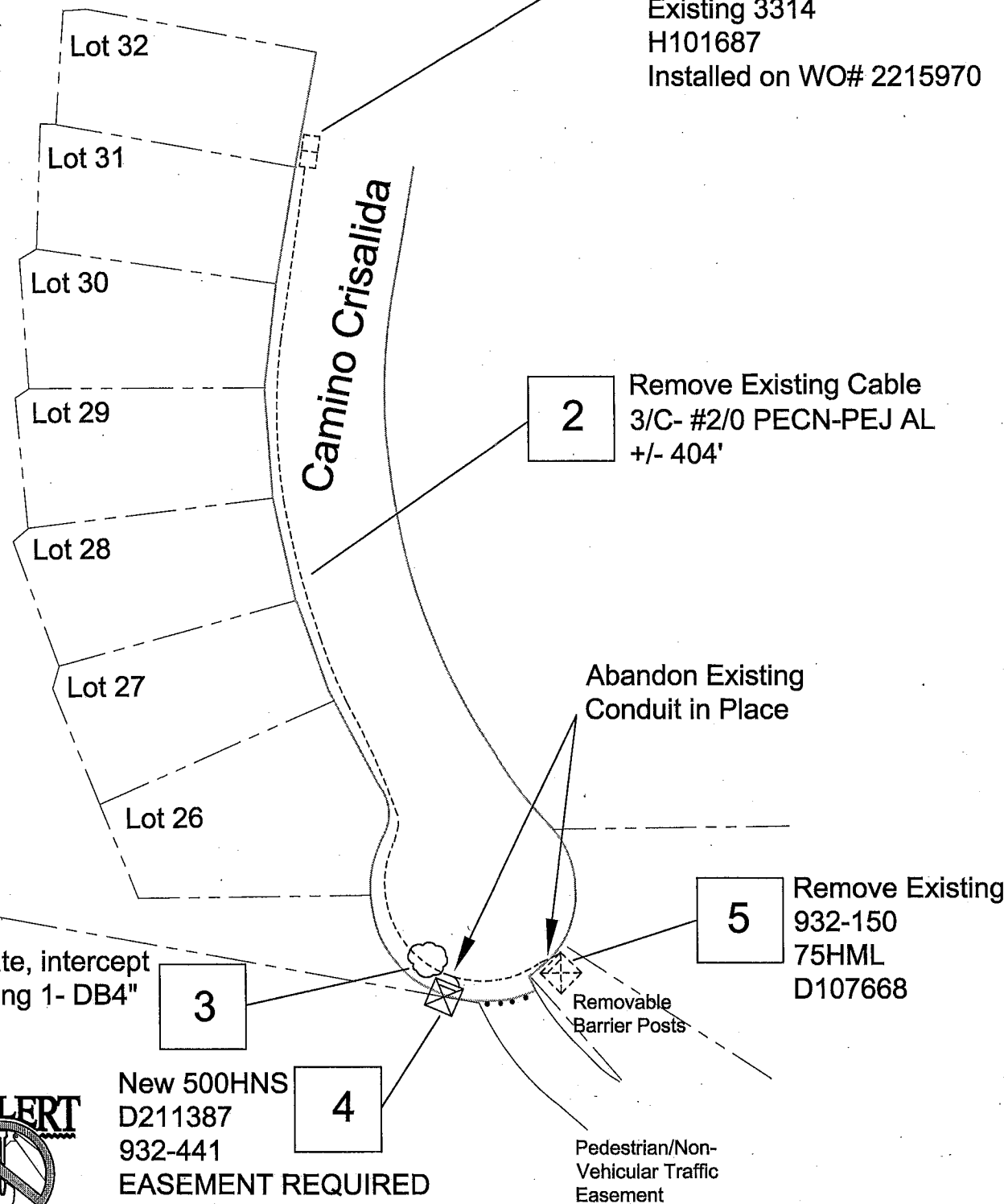
1" = 40'



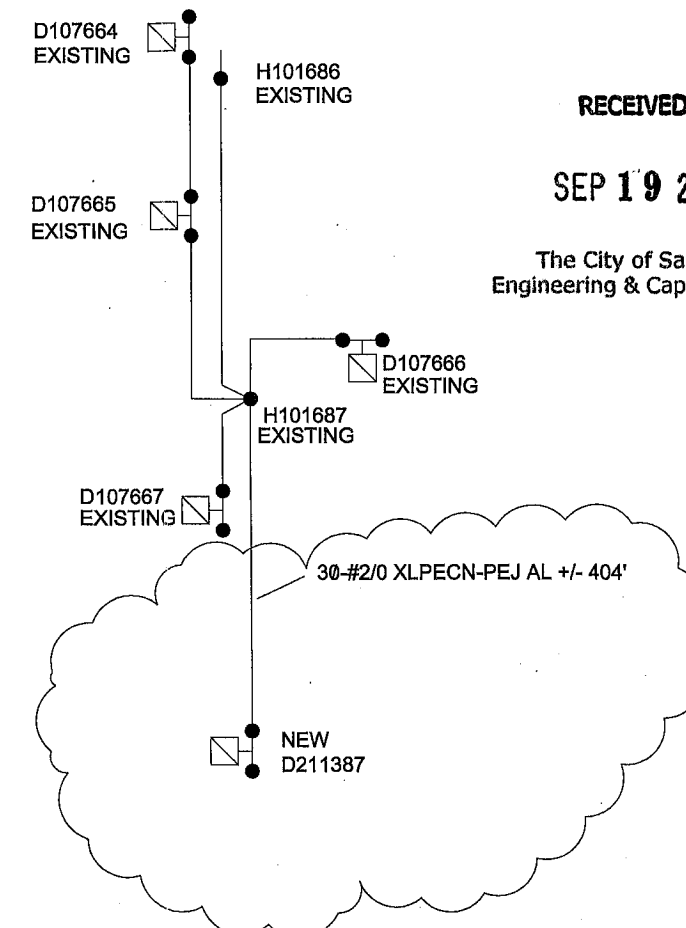
VICINITY MAP
NO SCALE TB 1169-G6



Call 2 Working Days Before You Dig!
1-800-227-2600



ONELINE



RECEIVED

SEP 19 2011

The City of San Diego
Engineering & Capital Projects

NOTES

CUSTOMER IS RESPONSIBLE FOR:
*TRENCH, EXCAVATION AND BACKFILL
*CONDUIT (INCLUDING REDUCERS & ADAPTERS AT HANDHOLES)
*SUBSTRUCTURES
*CONCRETE/SIDEWALK BREAK & REPAIR
*RETAINING WALLS

MAINTAIN A MINIMUM OF 5' WHEN PARALLELING WET UTILITIES AND 6' WHEN CROSSING

MAINTAIN 5' CLEARANCE BETWEEN VEHICULAR TRAFFIC AND PADMOUNTED EQUIPMENT
24 HOUR LINE TRUCK ACCESS TO SDG&E DISTRIBUTION AND SERVICE FACILITIES REQUIRED.

STANDARD CONDUIT BENDS TO BE USED:

CONDUIT BENDS (EXCEPT CP)		
	PRIMARY	SECONDARY
2"	36", 90 DEGREE BEND	24", 90 DEGREE BEND
3"	36", 90 DEGREE BEND	36", 90 DEGREE BEND
4"	36", 90 DEGREE BEND	36", 90 DEGREE BEND
5"	36", 90 DEGREE BEND	36", 90 DEGREE BEND

NEW SERVICE TO BE INSTALLED ON DPSS# 151408-020.

*ALL HORIZONTAL BENDS WILL BE MADE WITH 25 FOOT RADIUS SWEEPS AS PER STD. PG.3374 UNLESS OTHERWISE NOTED

DEVELOPER/OWNER: ROLF LEE, CITY OF SAN DIEGO
PHONE: (619) 533-4660

SDG&E CUSTOMER PROJECT PLANNER: AMY HAYASHI
PHONE: (760) 480-7647

760-480-7647	PLANNER/DESIGNER AMY HAYASHI	09/12/2011	PROJECT NO. 151408-010	SHEET NO. 1 of 1	SAN DIEGO GAS & ELECTRIC ELECTRIC CONSTRUCTION ORDER OH or UG DRAWING	CONSTRUCTION ORDER NO. 2950690	REV/SUPP



SCALE

1" = 40'



APPLICANT APPROVAL

APPROVAL OF THE SYSTEM DESIGN AS IT APPEARS ON THIS CONSTRUCTION DRAWING(S):

- A. Certifies that the location of facilities to be owned and operated by SDG&E are acceptable and are not in conflict with Applicant's planned improvement.
- B. Authorizes SDG&E to proceed with the preparation of final design(s), drawing(s), and/or cost(s). Any further costs incurred by SDG&E in the processing of this project will be at the Applicant's expense if:
 1. There are changes to the system caused by the Applicant or the Applicant's authorized representative.
 2. There is a deviation from the gas/electric load information provided which will necessitate design and/or construction changes.
 3. The project is cancelled after contract negotiations have been completed by Applicant and Utility.
- C. Phasing for energizing requested? YES NO

Applicant Approval _____ Date _____
 Utility Approval _____ Date _____
 FORM 106-141A (021500) 120

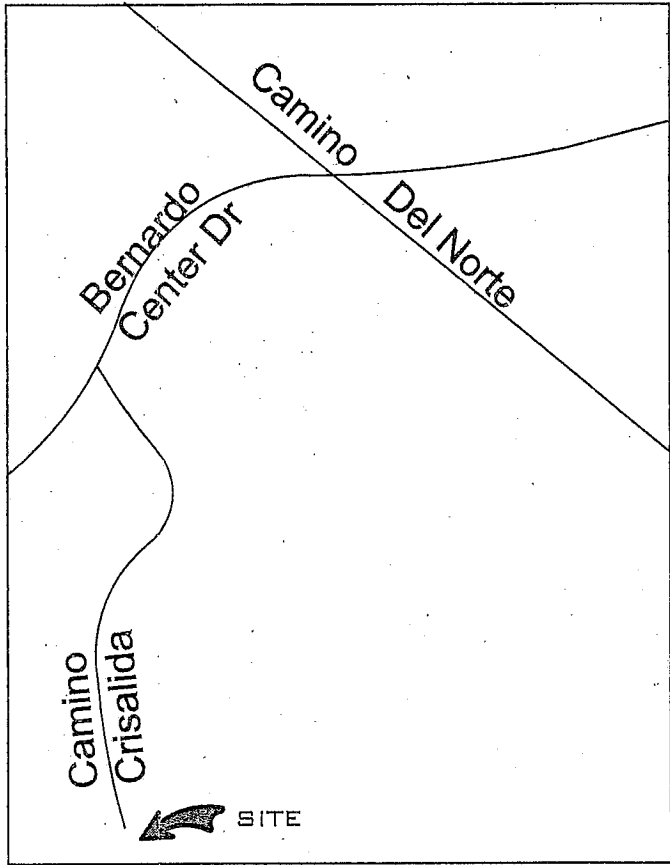
Plat Book/Page
57B-374/375

City of San Diego Pump Station #84 Gas Main Extension



Current Date: 08/23/11
Notice: Return approved preliminary design drawing on or before 5 working days from current date above. If SDG&E has not received the signed preliminary design drawing within the 5 working day period, your original design due date will need to be rescheduled. Rescheduling of your project's design will be subject to the design team's existing schedule. This preliminary design will be void 20 working days after current date above and will be scheduled as a new project should you wish to continue with the design. Changes to a void design may incur a new engineering fee. Customer approval of the preliminary design is mandatory. No costs or customer package will be released without customer approval of the design.

SDG&E/Avery Standard 5164/Joh/05/13/02
 Attach adjacent to SDG&E Applicant Approval Form 106-141A

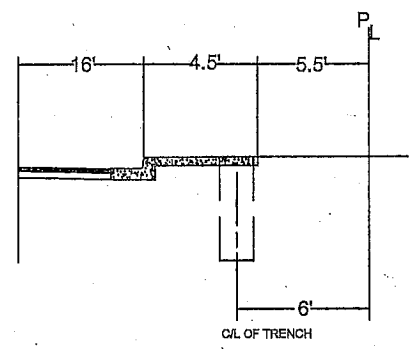


VICINITY MAP
NO SCALE TB 1169-G5

Weld Hole 1
Install 2" coupling

3 5' DE
5# Anode, 2" Cap

2 2" PE +/- 130'
Gas Trench Only



TYPICAL STREET SECTION
NO SCALE



Call 2 Working Days Before You Dig!
1-800-227-2600

NOTES

- COORDINATE WITH UNDERGOURND WORKORDER # 2950690
- ALL STUBS TO BE 1" YELLOW PIPE, EXCEPT AS NOTED
- THIS EXTENSION OF GAS FACILITIES TO BE INSTALLED BY THE DEVELOPER UNDER APPLICANT INSTALLATION (STAMP REQUIRED)
- FIELD ENGINEERING SERVICES TO SET POSITION AND GRADE FOR SDG&E TRENCH
- DEVELOPER/OWNER: Roif Lee, City of San Diego
PHONE: (619) 533-4660
- SDG&E CUSTOMER PROJECT PLANNER: Amy Hayashi
PHONE: (760) 480-7647

RECEIVED
 AUG 26 2011

The City of San Diego
 Engineering & Capital Projects

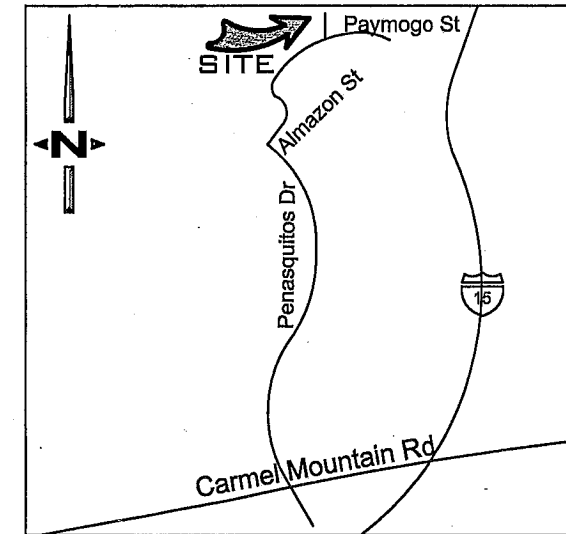
SDGE SAN DIEGO GAS & ELECTRIC ELECTRIC CONSTRUCTION ORDER OR UG DRAWING	PLANNER/DESIGNER AMY HAYASHI 760-480-7647	PROJECT NO. 151408-030	CONSTRUCTION ORDER NO. 1736080
	PLOT DATE 08/23/2011		

City of San Diego Pump Station #62 Remove Facilities

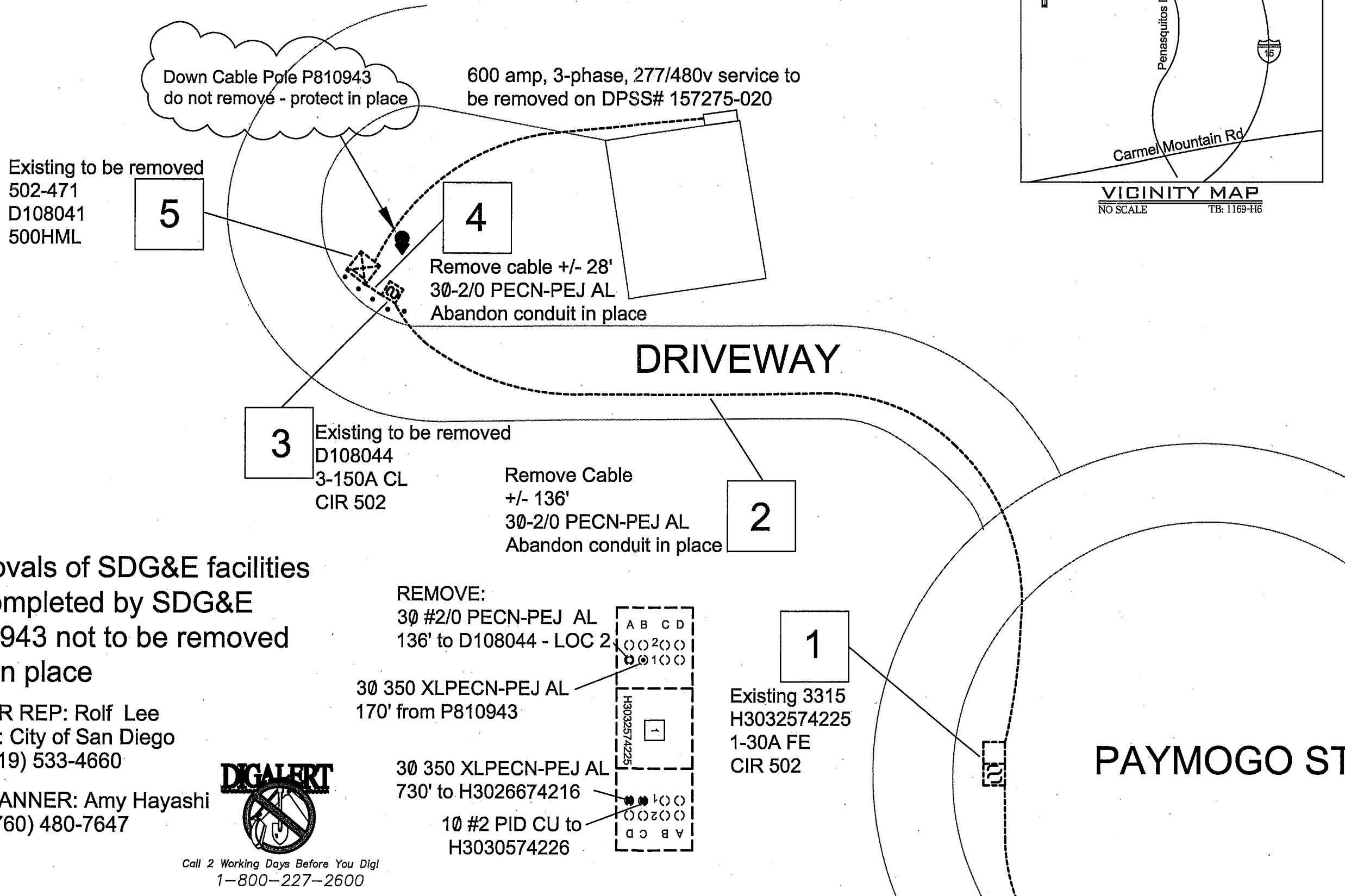


SCALE

1" = NTS



VICINITY MAP
NO SCALE TB: 1169-H6



All removals of SDG&E facilities
to be completed by SDG&E
***P810943 not to be removed
protect in place

CUSTOMER REP: Rolf Lee
COMPANY: City of San Diego
PHONE: (619) 533-4660

SDG&E PLANNER: Amy Hayashi
PHONE: (760) 480-7647



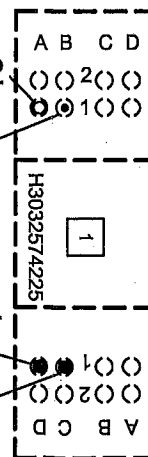
Call 2 Working Days Before You Dig!
1-800-227-2600

REMOVE:
3Ø #2/0 PECN-PEJ AL
136' to D108044 - LOC 2

3Ø 350 XLPECN-PEJ AL
170' from P810943

3Ø 350 XLPECN-PEJ AL
730' to H3026674216

1Ø #2 PID CU to
H3030574226



<p>SAN DIEGO GAS & ELECTRIC ELECTRIC CONSTRUCTION ORDER OH or UG DRAWING</p>	<p>PLANNER/DESIGNER AMY HAYASHI 760-480-7647</p>	<p>CONSTRUCTION ORDER NO. 2951250</p>
	<p>PLANT DATE 11/04/2011</p>	<p>PROJECT NO. 157275-010</p>
<p>REVISIONS</p>		<p>SHT 1 OF 1</p>

City of San Diego

ADDENDUM "F"

FOR



CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

BID NO.:	K-12-5525-DBB-C
SAP NO. (WBS/IO/CC):	S-00308
CLIENT DEPARTMENT:	2011
COUNCIL DISTRICT:	1
PROJECT TYPE:	BP

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

Adel Bassyouni
Professional Engineer or Licensed Architect

Seal:

For which proposals will be received at the Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California, until **2:00 PM on APRIL 13, 2012.**

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

Q1. For the bridge crane, drawing S-13 references 3'-6" total from top of beam to the hook. The specs call out for a single girder crane Part 2-Products General Requirements C. The 3'-6" cannot be met with a single girder we will need to go with a double girder crane or the 3'-6" will be greater.

A1. Refer to Section C. Volume 1, item 1 of this Addendum.

- Q2. Can I please obtain the Mitigation Monitoring and Reporting Program (MMRP)?
- A2. The MMRP is attached to this addendum.
- Q3. Are there any interim milestones on this project?
- A3. Yes. Beneficial use of station 84 as intended in the final design (without utilizing station 62) shall be accomplished within 300 calendar days from Notice To Proceed (NTP).
- Q4. What are the fines associated with missing the EPA deadline of June 30, 2013 for beneficial use of station 84, and are they going to be passed onto the contractor?
- A4. The fines are \$750.00/day for days 1 – 14, \$1,500.00/day for days 15 – 28, and \$3,000.00/day for days over 28. Yes, any fine for missing the EPA deadline will be passed on to the Contractor.

C. VOLUME 1

1. To the Technical Specifications, Section 14630 – Bridge Cranes, Part 2 – Products, item C. Design Criteria, page 505, “Type of Bridge”, **DELETE** in its entirety and **SUBSTITUTE** with the following:

Type of Crane	Single or Double Beam
---------------	-----------------------
2. To Appendix A (Reserved), page 685, **DELETE** in its entirety and **SUBSTITUTE** with page 3 of 15 through 15 of 15 of this Addendum.

Tony Heinrichs, Director
Public Works Department

Dated: *March 26, 2012*
San Diego, California

TH/nb/ca/egz

APPENDIX A

**MITIGATION, MONITORING AND REPORTING PROGRAM FOR
Sewer Pump Station 84 Upgrades and Pump Station 62 Abandonment
PTS No. 242235**

MITIGATION, MONITORING AND REPORTING PROGRAM:

A. GENERAL REQUIREMENTS – PART I

Plan Check Phase (prior to permit issuance)

1. Prior to the issuance Bid Opening/Bid Award or beginning any construction related activity on-site, the Development Services Department (DSD) Director's Environmental Designee (ED) shall review and approve all Construction Documents (CD), (plans, specification, details, etc.) to ensure the MMRP requirements have been incorporated.
2. In addition, the ED shall verify that the MMRP Conditions/Notes that apply ONLY to the construction phases of this project are included VERBATIM, under the heading, "ENVIRONMENTAL/MITIGATION REQUIREMENTS."
3. These notes must be shown within the first three (3) sheets of the construction documents in the format specified for engineering construction document templates as shown on the City website:

<http://www.sandiego.gov/development-services/industry/standtemp.shtml>

4. The **TITLE INDEX SHEET** must also show on which pages the "Environmental/Mitigation Requirements" notes are provided.

B. GENERAL REQUIREMENTS – PART II

Post Plan Check (After permit issuance/Prior to start of construction)

1. **PRE CONSTRUCTION MEETING IS REQUIRED TEN (10) WORKING DAYS PRIOR TO BEGINNING ANY WORK ON THIS PROJECT.** The PERMIT HOLDER/OWNER is responsible to arrange and perform this meeting by contacting the CITY RESIDENT ENGINEER (RE) of the Field Engineering Division and City staff from MITIGATION MONITORING COORDINATION (MMC). Attendees must also include the Permit holder's Representative(s), Job Site Superintendent and the following consultants:

Archaeologist, Native American Monitor, Environmental Services Department (ESD) Office, Asbestos and Lead Management Program (ALMP) representative

Note: Failure of all responsible Permit Holder's representatives and consultants to attend shall require an additional meeting with all parties present.

CONTACT INFORMATION:

- a) The PRIMARY POINT OF CONTACT is the **RE** at the **Field Engineering Division – 858-627-3200**
- b) For Clarification of ENVIRONMENTAL REQUIREMENTS, it is also required to call **RE and MMC at 858-627-3360**

2. MMRP COMPLIANCE: This Project, Project Tracking System (PTS) 242235, shall conform to the mitigation requirements contained in the associated Environmental Document and implemented to the satisfaction of the DSD's ED, MMC and the City Engineer (RE). The requirements may not be reduced or changed but may be annotated (i.e. to explain when and how compliance is being met and location of verifying proof, etc.). Additional clarifying information may also be added to other relevant plan sheets and/or specifications as appropriate (i.e., specific locations, times of monitoring, methodology, etc)

Note: Permit Holder's Representatives must alert RE and MMC if there are any discrepancies in the plans or notes, or any changes due to field conditions. All conflicts must be approved by RE and MMC BEFORE the work is performed.

3. OTHER AGENCY REQUIREMENTS: Evidence that any other agency requirements or permits have been obtained or are in process shall be submitted to the RE and MMC for review and acceptance prior to the beginning of work or within one week of the Permit Holder obtaining documentation of those permits or requirements. Evidence shall include copies of permits, letters of resolution or other documentation issued by the responsible agency.

Not Applicable for this project.

4. MONITORING EXHIBITS: All consultants are required to submit, to RE and MMC, a monitoring exhibit on a 11x17 reduction of the appropriate construction plan, such as site plan, grading, landscape, etc., marked to clearly show the specific areas including the **LIMIT OF WORK**, scope of that discipline's work, and notes indicating when in the construction schedule that work will be performed. When necessary for clarification, a detailed methodology of how the work will be performed shall be included.

5. OTHER SUBMITTALS AND INSPECTIONS: The Permit Holder/Owner's representative shall submit all required documentation, verification letters, and requests for all associated inspections to the RE and MMC for approval per the following schedule:

Document Submittal/Inspection Checklist

<i>Issue Area</i>	<i>Document submittal</i>	<i>Associated Inspection/Approvals/Note</i>
General	Consultant Qualification Letters	Prior to Pre-construction meeting
General	Consultant Const. Monitoring	Prior to or at the Pre-Construction meeting
Archaeology	Archaeology Reports	Archaeological observation
Final MMRP		Final MMRP Inspection
Biology	bird nesting letter report	Prior to Pre-construction

BIOLOGY

- I. If project grading/vegetation clearing is proposed in or adjacent to native habitat during the typical bird breeding season (i.e. February 1 through September 15), or an active nest is noted, the project biologist shall conduct a pre-grading survey for active nests in the development area and within 300 feet of it, and submit a letter report to Mitigation Monitoring Coordinator (MMC) prior to the pre-construction meeting.
 - A. If active nests are detected, or considered likely, the report shall include mitigation in conformance with the City's Biology Guidelines and applicable State and Federal Law (i.e. appropriate follow up surveys, monitoring schedules, construction and noise barriers/buffers, etc.) to the satisfaction of the Assistant Deputy Director (ADD) of the Entitlements Division. Mitigation requirements determined by the project biologist and the ADD shall be incorporated into the project's Biological Construction Monitoring Exhibit and monitoring results incorporated into the final biological construction monitoring report.
 - B. If no nesting birds are detected per "A" above, mitigation under "A" is not required.

HISTORICAL RESOURCES (ARCHAEOLOGY)

I. Prior to Permit Issuance or Bid Opening/Bid Award

- A. Entitlements Plan Check
 1. Prior to permit issuance or Bid Opening/Bid Award, whichever is applicable, the Assistant Deputy Director (ADD) Environmental designee shall verify that the requirements for Archaeological Monitoring and Native American monitoring have been noted on the applicable construction documents through the plan check process.
- B. Letters of Qualification have been submitted to ADD
 1. Prior to Bid Award, the applicant shall submit a letter of verification to Mitigation Monitoring Coordination (MMC) identifying the Principal Investigator (PI) for the project and the names of all persons involved in the archaeological monitoring program, as defined in the City of San Diego Historical Resources Guidelines (HRG). If applicable, individuals involved in the archaeological monitoring program must have completed the 40-hour HAZWOPER training with certification documentation.
 2. MMC will provide a letter to the applicant confirming the qualifications of the PI and all persons involved in the archaeological monitoring of the project meet the qualifications established in the HRG.

3. Prior to the start of work, the applicant must obtain written approval from MMC for any personnel changes associated with the monitoring program.

II. Prior to Start of Construction

A. Verification of Records Search

1. The PI shall provide verification to MMC that a site specific records search (1/4 mile radius) has been completed. Verification includes, but is not limited to a copy of a confirmation letter from South Coastal Information Center, or, if the search was in-house, a letter of verification from the PI stating that the search was completed.
2. The letter shall introduce any pertinent information concerning expectations and probabilities of discovery during trenching and/or grading activities.
3. The PI may submit a detailed letter to MMC requesting a reduction to the 1/4 mile radius.

B. PI Shall Attend Precon Meetings

1. Prior to beginning any work that requires monitoring; the Applicant shall arrange a Precon Meeting that shall include the PI, Native American consultant/monitor (where Native American resources may be impacted), Construction Manager (CM) and/or Grading Contractor, Resident Engineer (RE), Building Inspector (BI), if appropriate, and MMC. The qualified Archaeologist and Native American Monitor shall attend any grading/excavation related Precon Meetings to make comments and/or suggestions concerning the Archaeological Monitoring program with the Construction Manager and/or Grading Contractor.
 - a. If the PI is unable to attend the Precon Meeting, the Applicant shall schedule a focused Precon Meeting with MMC, the PI, RE, CM or BI, if appropriate, prior to the start of any work that requires monitoring.

2. Acknowledgement of Responsibility for Curation (CIP or Other Public Projects)

The applicant shall submit a letter to MMC acknowledging their responsibility for the cost of curation associated with all phases of the archaeological monitoring program.

3. Identify Areas to be Monitored
 - a. Prior to the start of any work that requires monitoring, the PI shall submit an Archaeological Monitoring Exhibit (AME) (with verification that the AME has been reviewed and approved by the Native American consultant/monitor when Native American resources may be impacted) based on the appropriate construction

documents (reduced to 11x17) to MMC identifying the areas to be monitored including the delineation of grading/excavation limits.

- b. The AME shall be based on the results of a site specific records search as well as information regarding the age of existing pipelines, laterals and associated appurtenances and/or any known soil conditions (native or formation).
 - c. MMC shall notify the PI that the AME has been approved.
4. When Monitoring Will Occur
- a. Prior to the start of any work, the PI shall also submit a construction schedule to MMC through the RE indicating when and where monitoring will occur.
 - b. The PI may submit a detailed letter to MMC prior to the start of work or during construction requesting a modification to the monitoring program. This request shall be based on relevant information such as review of final construction documents which indicate conditions such as age of existing pipe to be replaced, depth of excavation and/or site graded to bedrock, etc., which may reduce or increase the potential for resources to be present.
5. Approval of AME and Construction Schedule
- After approval of the AME by MMC, the PI shall submit to MMC written authorization of the AME and Construction Schedule from the CM.

III. During Construction

A. Monitor Shall be Present During Grading/Excavation/Trenching

1. The Archaeological Monitor shall be present full-time during all soil disturbing and grading/excavation/trenching activities which could result in impacts to archaeological resources as identified on the AME. **The Construction Manager is responsible for notifying the RE, PI, and MMC of changes to any construction activities such as in the case of a potential safety concern within the area being monitored. In certain circumstances OSHA's safety requirements may necessitate modification of the AME.**
2. The Native American consultant/monitor shall determine the extent of their presence during soil disturbing and grading/excavation/trenching activities based on the AME and provide that information to the PI and MMC. If prehistoric resources are encountered during the Native American consultant/monitor's absence, work shall stop and the Discovery Notification Process detailed in Section III.B-C and IV.A-D shall commence.

3. The PI may submit a detailed letter to MMC during construction requesting a modification to the monitoring program when a field condition such as modern disturbance post-dating the previous grading/trenching activities, presence of fossil formations, or when native soils are encountered that may reduce or increase the potential for resources to be present.
4. The archaeological and Native American consultant/monitor shall document field activity via the Consultant Site Visit Record (CSVR). The CSVR's shall be faxed by the CM to the RE the first day of monitoring, the last day of monitoring, monthly (**Notification of Monitoring Completion**), and in the case of ANY discoveries. The RE shall forward copies to MMC.

B. Discovery Notification Process

1. In the event of a discovery, the Archaeological Monitor shall direct the contractor to temporarily divert all soil disturbing activities, including but not limited to digging, trenching, excavating or grading activities in the area of discovery and in the area reasonably suspected to overlay adjacent resources and immediately notify the RE or BI, as appropriate.
2. The Monitor shall immediately notify the PI (unless Monitor is the PI) of the discovery.
3. The PI shall immediately notify MMC by phone of the discovery, and shall also submit written documentation to MMC within 24 hours by fax or email with photos of the resource in context, if possible.
4. No soil shall be exported off-site until a determination can be made regarding the significance of the resource specifically if Native American resources are encountered.

C. Determination of Significance

1. The PI and Native American consultant/monitor, where Native American resources are discovered shall evaluate the significance of the resource. If Human Remains are involved, follow protocol in Section IV below.
 - a. The PI shall immediately notify MMC by phone to discuss significance determination and shall also submit a letter to MMC indicating whether additional mitigation is required.
 - b. If the resource is significant, the PI shall submit an Archaeological Data Recovery Program (ADRP) and obtain written approval of the program from MMC, CM and RE. ADRP and any mitigation must be approved by MMC, RE and/or CM before ground disturbing activities in the area of discovery will be allowed to resume. **Note: If a unique**

archaeological site is also an historical resource as defined in CEQA Section 15064.5, then the limits on the amount(s) that a project applicant may be required to pay to cover mitigation costs as indicated in CEQA Section 21083.2 shall not apply.

(1). Note: For pipeline trenching and other linear projects in the public Right-of-Way, the PI shall implement the Discovery Process for Pipeline Trenching projects identified below under “D.”

c. If the resource is not significant, the PI shall submit a letter to MMC indicating that artifacts will be collected, curated, and documented in the Final Monitoring Report. The letter shall also indicate that that no further work is required.

(1). Note: For Pipeline Trenching and other linear projects in the public Right-of-Way, if the deposit is limited in size, both in length and depth; the information value is limited and is not associated with any other resource; and there are no unique features/artifacts associated with the deposit, the discovery should be considered not significant.

(2). Note, for Pipeline Trenching and other linear projects in the public Right-of-Way, if significance cannot be determined, the Final Monitoring Report and Site Record (DPR Form 523A/B) shall identify the discovery as Potentially Significant.

D. Discovery Process for Significant Resources - Pipeline Trenching and other Linear Projects in the Public Right-of-Way

The following procedure constitutes adequate mitigation of a significant discovery encountered during pipeline trenching activities or for other linear project types within the Public Right-of-Way including but not limited to excavation for jacking pits, receiving pits, laterals, and manholes to reduce impacts to below a level of significance:

1. Procedures for documentation, curation and reporting

a. One hundred percent of the artifacts within the trench alignment and width shall be documented in-situ, to include photographic records, plan view of the trench and profiles of side walls, recovered, photographed after cleaning and analyzed and curated. The remainder of the deposit within the limits of excavation (trench walls) shall be left intact.

b. The PI shall prepare a Draft Monitoring Report and submit to MMC via the RE as indicated in Section VI-A.

- c. The PI shall be responsible for recording (on the appropriate State of California Department of Park and Recreation forms-DPR 523 A/B) the resource(s) encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines. The DPR forms shall be submitted to the South Coastal Information Center for either a Primary Record or SDI Number and included in the Final Monitoring Report.
- d. The Final Monitoring Report shall include a recommendation for monitoring of any future work in the vicinity of the resource.

IV. Discovery of Human Remains

If human remains are discovered, work shall halt in that area and no soil shall be exported off-site until a determination can be made regarding the provenance of the human remains; and the following procedures as set forth in CEQA Section 15064.5(e), the California Public Resources Code (Sec. 5097.98) and State Health and Safety Code (Sec. 7050.5) shall be undertaken:

A. Notification

1. Archaeological Monitor shall notify the RE or BI as appropriate, MMC, and the PI, if the Monitor is not qualified as a PI. MMC will notify the appropriate Senior Planner in the Environmental Analysis Section (EAS) of the Development Services Department to assist with the discovery notification process.
2. The PI shall notify the Medical Examiner after consultation with the RE, either in person or via telephone.

B. Isolate discovery site

1. Work shall be directed away from the location of the discovery and any nearby area reasonably suspected to overlay adjacent human remains until a determination can be made by the Medical Examiner in consultation with the PI concerning the provenience of the remains.
2. The Medical Examiner, in consultation with the PI, will determine the need for a field examination to determine the provenience.
3. If a field examination is not warranted, the Medical Examiner will determine with input from the PI, if the remains are or are most likely to be of Native American origin.

C. If Human Remains **ARE** determined to be Native American

1. The Medical Examiner will notify the Native American Heritage Commission (NAHC) within 24 hours. By law, **ONLY** the Medical Examiner can make this call.

2. NAHC will immediately identify the person or persons determined to be the Most Likely Descendent (MLD) and provide contact information.
3. The MLD will contact the PI within 24 hours or sooner after the Medical Examiner has completed coordination, to begin the consultation process in accordance with CEQA Section 15064.5(e), the California Public Resources and Health & Safety Codes.
4. The MLD will have 48 hours to make recommendations to the property owner or representative, for the treatment or disposition with proper dignity, of the human remains and associated grave goods.
5. Disposition of Native American Human Remains will be determined between the MLD and the PI, and, if:
 - a. The NAHC is unable to identify the MLD, OR the MLD failed to make a recommendation within 48 hours after being notified by the Commission, OR;
 - b. The landowner or authorized representative rejects the recommendation of the MLD and mediation in accordance with PRC 5097.94 (k) by the NAHC fails to provide measures acceptable to the landowner, THEN
 - c. To protect these sites, the landowner shall do one or more of the following:
 - (1) Record the site with the NAHC;
 - (2) Record an open space or conservation easement; or
 - (3) Record a document with the County.
 - d. Upon the discovery of multiple Native American human remains during a ground disturbing land development activity, the landowner may agree that additional conferral with descendants is necessary to consider culturally appropriate treatment of multiple Native American human remains. Culturally appropriate treatment of such a discovery may be ascertained from review of the site utilizing cultural and archaeological standards. Where the parties are unable to agree on the appropriate treatment measures the human remains and items associated and buried with Native American human remains shall be reinterred with appropriate dignity, pursuant to Section 5.c., above.

D. If Human Remains are **NOT** Native American

1. The PI shall contact the Medical Examiner and notify them of the historic era context of the burial.

2. The Medical Examiner will determine the appropriate course of action with the PI and City staff (PRC 5097.98).
3. If the remains are of historic origin, they shall be appropriately removed and conveyed to the San Diego Museum of Man for analysis. The decision for internment of the human remains shall be made in consultation with MMC, EAS, the applicant/landowner, any known descendant group, and the San Diego Museum of Man.

V. Night and/or Weekend Work

- A. If night and/or weekend work is included in the contract
 1. When night and/or weekend work is included in the contract package, the extent and timing shall be presented and discussed at the precon meeting.
 2. The following procedures shall be followed.
 - a. No Discoveries
In the event that no discoveries were encountered during night and/or weekend work, the PI shall record the information on the CSVR and submit to MMC via fax by 8AM of the next business day.
 - b. Discoveries
All discoveries shall be processed and documented using the existing procedures detailed in Sections III - During Construction, and IV – Discovery of Human Remains. Discovery of human remains shall always be treated as a significant discovery.
 - c. Potentially Significant Discoveries
If the PI determines that a potentially significant discovery has been made, the procedures detailed under Section III - During Construction and IV-Discovery of Human Remains shall be followed.
 - d. The PI shall immediately contact the RE and MMC, or by 8AM of the next business day to report and discuss the findings as indicated in Section III-B, unless other specific arrangements have been made.
- B. If night and/or weekend work becomes necessary during the course of construction:
 1. The Construction Manager shall notify the RE, or BI, as appropriate, a minimum of 24 hours before the work is to begin.
 2. The RE, or BI, as appropriate, shall notify MMC immediately.
- C. All other procedures described above shall apply, as appropriate.

VI. Post Construction

A. Submittal of Draft Monitoring Report

1. The PI shall submit two copies of the Draft Monitoring Report (even if negative), prepared in accordance with the Historical Resources Guidelines (Appendix C/D) which describes the results, analysis, and conclusions of all phases of the Archaeological Monitoring Program (with appropriate graphics) to MMC via the RE for review and approval within 90 days following the completion of monitoring. **It should be noted that if the PI is unable to submit the Draft Monitoring Report within the allotted 90-day timeframe as a result of delays with analysis, special study results or other complex issues, a schedule shall be submitted to MMC establishing agreed due dates and the provision for submittal of monthly status reports until this measure can be met.**

- a. For significant archaeological resources encountered during monitoring, the Archaeological Data Recovery Program or Pipeline Trenching Discovery Process shall be included in the Draft Monitoring Report.

- b. Recording Sites with State of California Department of Parks and Recreation

The PI shall be responsible for recording (on the appropriate State of California Department of Park and Recreation forms-DPR 523 A/B) any significant or potentially significant resources encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines, and submittal of such forms to the South Coastal Information Center with the Final Monitoring Report.

2. MMC shall return the Draft Monitoring Report to the PI via the RE for revision or, for preparation of the Final Report.
3. The PI shall submit revised Draft Monitoring Report to MMC via the RE for approval.
4. MMC shall provide written verification to the PI of the approved report.
5. MMC shall notify the RE or BI, as appropriate, of receipt of all Draft Monitoring Report submittals and approvals.

B. Handling of Artifacts

1. The PI shall be responsible for ensuring that all cultural remains collected are cleaned and catalogued

2. The PI shall be responsible for ensuring that all artifacts are analyzed to identify function and chronology as they relate to the history of the area; that faunal material is identified as to species; and that specialty studies are completed, as appropriate.
- C. Curation of artifacts: Accession Agreement and Acceptance Verification
1. The PI shall be responsible for ensuring that all artifacts associated with the survey, testing and/or data recovery for this project are permanently curated with an appropriate institution. This shall be completed in consultation with MMC and the Native American representative, as applicable.
 2. When applicable to the situation, the PI shall include written verification from the Native American consultant/monitor indicating that Native American resources were treated in accordance with state law and/or applicable agreements. If the resources were reinterred, verification shall be provided to show what protective measures were taken to ensure no further disturbance occurs in accordance with Section IV – Discovery of Human Remains, Subsection C.
 3. The PI shall submit the Accession Agreement and catalogue record(s) to the RE or BI, as appropriate for donor signature with a copy submitted to MMC.
 4. The RE or BI, as appropriate shall obtain signature on the Accession Agreement and shall return to PI with copy submitted to MMC.
 5. The PI shall include the Acceptance Verification from the curation institution in the Final Monitoring Report submitted to the RE or BI and MMC.
- D. Final Monitoring Report(s)
1. The PI shall submit one copy of the approved Final Monitoring Report to the RE or BI as appropriate, and one copy to MMC (even if negative), within 90 days after notification from MMC of the approved report.
 2. The RE shall, in no case, issue the Notice of Completion until receiving a copy of the approved Final Monitoring Report from MMC which includes the Acceptance Verification from the curation institution.

City of San Diego

CONTRACTOR'S NAME: TL CONSTRUCTION Co. INC.
ADDRESS: 10540 PROSPECT AVE., SANTEE, CA. 92071
TELEPHONE NO.: 619-448-4560 FAX NO.: 619-448-3341
CITY CONTACT: ROLF LEE, 600 B Street Suite 800 MS 908A, San Diego, CA 92101
Email: rlee@sandiego.gov, Phone: (619) 533-4660, Fax: (619) 533-5278

CA/NB/egz

CONTRACT DOCUMENTS FOR



CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT

VOLUME 2 OF 2

BID NO.: K-12-5525-DBB-C
SAP NO. (WBS/IO/CC): S-00308
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 1
PROJECT TYPE: BP

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.

**THIS BIDDING DOCUMENT TO BE SUBMITTED IN ITS ENTIRETY
REFER TO INVITATION TO BIDS FOR TIME, DATE, AND LOCATION**

TABLE OF CONTENTS

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.

<u>DESCRIPTION</u>	<u>PAGE NUMBER</u>
1. Bid/Proposal.....	3-5
2. Bid Bond.....	6
3. Non-collusion Affidavit to be Executed By Bidder and Submitted with Bid.....	7
4. Contractors Certification of Pending Actions.....	8
5. Equal Benefits Ordinance Certification of Compliance.....	9
6. Proposal (Bid).....	10-12
7. Form AA35 List of Subcontractors.....	13
8. Form AA40 Named Equipment/Material Supplier List.....	14

BIDDING DOCUMENTS

PROPOSAL

Bidder's General Information

To the City of San Diego:

Pursuant to "Invitation to 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: *N/A*

- (1) Name under which business is conducted _____
- (2) Signature (Given and surname) of proprietor _____
- (3) Place of Business (Street & Number) _____
- (4) City and State _____ Zip Code _____
- (5) Telephone No. _____ Facsimile No. _____

IF A PARTNERSHIP, SIGN HERE: *N/A*

- (1) Name under which business is conducted _____
- (2) Name of each member of partnership [indicate character of each partner, general or special (limited):

BIDDING DOCUMENTS

(3) Signature (Note: Signature must be made by a general partner)

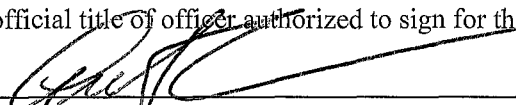
Full Name and Character of partner

(4) Place of Business (Street & Number) _____
(5) City and State _____ Zip Code _____
(6) Telephone No. _____ Facsimile No. _____

IF A CORPORATION, SIGN HERE:

(1) Name under which business is conducted TC CONSTRUCTION CO. INC.

(2) Signature, with official title of officer authorized to sign for the corporation:



(Signature)

AUSTIN CAMERON

(Printed Name)

SECRETARY

(Title of Officer)

(Impress Corporate Seal Here)

(3) Incorporated under the laws of the State of CALIFORNIA

(4) Place of Business (Street & Number) 10540 PROSPECT AVE.
(5) City and State SANTEE CA. Zip Code 92071
(6) Telephone No. 619-448-4560 Facsimile No. 619-448-3341

THE FOLLOWING SECTIONS MUST BE FILLED IN BY ALL PROPOSERS:

In accordance with the "INVITATION TO 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 A, C-21

LICENSE NO. 402459 EXPIRES 4-30, 2013

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.

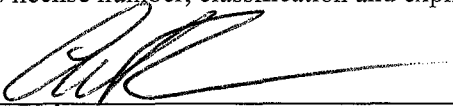
TAX IDENTIFICATION NUMBER (TIN): [REDACTED]

E-Mail Address: aacameron@tcincsd.com

BIDDING DOCUMENTS

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  Title SECRETARY
AUSTIN CAMERON

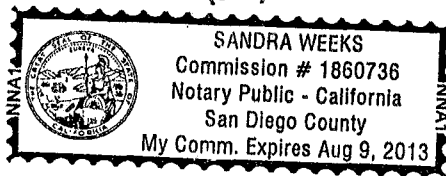
SUBSCRIBED AND SWORN TO BEFORE ME, THIS _____ DAY OF _____, 2____.

Notary Public in and for the County of _____, State of _____

(NOTARIAL SEAL)

State of California County of
San Diego
Subscribed and sworn to (or affirmed)
before me on this 11th day of April, 2012, by
Austin Cameron
proved to me on the basis of satisfactory evidence
to be the person(s) who appeared before me.
Signature Sandra Weeks

(Seal)



BIDDING DOCUMENTS

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That TC Construction Company, Inc. as Principal, and
Liberty Mutual 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

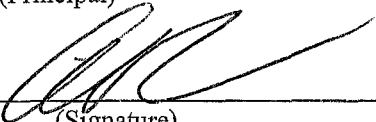
City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment; Bid No. K-12-5525-DBB-C

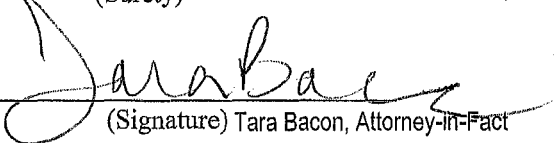
NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time
and in the manner required in the "Invitation to Bids" enters into a written Agreement on the form of
agreement bound with said Contract Documents, furnishes the required certificates of insurance, and
furnishes 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 8th day of March, 2012

TC Construction Company, Inc. (SEAL)
(Principal)

Liberty Mutual Insurance Company (SEAL)
(Surety)

By: 
(Signature)

By: 
(Signature) Tara Bacon, Attorney-in-Fact

AUSTIN CAMERON, SECRETARY
(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

State of California

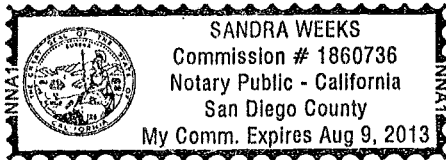
County of San Diego

On April 11, 2012 before me,

Sandra Weeks, Notary Public
Here Insert Name and Title of the Officer

personally appeared

Austin Cameron
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: Sandra Weeks
Signature of Notary Public

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 this 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: _____

Corporate Officer — Title(s): _____

Individual

Partner — Limited General

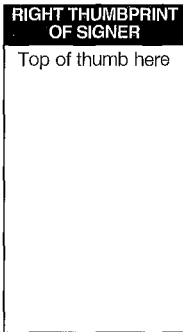
Attorney in Fact

Trustee

Guardian or Conservator

Other: _____

Signer Is Representing: _____



Signer's Name: _____

Corporate Officer — Title(s): _____

Individual

Partner — Limited General

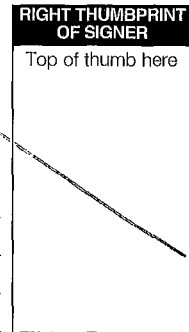
Attorney in Fact

Trustee

Guardian or Conservator

Other: _____

Signer Is Representing: _____



ACKNOWLEDGMENT

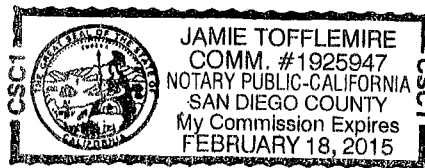
State of California
County of San Diego

On March 8, 2012 before me, Jamie Tofflemire, Notary Public, personally appeared Tara Bacon, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that she executed the same in her authorized capacity, and that by her signature on the instrument the person, or the entity upon behalf of which the person 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



(Seal)

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

LIBERTY MUTUAL INSURANCE COMPANY
BOSTON, MASSACHUSETTS
POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS: That Liberty Mutual Insurance Company (the "Company"), a Massachusetts stock insurance company, pursuant to and by authority of the By-law and Authorization hereinafter set forth, does hereby name, constitute and appoint DALE G. HARSHAW, BRADLEY R. ORR, GEOFFREY SHELTON, TARA BACON, ALL OF THE CITY OF SAN DIEGO, STATE OF CALIFORNIA.....

, each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations in the penal sum not exceeding FIFTY MILLION AND 00/100***** DOLLARS (\$ 50,000,000.00*****) each, and the execution of such undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

That this power is made and executed pursuant to and by authority of the following By-law and Authorization:

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.

Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

By the following instrument the chairman or the president has authorized the officer or other official named therein to appoint attorneys-in-fact:

Pursuant to Article XIII, Section 5 of the By-Laws, David M. Carey, Assistant Secretary of Liberty Mutual Insurance Company, is hereby authorized to appoint such attorneys-in-fact as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

That the By-law and the Authorization set forth above are true copies thereof and are now in full force and effect.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Company and the corporate seal of Liberty Mutual Insurance Company has been affixed thereto in Plymouth Meeting, Pennsylvania this day of 9th day of September, 2011.



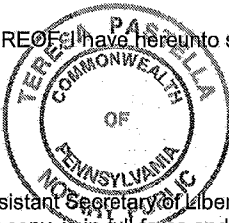
LIBERTY MUTUAL INSURANCE COMPANY

By David M. Carey
David M. Carey, Assistant Secretary

COMMONWEALTH OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 9th day of September, 2011, before me, a Notary Public, personally came David M. Carey, to me known, and acknowledged that he is an Assistant Secretary of Liberty Mutual Insurance Company; that he knows the seal of said corporation; and that he executed the above Power of Attorney and affixed the corporate seal of Liberty Mutual Insurance Company thereto with the authority and at the direction of said corporation.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.



Notarial Seal
Teresa Pastella, Notary Public
Plymouth Twp., Montgomery County
My Commission Expires Mar. 28, 2013
Member, Pennsylvania Association of Notaries

By Teresa Pastella
Teresa Pastella, Notary Public

CERTIFICATE

I, the undersigned, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy, is in full force and effect on the date of this certificate; and I do further certify that the officer or official who executed the said power of attorney is an Assistant Secretary specially authorized by the chairman or the president to appoint attorneys-in-fact as provided in Article XIII, Section 5 of the By-laws of Liberty Mutual Insurance Company.

This certificate and the above power of attorney may be signed by facsimile or mechanically reproduced signatures under and by authority of the following vote of the board of directors of Liberty Mutual Insurance Company at a meeting duly called and held on the 12th day of March, 1980.

VOTED that the facsimile or mechanically reproduced signature of any assistant secretary of the company, wherever appearing upon a certified copy of any power of attorney issued by the company in connection with surety bonds, shall be valid and binding upon the company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said company, this 8th day of March, 2012.



Gregory W. Davenport, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

BIDDING DOCUMENTS

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23 USC 112 AND PCC 7106

State of California)
County of SAN DIEGO) ss.

AUSTIN CAMERON, being first duly sworn, deposes and says that he or she is SECRETARY 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: [Signature] AUSTIN CAMERON
Title: SECRETARY

State of California County of San Diego
Subscribed and sworn to before me this ___ day of ___, 20__
before me on this 11th day of April, 2012, by Austin Cameron
proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.
Signature Sandra Weeks
(Seal)

Notary Public
SANDRA WEEKS
Commission # 1860736
Notary Public - California
San Diego County
My Comm. Expires Aug 9, 2013

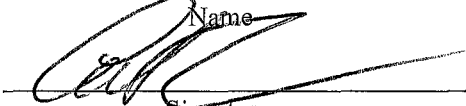
CONTRACTORS CERTIFICATION OF PENDING ACTIONS

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 ten 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 ten 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:

Contractor Name TC CONSTRUCTION CO. INC.
Certified By AUSTIN CAMERON Title SECRETARY

Signature _____ Date 4.13.12

USE ADDITIONAL FORMS AS NECESSARY

BIDDING DOCUMENTS

**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: <u>TC CONSTRUCTION CO. INC.</u>	Contact Name: <u>AUSTIN CAMERON</u>
Company Address: <u>10540 PROSPECT AVE.</u>	Contact Phone: <u>619.448.4560 x 117</u>
<u>SANTEE, CA. 92071</u>	Contact Email: <u>acameron@tcincsd.com</u>

CONTRACT INFORMATION

Contract Title: <u>CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT</u>	Start Date: <u>TBD</u>
Contract Number (if no number, state location): <u>K-12-5525-DEB-C</u>	End Date: <u>TBD</u>

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.

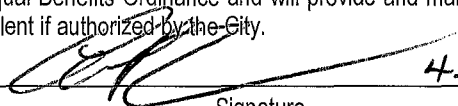
I affirm **compliance** with the EBO because my firm (*contractor must select one reason*):

- 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.

AUSTIN CAMERON, SECRETARY  4-13-12

Name/Title of Signatory Signature

FOR OFFICIAL CITY USE ONLY

Receipt Date:	EBO Analyst:	<input type="checkbox"/> Approved	<input type="checkbox"/> Not Approved – Reason:
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rev 02/15/2011

BIDDING DOCUMENTS

PROPOSAL (BID)

The Bidder agrees to the construction of **CITY WIDE PUMP STATION UPGRADES: PS 84 UPGRADE AND PS 62 ABANDONMENT**, 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 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	237110	01025	General Construction	XXXXXX	\$ 5,100,000 ⁰⁰
2.	1	LS	237110	01025	Sheeting, Shoring and Bracing	XXXXXX	\$ 500,000. ⁰⁰
3.	1	LS	237110	01025	Final Approval of Operation & Maintenance Manuals (or Owner's Manuals) and Master Record Documents (Stipulated Lump Sum)	XXXXXX	\$50,000.00
4.	1	LS	541330	801-9.4	Water Pollution Control Program Development	XXXXXX	\$ 6,500. ⁰⁰
5.	1	LS	237990	801-9.4	Water Pollution Control Program Implementation	XXXXXX	\$ 40,000. ⁰⁰
6.	1	LS	237110	2-4.1	Bonds (Payment and Performance)	XXXXXX	\$ 50,000. ⁰⁰
7.	1	AL	237110	9-3.5	Field Orders	XXXXXX	\$500,000.00
ESTIMATED TOTAL BASE BID:							\$ 6,246,500

TOTAL BID PRICE FOR BID (Items 1 through 7 inclusive) amount written in words:

Six million, two hundred forty-six thousand, five hundred dollars even.

BIDDING DOCUMENTS

The names of all persons interested in the foregoing proposal as principals are as follows:

TERRY CAMERON, PRESIDENT

STEVE COKER, VICE PRESIDENT

AUSTIN CAMERON, SEC. TREAS.

DEREK FRANKEN, VICE PRESIDENT

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: TC CONSTRUCTION CO. INC.

Title: SECRETARY

Business Address: 10540 PROSPECT AVE., SANTEE, CA. 92071

Place of Business: SAME

Place of Residence: N/A

Signature:  AUSTIN CAMERON

BIDDING DOCUMENTS

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 shall 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. The Bid shall contain an acknowledgment of receipt of all addenda, the numbers of which shall be filled in on the Bid form. The following addenda have been received and are acknowledged in this bid: [~~A~~,~~B~~,~~C~~,~~D~~,~~E~~,~~F~~.....]. If an addendum or addenda has been issued by the City and not noted above as being received by the Bidder, this proposal shall be rejected as being **non-responsive**.

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB ^①	WHERE CERTIFIED ^②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		(AC) Sheet Metal				
Name: <u>Cranetics</u> Address: <u>4700 Chuyenne</u> City: <u>China</u> State: <u>CA</u> Zip: <u>90710</u> Phone: <u>909-590-1444</u>	Constructor	(AC) Monorail Monorail	\$ 77,155 -			
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		(AC) Manholes/ Vaults				

- 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 (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>Brian F. Smith & Assoc. Inc.</u> Address: <u>14010 Poway Rd, Ste. A</u> City: <u>Poway</u> State: <u>CA</u> Zip: <u>92064</u> Phone: <u>858-679-8218</u>	constructor	Monitoring	\$40,434 -	SLBE	City	
Name: <u>H&D Construction Co.</u> Address: <u>P.O. Box 12859</u> City: <u>Elcain</u> State: <u>CA</u> Zip: <u>92022</u> Phone: <u>619-444-6118</u> <u>Steve Duich, Inc.</u>	constructor	Flatwork	\$50,064	SLBE	City	
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		Doors & Hardware ^{AC}				

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 (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		AC Overhead Doors				
Name: <u>Southern Contracting</u> Address: <u>559 Twin Oaks Valley Rd</u> City: <u>San Marcos</u> State: <u>CA</u> Zip: <u>92079</u> Phone: <u>760-744-0760</u>	AC Constructor	AC Electrical & Instrumentation	\$ 311,500			
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		AC Fencing				

70 Box 445

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 |
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| 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 (except for OBE, SLBE and ELBE).

Form Title: LIST OF SUBCONTRACTORS

(Rev. June 2011)

Form Number: AA35

City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>PKS</u> Address: <u>107 10420 Santa Vane</u> City: <u>Mira Loma</u> State: <u>CA</u> Zip: <u>91572</u> Phone: <u>951 692 1091</u>	Constructor	Grinding	<u>(AC)</u> \$31,000 \$31,484			
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____		<u>(AC)</u> Landscaping				
Name: <u>Pacific Coast Steel</u> Address: <u>4805 Murphy Canyon Rd</u> City: <u>San Diego</u> State: <u>CA</u> Zip: <u>92123</u> Phone: <u>858 757 7800</u>	Constructor	Rebar	\$181,000			

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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

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

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In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>Blue Iron</u> Address: <u>PO Box 36</u> City: <u>W. Sacramento</u> State: <u>CA</u> Zip: <u>95691</u> Phone: <u>949-265-5991</u>	Constructor	Shoring	\$ 190,000 -			
Name: <u>K-Company</u> Address: <u>3643 Fairway Drive</u> City: <u>LA MESA</u> State: <u>CA</u> Zip: <u>91941</u> Phone: <u>760-525-8416</u>	Constructor	Trucking	\$ 166,472 -	ELBE	City	
Name: <u>Tharsos</u> Address: <u>5022 Thome Dr</u> City: <u>La Mesa</u> State: <u>ca</u> Zip: <u>91942</u> Phone: <u>619-467-0690</u>	Constructor	Manholes	\$ 73 ^(AC) \$ 81,250 -	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

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSBⓐ	WHERE CERTIFIEDⓑ	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>Milteo</u> Address: <u>3511 Camino Del Rio S.</u> City: <u>San Diego</u> State: <u>CA</u> Zip: <u>92108</u> Phone: <u>619-281-9281</u>	Constructor	Pump station Building	\$630,000-			
Name: <u>National Coatings</u> Address: <u>1401 Oceanside Blvd</u> City: <u>Oceanside</u> State: <u>CA</u> Zip: _____ Phone: _____	const	paint/coat	\$106,701-			
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						

- ⓐ 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 | | |
- ⓑ 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 (except for OBE, SLBE and ELBE).

Form Title: LIST OF SUBCONTRACTORS

(Rev. June 2011)

Form Number: AA35

City Wide Pump Station Upgrades: PS 84 Upgrade and PS 62 Abandonment

BIDDING DOCUMENTS

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 shall list the Supplier(s) on the Named Equipment/Material Supplier List. The Named Equipment/Material Supplier List, at a minimum, shall 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	SUPPLIER (Yes/No)	MANUFACTURE R (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB ^①	WHERE CERTIFIED ^②
Name: <u>Robcar Corp.</u> Address: <u>777 Gable Way</u> City: <u>El Cajon</u> State: <u>CA</u> Zip: <u>92020</u> Phone: <u>619-441-3104</u>	Supplies	\$33,000	Yes	No	SLBE	City
Name: <u>Tharsos</u> Address: <u>5022 Thorne Dr.</u> City: <u>La Mesa</u> State: <u>CA</u> Zip: <u>91942</u> Phone: <u>619-467-0690</u>	Supplies	\$350,000	Yes	No	ELBE	City
Name: <u>AC</u> Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						

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 | | |

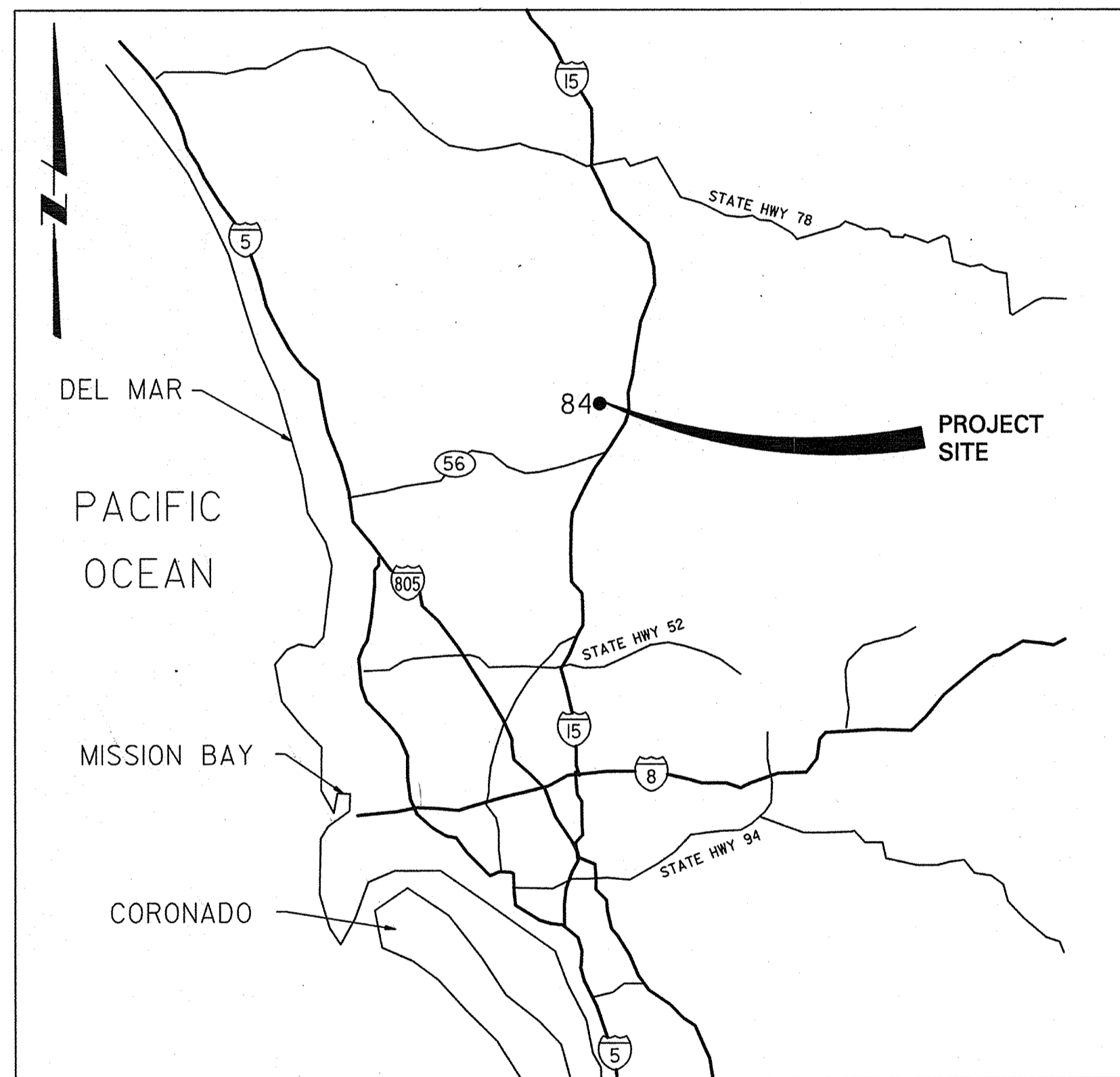
② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

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 (except for OBE, SLBE and ELBE).

CONTRACT DRAWINGS FOR

ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
City of San Diego

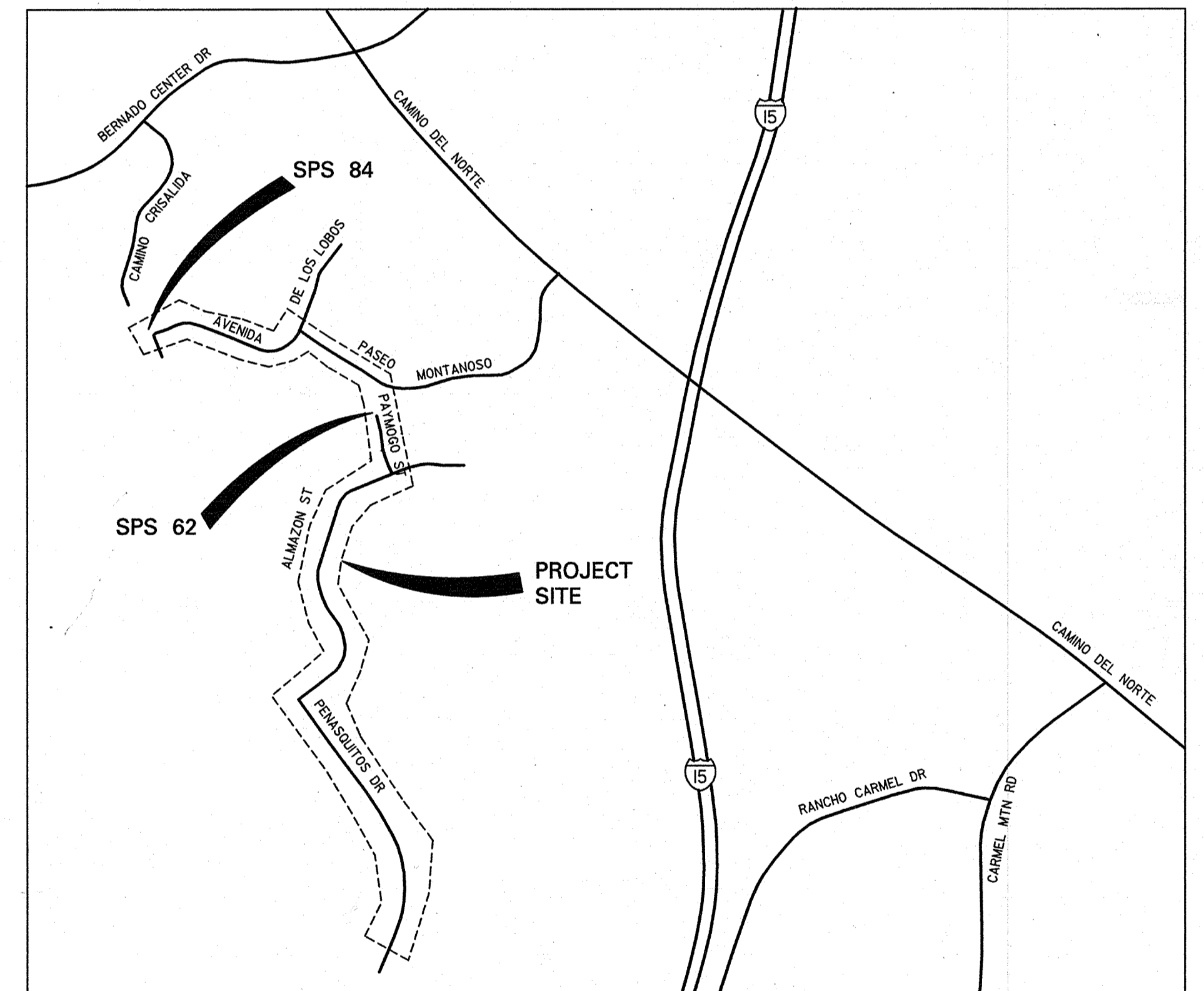


VICINITY MAP
NTS

CITY WIDE
PUMP STATION
UPGRADES
SPS 84 UPGRADE /
SPS 62
ABANDONMENT

SPECIFICATION NO. 5525

JULY 2011



LOCATION MAP
NTS

DRAWING NO. T-1	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		WATER WBS
SHEET NO. 1	COVER SHEET		SEWER WBS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 1 OF 118 SHEETS		S-00308
APPROVED BY: FOR CITY ENGINEER	Hogler	7-26-11	DATE
CHECKED BY: CONSTRUCTION ENGINEER			
CHECKED BY: INSPECTOR			
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
			CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196- 1 -D

DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC



WARNING
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HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE
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VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



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DRAWING NO.	DESCRIPTION	SHEET NO.	REVISION
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SHEET NO. 2	LIST OF DRAWINGS		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 2 OF 118 SHEETS	WATER WBS	SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	DATE	FILED
CHECKED BY: CONSTRUCTION ENGINEER			
CHECKED BY: INSPECTOR			
CONTRACTOR	DATE STARTED	CONTROL CERTIFICATION	
INSPECTOR	DATE COMPLETED	302-1737 LAMBERT COORDINATES	
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DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

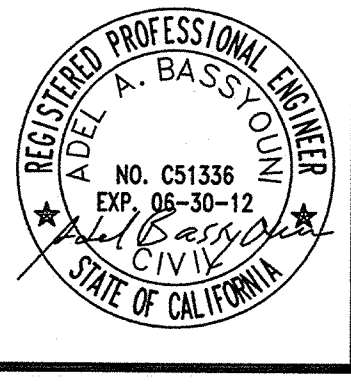
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



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8690 BALBOA AVENUE, SUITE 200
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ABBREVIATION MEANING

AC	ACTIVATED CARBON, ASPHALT CONCRETE
ACP	ASPHALT CONCRETE PAVEMENT/ASBESTOS CEMENT PIPE
AVAR	AIR VACUUM AND AIR RELEASE
B	BIOXIDE
BC	BEGIN CURVE
BCC	BEGIN COMPOUND CURVE
BFP	BACK FLOW PREVENTER
BM	BEAM, BENCH MARK
BMP	BEST MANAGEMENT PRACTICE
BO	BLOW-OFF ASSEMBLY
BVC	BEGIN VERTICAL CURVE
BVCE	BEGIN VERTICAL CURVE ELEVATION
C	COMMUNICATIONS
CATV	CABLE TV
CFM	CUBIC FEET PER MINUTE
CIPP	CURED IN PLACE PIPING
CL	CENTERLINE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
CONC	CONCRETE
CONT	CONTINUOUS
CTR	CENTER
CV	CHECK VALVE
D	DRAIN
DEFL	DEFLECTION
DEG	DEGREE
DI	DUCTILE IRON
DIA	DIAMETER
EA	EACH
EC	END CURVE
EL	ELEVATION
ELEC	ELECTRICAL
EP	EDGE OF PAVEMENT
EVC	END VERTICAL CURVE
EVCE	END VERTICAL CURVE ELEVATION
EXST	EXISTING
FF	FINISHED FLOOR ELEVATION
FLG	FLANGE
FM	FORCE MAIN
GB	GRADE BREAK
GBE	GRADE BREAK ELEVATION
GPM	GALLONS PER MINUTE
HHWL	HIGH HIGH WATER LEVEL
HP	HORSEPOWER, HIGH PRESSURE
HV	HAND VALVE
HWL	HIGH WATER LEVEL
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCH
LAT	LATERAL
LF	LINEAR FOOT
LLWL	LOW LOW WATER LEVEL
LT	LIGHT, LEFT
LWL	LOW WATER LEVEL
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MNFR	MANUFACTURER
N	NORTH/NORTHING
OC	ON CENTER

ABBREVIATION MEANING

P	PUMP
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PRW	AIR-GAPPED POTABLE WATER
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENT
PW	POTABLE WATER
PVC	POLYVINYL CHLORIDE
RCP, RCCP	REINFORCED CONCRETE PIPE
RT	RIGHT
SCH	SCHEDULE
SD	STORM DRAIN
SDG	SEWER DESIGN GUIDE
SDGE	SAN DIEGO GAS AND ELECTRICAL
SDR	STORM DRAIN, STANDARD DIMENSION RATIO
SDSD	CITY OF SAN DIEGO STANDARD DRAWINGS
SP	SUMP PUMP
SPD	SUMP PUMP DRAIN
SPECS	SPECIFICATIONS
SPS	SEWER PUMP STATION
SS	SANITARY SEWER
STA	STATION
STD	STANDARD
ST LT	STREET LIGHT/STREET LIGHT CONDUIT
SWR	SEWER
TYP	TYPICAL
TEL	TELEPHONE
UGE	UNDERGROUND ELECTRICAL
UGT	UNDERGROUND TELEPHONE
VERT	VERTICAL
W/	WITH
W/O	WITHOUT
WM	WATER METER

CONSTRUCTION NOTES

- ALL ELEVATIONS SHOWN ON THE FORCE MAIN PROFILES ARE INDICATING THE TOP OF PIPE ELEVATIONS UNLESS OTHERWISE NOTED.
- THE NEW FORCE MAIN SHALL BE PLACED WITH A STEADY SLOPE (I.E. NO SAGS) IN THE DIRECTION OF THE DISCHARGE MANHOLE AS NOTED ON THE PROFILE.
- ALL PRESSURE MAIN (WATER, SEWER AND GAS) DEPTHS ON PROFILE REFLECT THE COVER DEPTH INDICATED ON AS-BUILT DRAWINGS. THE ACTUAL DEPTH MAY VARY IN THE FIELD. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL DEPTH PRIOR TO CONSTRUCTION.
- ALL UTILITY LOCATIONS SHOWN ARE APPROXIMATE. FORCE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING UNDERGROUND SERVICE ALERT TO LOCATE EXISTING UTILITIES PRIOR TO BEGIN CONSTRUCTIONS. THE CONTRACTOR SHALL PERFORM ADDITIONAL POTHOLES IF NEEDED AND EXERCISE CAUTION DURING EXCAVATION TO PREVENT DAMAGING EXISTING UTILITIES.
- EXISTING UNDERGROUND UTILITIES ARE FROM RECORD INFORMATION ONLY, EXACT LOCATION IS UNKNOWN.
- PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
- PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL SUBMIT A WATER POLLUTION CONTROL PLAN (WPCP). THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH THE GUIDELINES IN APPENDIX E OF THE CITY'S STORM WATER STANDARDS.

GENERAL NOTES

TRAFFIC REQUIREMENTS:

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, SECTION 7-10.1 THROUGH 7-10.4

STANDARD SPECIFICATIONS:

DOC NO	FILED	DESCRIPTION
PITS050409-1	05-04-09	STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, INCLUDING THE 2009 REGIONAL AND THE 2009 CITY OF SAN DIEGO SUPPLEMENTAL AMENDMENTS (PITS050409-2)
AEC1231064	12-31-06	CALIFORNIA DEPARTMENT OF TRANSPORTATION, MANUAL OF TRAFFIC CONTROLS SERVICES DATED SEPTEMBER 26, 2006
PITS090110-1	09-01-10	STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, THE "WHITEBOOK", 2010 EDITION

STANDARD DRAWINGS:

DOC NO	FILED	DESCRIPTION
AEC1231063	12-31-06	CITY OF SAN DIEGO STANDARD DRAWINGS

ADDITIONAL/UPDATED STANDARD DRAWINGS ARE LISTED AND AVAILABLE FOR DOWNLOAD AT WWW.SANDIEGO.GOV/ENGINEERING-CIP/SERVICES/CONSULTCONTRACT/EDOCREF/DRAWINGSTANDARDS.SHTML. THESE SUPERCEDE THOSE INCLUDED IN DOC. NO. AEC1231063.

UNDERGROUND UTILITIES:

THE CONTRACTOR SHALL AT LEAST THREE (3) WORKING DAYS PRIOR TO THE START OF WORK, PHONE THE TELEPHONE AND THE GAS AND ELECTRIC COMPANY AND OTHER UTILITY COMPANIES AND REQUEST THAT THEIR UNDERGROUND UTILITIES BE MARKED OUT. THIS REQUEST SHALL BE MADE BY THE CONTRACTOR PRIOR TO ALL TRENCHING OPERATIONS REGARDLESS OF WHETHER THE PLANS SHOW UNDERGROUND TELEPHONE OR GAS AND ELECTRIC DUCTS, CABLES, OR PIPELINES.

SAN DIEGO GAS & ELECTRIC CO.	1-800-227-2600
ATT.	1-866-492-5644
COX COMMUNICATION.	1-619-263-9251
TIME WARNER CABLE	1-619-574-3853
USA - DIGALERT	1-800-422-4133 OR DIAL 811

THE CONTRACTOR SHALL NOTIFY THE FOLLOWING CITY OF SAN DIEGO AGENCIES AT LEAST THREE (3) WORKING DAYS PRIOR TO START OF WORK NEAR THEIR FACILITIES:

CITY BUILDINGS DIVISION	236-5500
WATER & SEWER	236-5650
STREET LIGHTING SYSTEMS	236-5310
CABLE TV	236-1122
COMMUNICATIONS DIVISION	236-5505

DATUM: MEAN SEA LEVEL (MSL) BASED UPON NGVD 29 AS SHOWN IN THE CITY BENCH BOOK

INDEX OF DISCIPLINES:

- G GENERAL
- R REFERENCE
- D DEMOLITION
- C CIVIL
- A ARCHITECTURAL
- L LANDSCAPING
- S STRUCTURAL
- M MECHANICAL
- E ELECTRICAL
- I INSTRUMENTATION
- P PROCESS AND INSTRUMENTATION DIAGRAM

PIPING AND MECHANICAL NOTES

- CONTRACTOR MUST FIELD SURVEY, POT HOLE AND/OR DIG TEST PITS TO DETERMINE EXACT LOCATIONS AND DEPTHS OF EXISTING UTILITIES AS NEEDED TO FINALIZE BURIED UTILITY ALIGNMENTS PRIOR TO SUBMISSION OF SHOP DRAWINGS. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF PROPOSED ALIGNMENTS THAT INCLUDE LOCATIONS OF EXISTING UTILITIES.
- ALIGNMENTS FOR SMALL PIPING (<3 INCH DIAMETER) ARE SHOWN DIAGRAMMATICALLY IN THE CONTRACT DRAWINGS, AND CONTRACTOR SHALL BE RESPONSIBLE FOR FINALIZING ALIGNMENTS.
- CONTRACTOR TO FIELD SURVEY PIPE ALIGNMENTS PRIOR TO PREPARING SHOP DRAWINGS, IDENTIFY ANY CONFLICTS BETWEEN SUGGESTED ALIGNMENTS DEPICTED IN THE CONTRACT DRAWINGS AND EXISTING CONDITIONS, AND IDENTIFY CONTRACTOR'S PROPOSED SOLUTIONS TO RESOLVING CONFLICTS, IN ADVANCE OF SUBMITTING SHOP DRAWINGS. SUBMITTED SHOP DRAWINGS SHALL INDICATE RESULTS OF FIELD SURVEY AND CONTRACTOR'S PROPOSED PIPE ALIGNMENTS.
- PIPE ALIGNMENTS MUST NOT INTERFERE WITH ACCESS TO OR OPERATION OF ANY OTHER PIPE, VALVE OR EQUIPMENT. CONTRACTOR'S PROPOSED PIPE ALIGNMENTS ARE SUBJECT TO APPROVAL BY PUD AND THE ENGINEER.
- CONTRACTOR SHALL PROVIDE ONE OF THE FOLLOWING OPTIONS AT CONNECTIONS TO EXISTING PIPING: a. REPLACE PIPING BACK TO NEAREST FITTING; b. USE SLEEVE COUPLINGS (RESTRAINED ON PRESSURE LINES)
- CONNECTIONS TO LIQUID-CONTAINING STRUCTURES AND PIPING OF FACILITIES IN OPERATION MAY REQUIRE ISOLATION AND DRAINING OF THE STRUCTURES AND PIPING, SHUTDOWN OF RELATED EQUIPMENT, AND/OR LIVE CONNECTIONS INTO RELATED STRUCTURES AND PIPING. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK AS REQUIRED, INCLUDING TEMPORARY BYPASS EQUIPMENT AND PIPING AS NEEDED TO MAKE THE REQUIRED CONNECTIONS.
- UNLESS OTHERWISE INDICATED, PROVIDE ALL PIPING WITH 3/4" HIGH-POINT VENTS AND 3/4" LOW-POINT DRAINS. EACH DRAIN AND VENT TO INCLUDE BOSS FITTING AND 3/4" BALL VALVE. PIPE DRAINS AND VENTS TO NEAREST SUMP OR GUTTER.
- RESTRAIN ALL FLEXIBLE CONNECTORS INCLUDING RUBBER EXPANSION JOINTS AND SLEEVE COUPLINGS SUBJECT TO PRESSURE.
- PROVIDE MINIMUM OF 30" COVER FOR ALL BURIED PIPING UNLESS OTHERWISE INDICATED.
- SEAL ALL PIPE PENETRATIONS THROUGH WALLS AND FLOORS PER MECHANICAL DETAILS.
- PROVIDE PIPE SUPPORTS PER MECHANICAL DETAILS FOR ALL PIPING IN PUMP ROOMS AND TUNNELS UNLESS INDICATED OTHERWISE.
- REPAIR LININGS OF EXISTING PIPING AT POINTS OF CONNECTION.
- CONTRACT DRAWINGS DO NOT INDICATE ALL FLANGES OR FLEXIBLE COUPLINGS REQUIRED TO INSTALL THE PIPING SYSTEMS IN THE INDICATED ALIGNMENTS. CONTRACTOR SHALL PROVIDE ALL FITTINGS REQUIRED FOR INSTALLATION OF PIPING BASED ON INDICATED ALIGNMENTS.
- WHERE DISSIMILAR METALS ARE USED IN CONJUNCTION WITH EACH OTHER, PROVIDE INSULATION BETWEEN ADJOINING SURFACES TO ELIMINATE DIRECT CONTACT AND ANY RESULTANT ELECTROLYSIS. PROVIDE BITUMINOUS INSULATION, HEAVY BITUMINOUS COATINGS, NON-METALLIC WASHERS OR SEPARATORS, IMPREGNATED FELT, OR SIMILAR ARRANGEMENT.
- ALL STAINLESS STEEL MATERIALS SHALL BE TYPE 316 STAINLESS STEEL UNLESS OTHERWISE SPECIFIED.
- PROVIDE CONCRETE INSERTS FOR HANGERS OF A TYPE WHICH WILL PERMIT ADJUSTMENT OF THE HANGERS BOTH HORIZONTALLY AND VERTICALLY, AND LOCKING OF THE HANGER HEAD OR NUT. ALL CONCRETE INSERTS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM STANDARD SPECIFICATIONS FOR HOT-DIP ZINC COATINGS ON IRON AND STEEL HARDWARE.
- EXISTING STRUCTURES, PIPING AND APPURTENANCES ARE INDICATED WITH LIGHTER SHADED LINE TYPE.

PIPING AND MECHANICAL NOTES

- FLOOR DRAINS OR SIMILAR TRAPS DIRECTLY CONNECTED TO THE DRAINAGE SYSTEM AND SUBJECT TO INFREQUENT USE SHALL BE PROVIDED WITH AN APPROVED AUTOMATIC MEANS OF MAINTAINING THEIR WATER SEALS.
- BUILDING DRAIN AND VENT PIPING MATERIALS SHALL COMPLY WITH SECTIONS 701.0 AND 903.0 OF THE CALIFORNIA PLUMBING CODE.
- ALL SANITARY SYSTEM MATERIALS SHALL BE LISTED BY AN APPROVED LISTING AGENCY.
- WATER PIPING MATERIAL SHALL COMPLY WITH SEC. 604.0 CPC.
- CROSS CONNECTION PROTECTION SHALL BE PROVIDED AT ALL POTABLE WATER SUPPLIED APPLIANCES AND EQUIPMENT (OTHER THAN THOSE LISTED IN INFORMATION BULLETIN 103).
- PERMANENT VACUUM BREAKERS SHALL BE INCLUDED WITH ALL HOSE BIBS.

PROJECT NOTES

CONTRACTOR'S RESPONSIBILITIES:

- IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND RECONNECT ALL SEWER LATERALS. LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE ONLY. LATERAL RECORDS ARE AVAILABLE TO THE CONTRACTOR AT THE DEVELOPMENT SERVICES CENTER, 1222 FIRST AVENUE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE THE IMPROVEMENTS THAT WILL BE AFFECTED BY LATERAL REPLACEMENTS. ALL IMPROVEMENTS DISTURBED BY CONTRACTOR SHALL BE REPLACED IN KIND TO ORIGINAL CONDITION OR BETTER.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF ANY STREET SURVEY MONUMENTS DISTURBED BY THE IMPROVEMENTS. SEE REGIONAL STANDARD DRAWING M-10.
- THE LOCATION AND ELEVATION OF EXISTING UTILITIES AND IMPROVEMENTS AS SHOWN ON THE DRAWINGS ARE APPROXIMATE ONLY.
- THE LOCATIONS OF EXISTING BUILDINGS AS SHOWN ON THE DRAWINGS ARE APPROXIMATE ONLY.
- UNLESS INDICATED OTHERWISE, ALL NEW MANHOLES ON THIS PROJECT SHALL BE CONSTRUCTED AS SHOWN ON REGIONAL STANDARD DRAWINGS SDS-106 OR SDS-107.
- THE CONTRACTOR SHALL INCORPORATE THE REFERENCED DETAILS IN DOCUMENT NO. AEC 1231063, FILED 12-31-06, THE CITY OF SAN DIEGO STANDARD DRAWINGS, IN ITS PROJECT. SUCH DETAILS HAVE ONLY BEEN REFERENCED PER THE EXAMPLE GIVEN IN STANDARD DRAWING R-1 AND HAVE NOT BEEN COPIED OR REPRODUCED IN THE DESIGN DOCUMENTS.
- CONTRACTOR SHALL PROVIDE CONTINUOUS SEWER SERVICE DURING CONSTRUCTION, INCLUDING A SOURCE OF POWER.
- 72 HOURS PRIOR TO THE PRE-CONSTRUCTION MEETING, CONTACT THE GROUNDS MAINTENANCE MANAGER FOR THE PENASQUITOS EAST MAINTENANCE ASSESSMENT DISTRICT (619) 533-6723 AND THE AREA MANAGER FOR RANCHO PENASQUITOS (858) 538-8132.

DRAWING NO. G-1	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 3	ABBREVIATIONS, GENERAL AND PROJECT NOTES	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 3 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	<i>Hosie Aguiar</i> 10-25-11 DATE	PROJECT MANAGER <i>Paul A. Dell</i>
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION BY APPROVED DATE FILMED	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CHECKED BY: INSPECTOR	CONTRACTOR DATE STARTED	INSPECTOR DATE COMPLETED

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
I	09/11		BLDG PERMIT	DG	SB	AB			

WARNING
0 1/2 1
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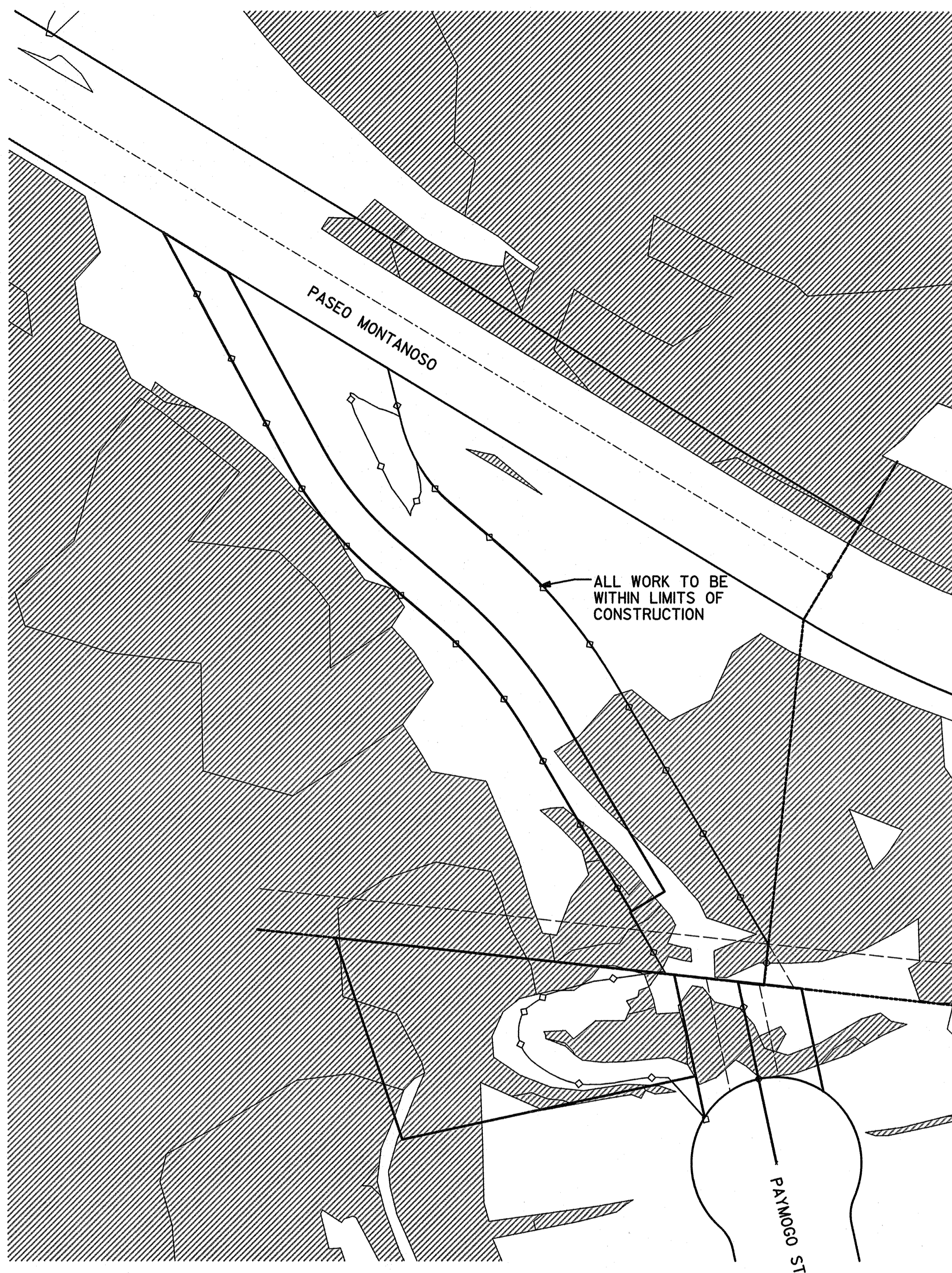
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VERTICAL

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PUBLIC WORKS PROJECT**

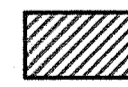
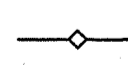
REGISTERED PROFESSIONAL ENGINEER
ADEL A. BASSOUNI
NO. CS1336
EXP. 06-30-12
CIVIL
STATE OF CALIFORNIA

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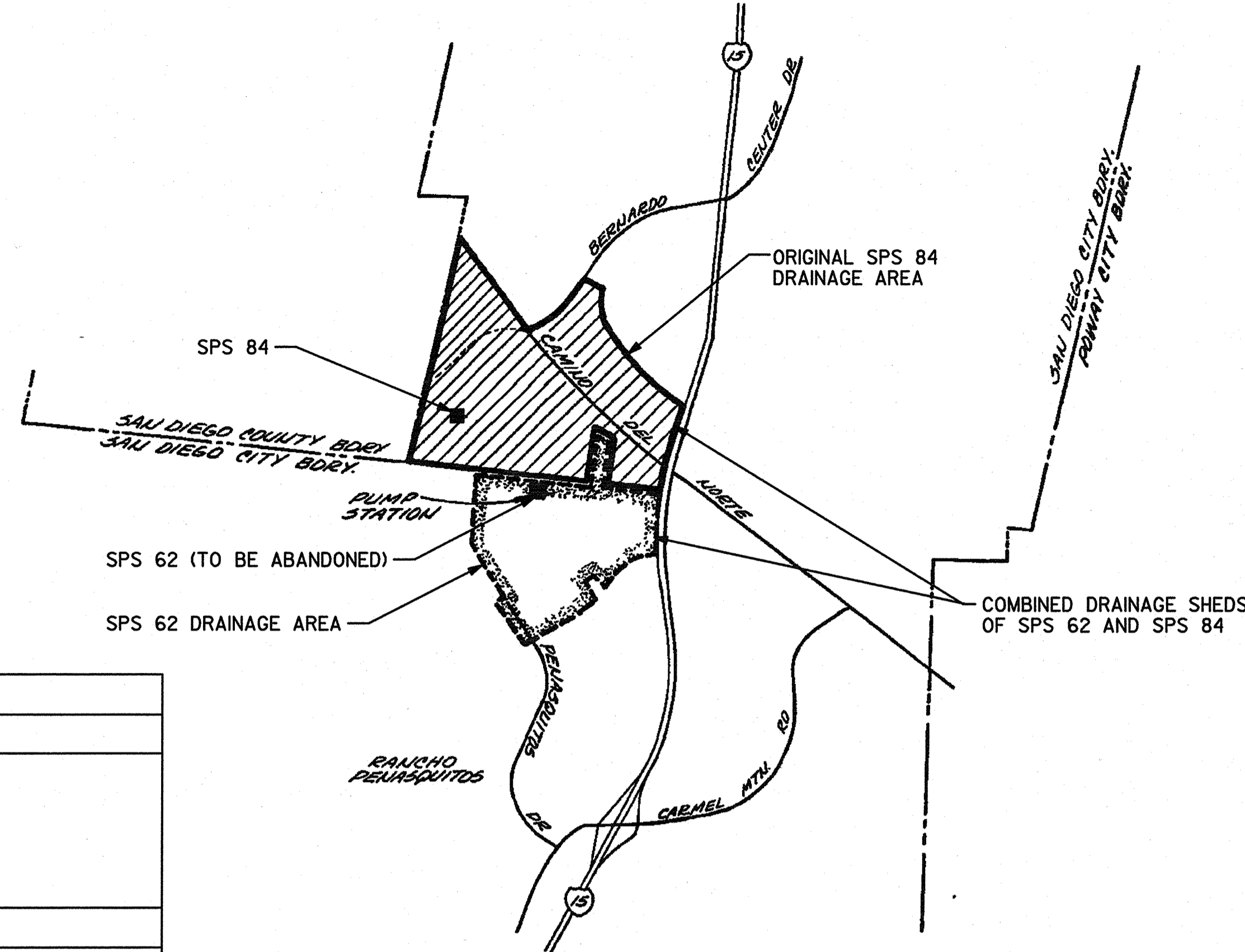
STEEP SLOPES IMPACT
NTS

 SLOPES 25% OR GREATER
 LIMITS OF CONSTRUCTION

NOTES:

I. ALL SLOPES 25% OR GREATER WITHIN THE LIMITS OF CONSTRUCTION ARE MANMADE GRADIENTS CREATED DURING SUBDIVISION DEVELOPMENT. REFER TO CAMINO BERNARDO UNIT NO. 1 DRAWINGS (23173-D & 23389-D) AND PENASQUITOS GLENS UNIT NO. 2 DRAWINGS (13939-D) FOR ORIGINAL GRADING OF AREA WITHIN LIMITS OF CONSTRUCTION.

DESIGN CRITERIA
FLOW (2050 PROJECTION)
AVERAGE FLOW SPS 62, GPM 130 AVERAGE FLOW SPS 84, GPM 170 TOTAL AVERAGE FLOW (SPS 62 + SPS 84), GPM 300
PEAK FLOW SPS 62, GPM 442 PEAK FLOW SPS 84, GPM 661 TOTAL PEAK FLOW (SPS 62 + SPS 84), GPM 1,103
STORAGE
WETWELL (NORMAL OPERATION BETWEEN PUMPS-OFF AND LEAD PUMP-ON LEVELS) EFFECTIVE STORAGE VOLUME, GAL 8,360 FILL TIME AT AVERAGE FLOW, MINUTE 27.9 FILL TIME AT PEAK FLOW, MINUTE 7.6
EMERGENCY STORAGE EFFECTIVE STORAGE VOLUME IN EMERGENCY TANK, GAL 121,560 ADDITIONAL VOLUME IN WETWELL (ABOVE HWL TO SPILL LEVEL), GAL 10,590 TOTAL EMERGENCY STORAGE (TANK + WETWELL), GAL 132,150
FILL TIME AT AVERAGE FLOW, HOUR 7.3 FILL TIME AT PEAK FLOW, HOUR 2.0
PUMPS
NUMBER 2 (1 LEAD + 1 LAG) DESIGN CAPACITY, GPM 1,225 DESIGN HEAD, FT 257 SUCTION PIPE DIAMETER, INCH 10 DISCHARGE PIPE DIAMETER, INCH 8 RUN TIME AT AVERAGE FLOW, MINUTE 9.0 AVERAGE CYCLE TIME (FILLING + PUMPING), MINUTE 36.9 STARTS PER HOUR AT AVERAGE FLOW 1.6
SEWER FORCE MAINS
FORCE MAIN #1 NOMINAL DIAMETER, INCH 12 PIPE MATERIAL PVC PRESSURE CLASS DR-14 LENGTH, FEET 6,870 PUMPING VELOCITY, FPS 4.0 AVERAGE RETENTION TIME, HOUR 2.0
FORCE MAIN #2 NOMINAL DIAMETER, INCH 12 PIPE MATERIAL PVC AVERAGE RETENTION TIME, HOUR 2.1
NEW PIPE LENGTH, FEET 2,420 PRESSURE CLASS DR-14 FLOW VELOCITY, FPS 4.0
EXISTING PIPE LENGTH, FEET 4,450 PRESSURE CLASS DR-18 FLOW VELOCITY, FPS 3.7

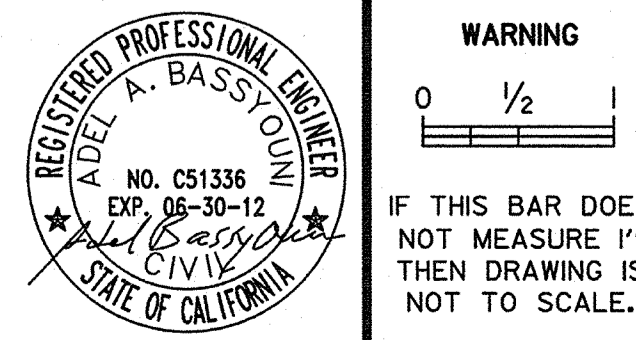


PUMP STATION DRAINAGE AREA

NTS
 PEAK INFLOW (WW) (2009) 1,061 GPM (1.53 MGD)*
 PEAK INFLOW (WW) (2050) 1,103 GPM (1.59 MGD)*
 *PROJECTED FLOWS FROM PUD, DEC. 2010

DRAWING NO. G-4	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT PUMP STATION DRAINAGE AREAS AND STEEP SLOPES IMPACT			
SHEET NO. 6	CITY OF SAN DIEGO, CALIFORNIA SHEET 6 OF 118 SHEETS			
SPECIFICATION NO. 5525	WATER WBS SEWER WBS			S-00308
APPROVED BY: <i>Hosca Acer</i>	DATE 7-26-11	PROJECT MANAGER <i>Felix P...</i>		
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED	DATE
CHECKED BY:	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES			
CONSTRUCTION ENGINEER	CONTRACTOR			
CHECKED BY:	DATE STARTED			
INSPECTOR	DATE COMPLETED			
36196- 6 -D				

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC



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SCALE: HORIZONTAL, VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

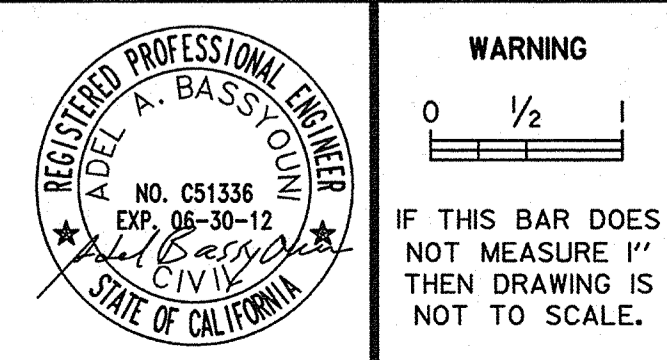
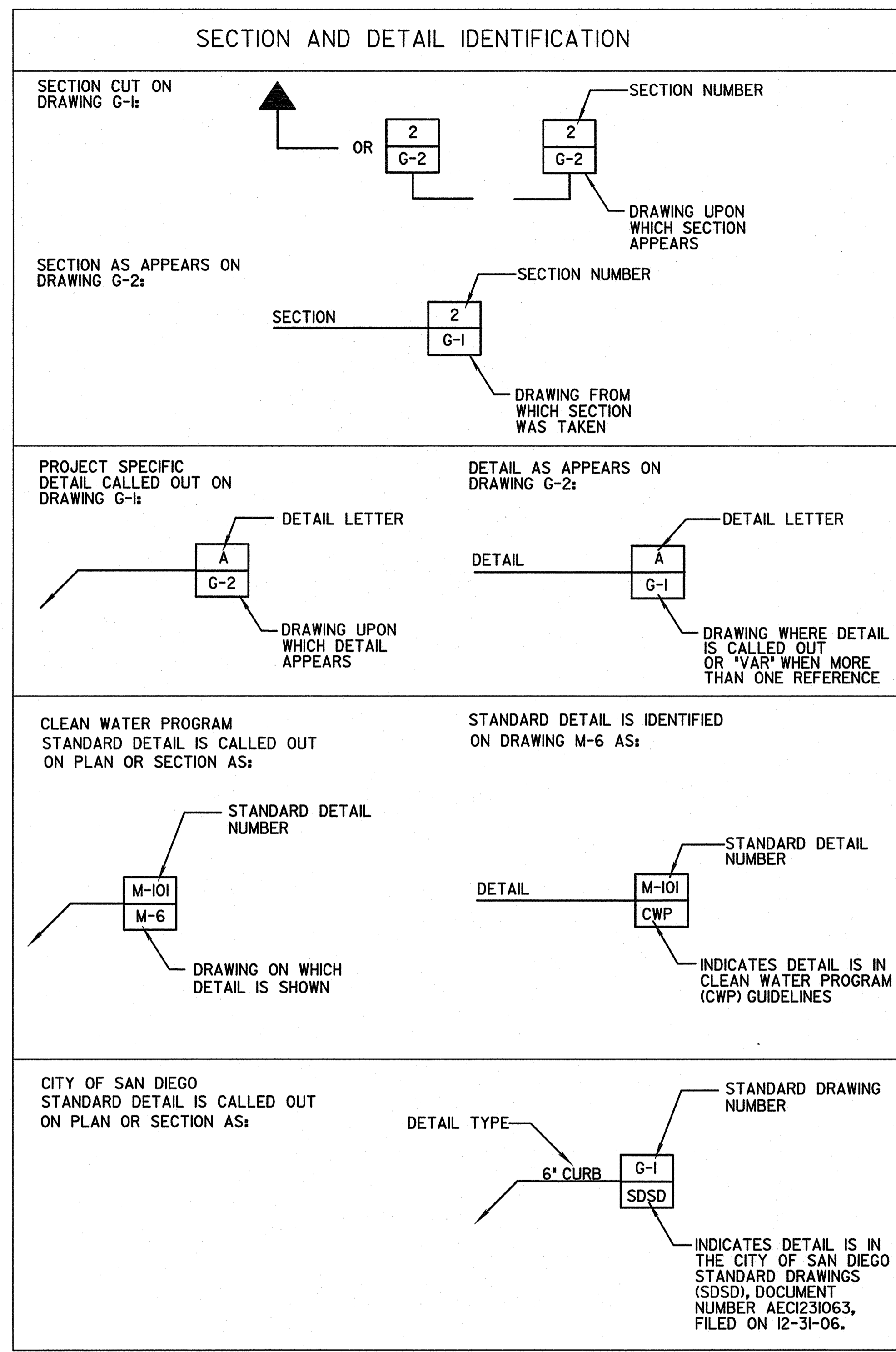


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	CENTERLINE		EXISTING AIR VALVE		EXISTING SEWER MAIN-PROFILE (USE ONLY FOR SEWERS LESS THAN 8 INCHES)
	PROPERTY LINE		EXISTING BLOW-OFF, DEAD END OR INLINE		PROPOSED SEWER MAIN - PLAN
	PROPOSED STRUCTURE OR FACILITY		PROPOSED REDUCER, PROPOSED PIPE		PROPOSED SEWER MAIN-PROFILE (USE ONLY FOR SEWERS LESS THAN 8 INCHES)
	EXISTING STRUCTURE OR FACILITY		EXISTING REDUCER NOTE: EXISTING REDUCER TO BE SHOWN ONLY WHEN CONNECTING TO A PROPOSED PIPE.		EXISTING CONCRETE MANHOLE - PLAN
	FUTURE STRUCTURE OR FACILITY		CROSSING OF LINES (EXISTING OR PROPOSED)		EXISTING CONCRETE MANHOLE - PROFILE
	NEW FENCE		PLUG EXISTING SEWER		EXISTING MANHOLE TO BE ABANDONED
	EXISTING FENCE		EXISTING FIRE HYDRANT		PROPOSED CONCRETE MANHOLE - PLAN
	CONTOUR LINE, PROPOSED FINISHED GRADE		EXISTING POTABLE WATER LINE		PROPOSED CONCRETE MANHOLE - PROFILE
	CONTOUR LINE, EXISTING GRADE		EXISTING POTABLE WATER MAIN PROFILE		EXISTING DROP MANHOLE - PLAN
	FINISHED SPOT ELEVATION		PROPOSED EMBANKMENT - PLAN		EXISTING STORM DRAIN
	EXISTING SPOT ELEVATION		EXISTING EMBANKMENT - PLAN		SURVEY MONUMENT
	EXISTING UNDERGROUND ELECTRIC POWER		EXISTING PAVEMENT		PROPOSED AIR VALVE
	EXISTING TELEPHONE LINE		EXISTING GRADE		PROPOSED BLOW-OFF
	EXISTING CABLE TV LINE		EDGE OF PAVEMENT		LOT LINE
	EXISTING GAS MAIN		(DIRT AREA)		CURB LINE
	EXISTING ELECTRIC MANHOLE		(PVMT AREA)		PROPERTY LINE ALONG STREET OR ALLEY R/W
	EXISTING ELECTRIC TRANSFORMER		EASEMENT LINE		MARSH OR SWAMP
	EXISTING TELEPHONE MANHOLE		STATE R/W LINE		TRAFFIC ISLAND
	EXISTING TRAFFIC LIGHT ON POLE		GUARD RAIL - BARRICADE		RAILROAD, STREET CAR TRACKS OR TROLLEY
	EXISTING STREET LIGHT				
	EXISTING POWER POLE				
	EXISTING TELEPHONE POLE				
	EXISTING OVERHEAD ELECTRICAL (CALLOUT ON PLANS IF LESS THAN 12' HIGH)				
	EXISTING OVERHEAD TELEPHONE OR CABLE T.V. (CALLOUT ON PLANS IF LESS THAN 12' HIGH)				



WARNING

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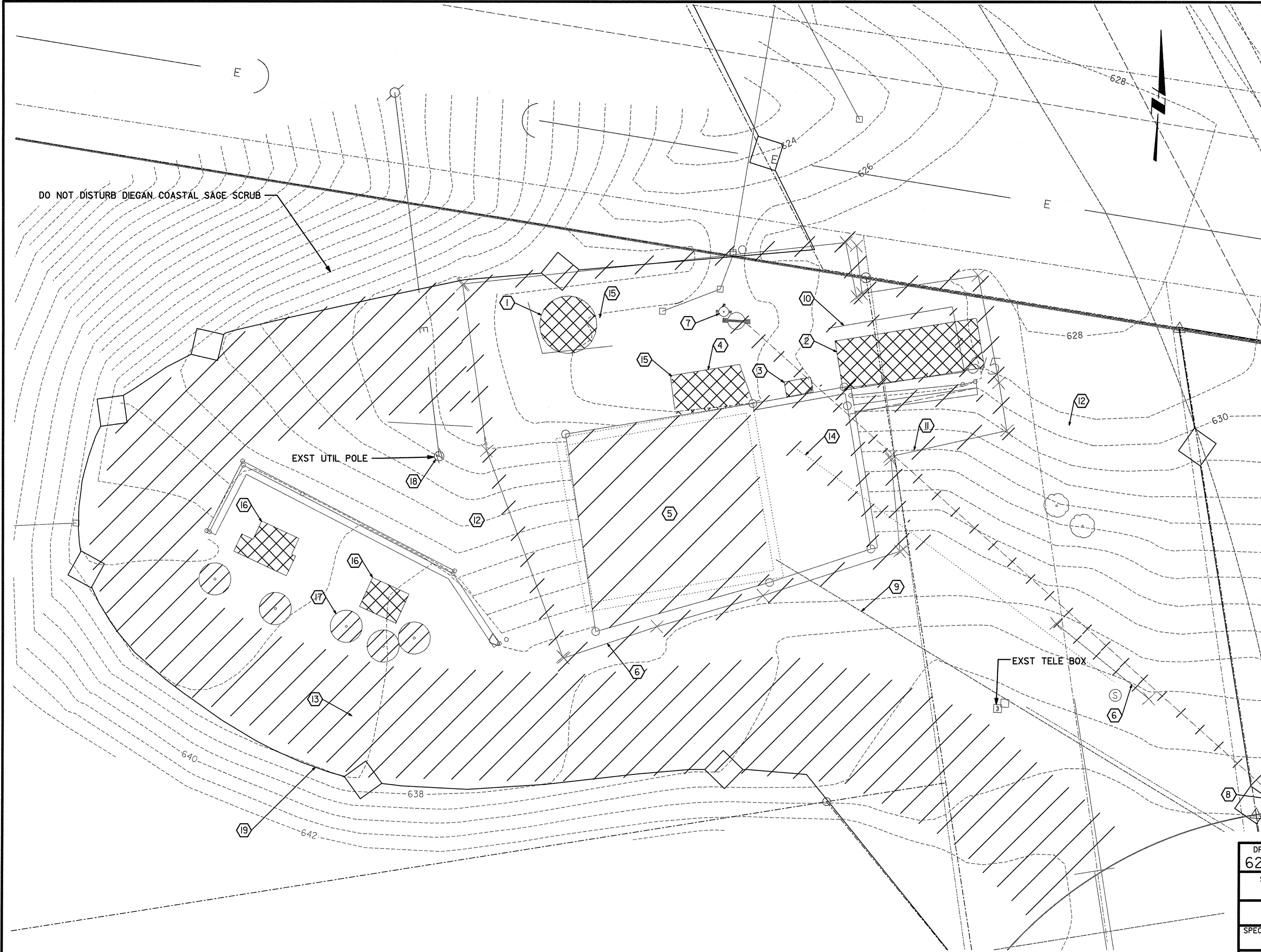
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. R-1	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 7	SYMBOLS - CIVIL	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 7 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: <i>Hos C. Asok</i> FOR CITY ENGINEER	DATE 7-26-11	PROJECT MANAGER <i>Paul H. Lee</i>
CHECKED BY:	DESCRIPTION	BY
CHECKED BY:	APPROVED	DATE
CHECKED BY:	FILED	
INSPECTOR	CONTRACTOR	DATE STARTED
	INSPECTOR	DATE COMPLETED
		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
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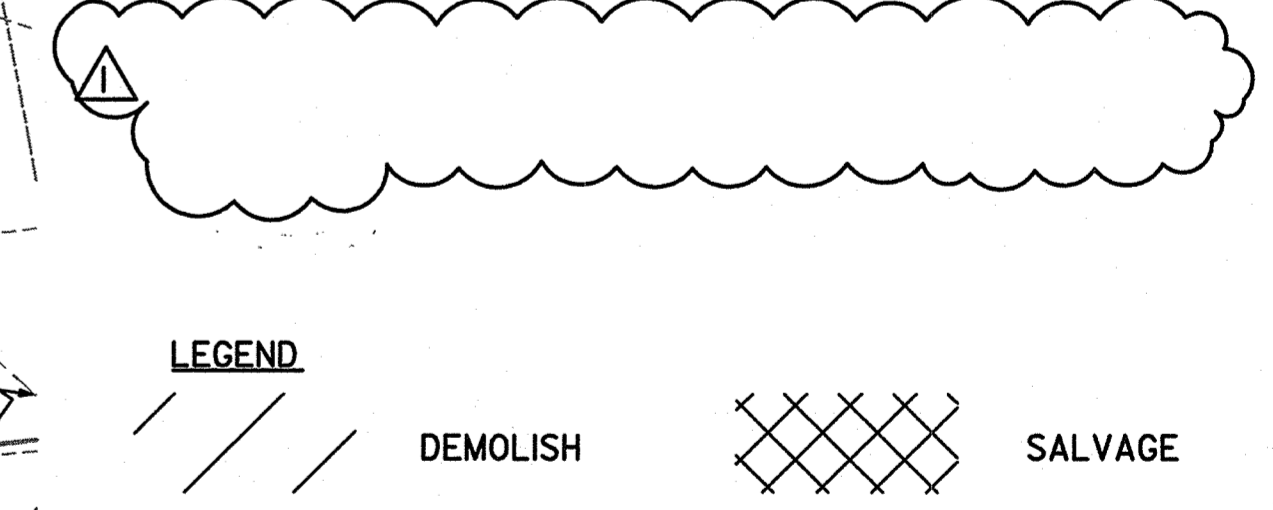
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- KEYNOTES:**
- 1 EXISTING BIOXIDE TANK AND FEED EQUIPMENT TO BE REMOVED BY OTHERS (SEE NOTE 4).
 - 2 INITIALLY RELOCATE EXISTING GENERATOR AND FUEL TANK DURING CONSTRUCTION ACTIVITIES THEN SALVAGE.
 - 3 SALVAGE EXISTING AUTOMATIC TRANSFER SWITCH.
 - 4 SALVAGE EXISTING ELECTRICAL MAIN SERVICE CENTER.
 - 5 DEMOLISH EXISTING PUMP STATION BUILDING (SEE DETAILS ON DWG. 62-D-101).
 - 6 DEMOLISH EXISTING CHAIN LINK FENCE AND GATES.
 - 7 DEMOLISH EXISTING POTABLE WATER FIRE HYDRANT AND HOSE BIBB. REUSE EXST BACKFLOW PREVENTER FOR NEW IRRIGATION.
 - 8 DEMOLISH EXISTING 2-INCH POTABLE WATER LINE TO EXTENT SHOWN.
 - 9 ABANDON IN PLACE EXISTING 8-INCH VITRIFIED CLAY SEWER LINE.
 - 10 DEMOLISH EXISTING GENERATOR CONCRETE PAD.
 - 11 DEMOLISH EXISTING RETAINING WALLS.
 - 12 CLEAR EXISTING LANDSCAPING TO EXTENT SHOWN.
 - 13 REMOVE TOP 4 INCHES OF EXISTING PAVED ACCESS ROAD.
 - 14 DEMOLISH EXISTING 12-INCH DUCTILE IRON SEWAGE FORCE MAIN TO EXTENT SHOWN (ABANDON IN PLACE REMAINING PIPING)
 - 15 DEMOLISH EXISTING CONCRETE EQUIPMENT PADS.
 - 16 EXISTING SDG&E TRANSFORMER AND METER CABINET TO BE REMOVED BY OTHERS (SEE NOTE 5).
 - 17 DEMOLISH EXISTING BOLLARDS.
 - 18 EXISTING SDG&E POWER POLE TO REMAIN.
 - 19 LIMITS OF CONSTRUCTION.

- NOTES:**
1. MAINTAIN CONTINUOUS OPERATION OF SPS 62 UNTIL SEWER FLOW IS DIVERTED TO SPS 84. COORDINATE DEMOLITION AND SALVAGE ACTIVITY WITH NEW SEWER UTILITIES CONSTRUCTION REQUIREMENTS.
 2. ALL SALVAGE ITEMS IDENTIFIED SHALL BE DELIVERED TO THE OWNER AT THEIR PREFERRED LOCATION.
 3. ALL NON-SALVAGED ITEMS SHALL BE DEMOLISHED AND DISPOSED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
 4. THE CONTRACTOR SHALL COORDINATE WITH SEIMENS WATER TECHNOLOGY CORP. (800) 566-1568 FOR REMOVAL OF THE EXISTING BIOXIDE TANK AND FEED EQUIPMENT.
 5. THE CONTRACTOR SHALL COORDINATE WITH SDG&E (760) 480-7647 FOR THE REMOVAL OF THE EXISTING ELECTRICAL TRANSFORMER AND METER CABINET.



DRAWING NO. 62-D-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 9	SPS 62 DEMOLITION PLAN	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 9 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: <i>Hotz</i> 10.25.11 FOR CITY ENGINEER DATE		PROJECT MANAGER <i>Polina</i>
CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CONTRACTOR _____ DATE STARTED _____ INSPECTOR _____ DATE COMPLETED _____		36196- 9 -D

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SCALE HORIZONTAL 1" = 5'
 VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

DRAWING STATUS

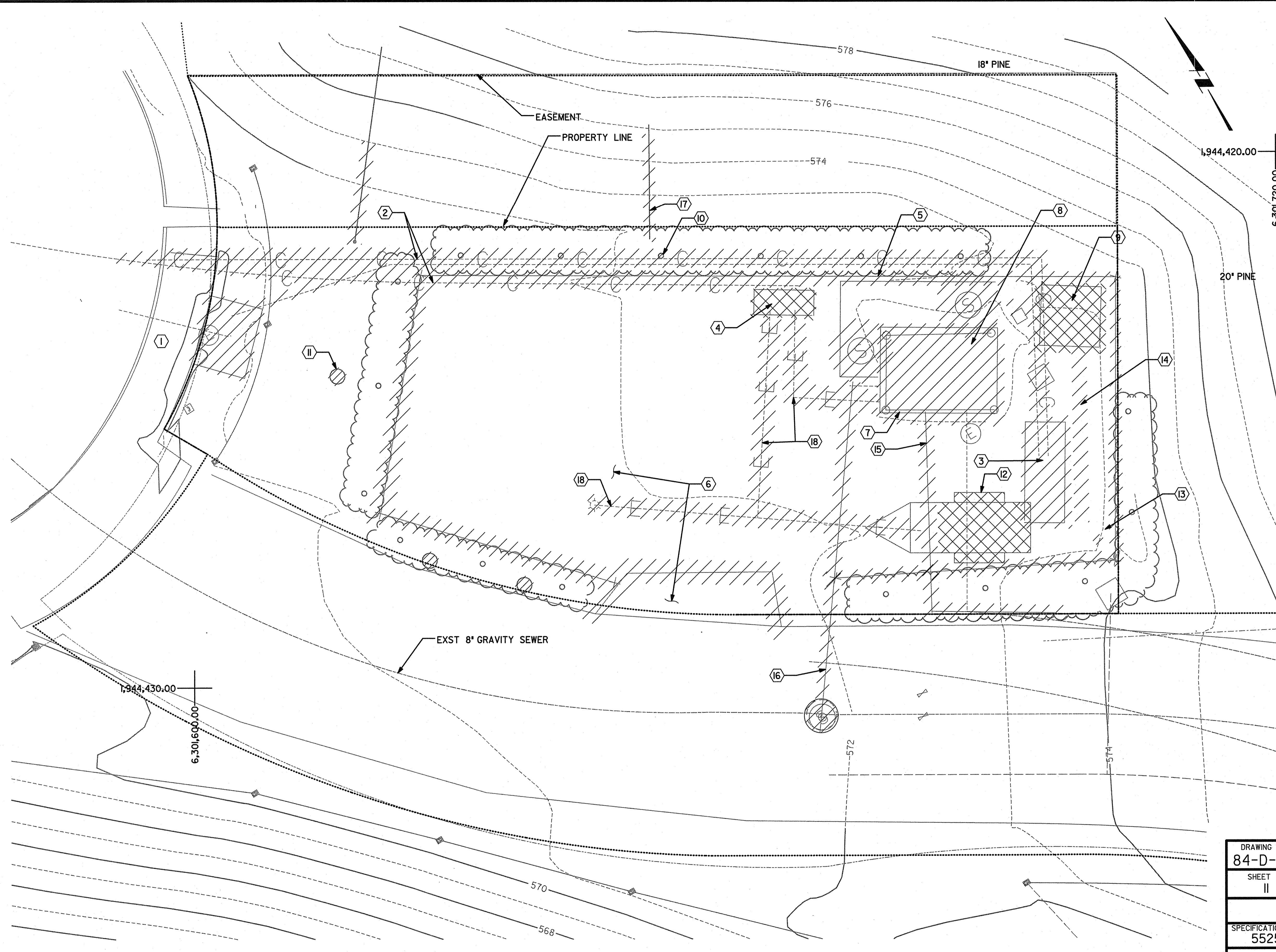
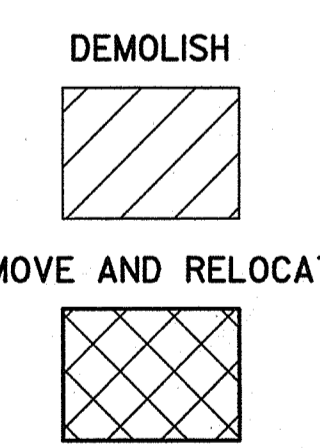
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		SDG&E UPDATE	DG	SB	AB			

KEYNOTES:

- ① EXST SDG&E #3425 TRANSFORMER TO BE REPLACED.
- ② EXST 4" ELEC & TEL CONDUITS TO BE DEMOLISHED.
- ③ EXST MAIN SWITCHGEAR TO BE DEMOLISHED.
- ④ EXST CONTROL PANELS TO BE RELOCATED.
- ⑤ EXST 6' CHAIN LINK FENCE AND 16' GATE TO BE DEMOLISHED.
- ⑥ EXST ASPHALT AND CONCRETE APRON TO BE DEMOLISHED.
- ⑦ EXST CONCRETE WET WELL TO BE DEMOLISHED.
- ⑧ EXST G-R PACKAGE PUMP STATION TO BE DEMOLISHED/SALVAGED.
- ⑨ EXST BIOXIDE TANK AND FEED EQUIPMENT TO BE REMOVED BY OTHERS.
- ⑩ PRUNE AND TRANSPLANT 17 BOUGAINVILLEA TO TEMPORARY PLANTERS.
- ⑪ CLEAR REMAINING LANDSCAPING WITHIN SITE AND EASEMENTS.
- ⑫ EXST PORTABLE GENERATOR TO BE SALVAGED.
- ⑬ EXST 2" REDUCED PRESSURE BACKFLOW PREVENTER TO BE DEMOLISHED.
- ⑭ EXST 2" WATER LINE AND APPURTENANCES TO BE DEMOLISHED.
- ⑮ EXST 8" PVC SEWAGE FORCE MAIN TO BE DEMOLISHED.
- ⑯ EXST 12" PVC SEWER AND MANHOLE #41 TO BE DEMOLISHED.
- ⑰ EXST IRRIGATION PIPING AND SPRINKLER HEADS TO BE DEMOLISHED.
- ⑱ EXST ELECTRICAL AND SIGNAL CONDUITS AND APPURTENANCES TO BE DEMOLISHED.

GENERAL NOTES:

- 1. PRIOR TO ANY DEMOLITION WORK, THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION PLAN FOR PHASING CONSTRUCTION AND ENSURE CONTINUOUS OPERATION OF THE PUMP STATION. SEE SECTION 01300 OF THE CONTRACT DOCUMENTS.
- 2. EXISTING SITE CONDITIONS ARE BASED UPON FIELD SURVEYING AND AS-BUILT DRAWING SETS 23173 AND 31648.
- 3. THE CONTRACTOR SHALL COORDINATE WITH SIEMENS WATER TECHNOLOGY CORP (800)566-1568 FOR REMOVAL OF THE EXISTING BIOXIDE TANK AND FEED EQUIPMENT. BIOXIDE FEED SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.



DRAWING NO. 84-D-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. II	SPS 84 DEMOLITION PLAN	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET II OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER <i>Hos W. Aron</i>	DATE 7-26-11	PROJECT MANAGER <i>Robert Lee</i>
CHECKED BY: CONSTRUCTION ENGINEER	CONTROL CERTIFICATION 302-1737	LAMBERT COORDINATES 36196 - II -D
CHECKED BY: INSPECTOR	CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

REGISTERED PROFESSIONAL ENGINEER
ADEL A. BASSOUL
NO. C51336
EXP. 06-30-12
CIVIL
STATE OF CALIFORNIA

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR

8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

SCALE HORIZONTAL 1" = 5'-0" VERTICAL

7/19/2011 2:57:47 PM

SPS84-D-100.dgn

GAS METER AND REGULATOR BY SDG&E. CONTRACTOR SHALL BE RESPONSIBLE FOR GAS LINE AFTER THE METER. REFER TO SDG&E CONST ORDER NO

OPEN SPACE
LOT 55

CONSTRUCT PROTECTION POSTS AROUND METER AS NEEDED PER CITY STD DWG M-16

RELOCATED TRANSFORMER

EXIST 18' PINE (TO REMAIN)

1,944,430.00
6,301,720.00

NEW 3" GAS
NATURAL GAS SERVICE LINE BY SDG&E

N 1,944,465.74
E 6,301,629.37

NEW - TOP OF EMERGENCY STORAGE TANK EMBEDDED W/ RIVER WASHED PEA GRAVEL (TAN) (EXCLUDE BIOXIDE TANK PAD)

PROPERTY LINE, TYP

NEW 6' CHAIN LINK FENCE W/ SLATS (BLACK PVC COATED FABRIC)

N 1,944,441.14
E 6,301,666.51

N 1,944,437.54
E 6,301,672.51

N 1,944,429.75
E 6,301,689.41

N 1,944,436.44
E 6,301,672.01

N 1,944,427.18
E 6,301,687.87

N 1,944,421.01
E 6,301,698.16

CAMINO CRISALIDA

BIOXIDE TANK CONCRETE PAD
X 573.00

X 570.00

PUMP STATION BUILDING

EXIST 20' PINE (TO REMAIN)

EXIST TELCO PEDESTAL

SLOPE

EMERGENCY STORAGE TANK

WET WELL

N 1,944,414.56
E 6,301,650.57

N 1,944,412.83
E 6,301,649.56

N 1,944,413.56
E 6,301,658.72

N 1,944,410.96
E 6,301,656.58

N 1,944,404.31
E 6,301,674.16

N 1,944,445.99
E 6,301,617.53

N 1,944,445.99
E 6,301,617.53

N 1,944,439.43
E 6,301,617.18

N 1,944,398.14
E 6,301,684.45

EXIST WATER METER TO BE REUSED

N 1,944,388.72
E 6,301,682.98

N 1,944,399.73
E 6,301,671.42

N 1,944,389.27
E 6,301,679.03

N 1,944,444.07
E 6,301,588.11

1,944,430.00
6,301,600.00

EXIST 8" GRAVITY SEWER

N 1,944,420.10
E 6,301,637.42

NEW 24' WIDE DOUBLE GATE

NEW 12" FLEXIBLE EXPANSION JOINT

NEW 12" DI SEWER
N 1,944,398.37
E 6,301,647.48

NEW SEWER MANHOLE 41A

NEW 10"x12" DI INCREASER

NEW 10"x12" DI INCREASER

NEW 12" FLEXIBLE COUPLING

N 1,944,397.55
E 6,301,663.53

N 1,944,394.10
E 6,301,664.35

NEW 12" FLEXIBLE COUPLING, TYP

NEW DI 45 DEGREE ELBOW W/ RESTRAINED JOINTS, TYP

NEW 12" FM #1

NEW 12" PVC SEWER

NEW DI 45 DEGREE ELBOW W/ RESTRAINED JOINTS

EXIST 12" WATER

NEW 2" SPD FROM PUMP STATION BUILDING

N 1,944,376.45
E 6,301,662.67

NEW EDGE OF AC PAVEMENT, TYPICAL.

SDG-107
SDSD

N 1,944,403.84
E 6,301,655.81

NEW 12" FM #1

NEW 12" PVC SEWER

EXIST 12" WATER

NEW AC PAVEMENT. RESTORE TO EXISTING WIDTH OF 18'. SEE NOTE 2.

NOTES:

- SEE PLAN AND PROFILE DRAWINGS FOR SANITARY SEWER AND FORCE MAINS DESIGN INFORMATION.
- TEMPORARY AC PAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL SEWER AND FORCEMAIN PIPING INSTALLED AND TESTING COMPLETED.

DRAWING NO. 84-C-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 13	SPS 84 SITE PLAN	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 13 OF 118 SHEETS	WATER WBS SEWER WBS S-00308

APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	<i>Hosci Asar</i> 7-26-11 DATE	DATE STARTED DATE COMPLETED
DESCRIPTION	BY	APPROVED
DATE	FILMED	
PROJECT MANAGER <i>Poly A. Lee</i>		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CONTRACTOR		36196-13-D

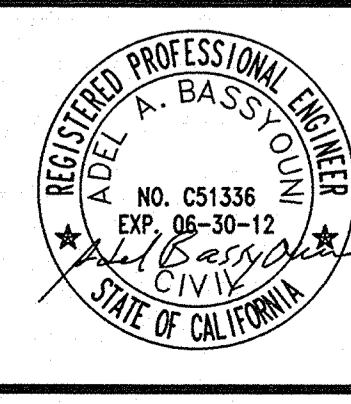
DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE
HORIZONTAL 1" = 5'-0"
VERTICAL

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

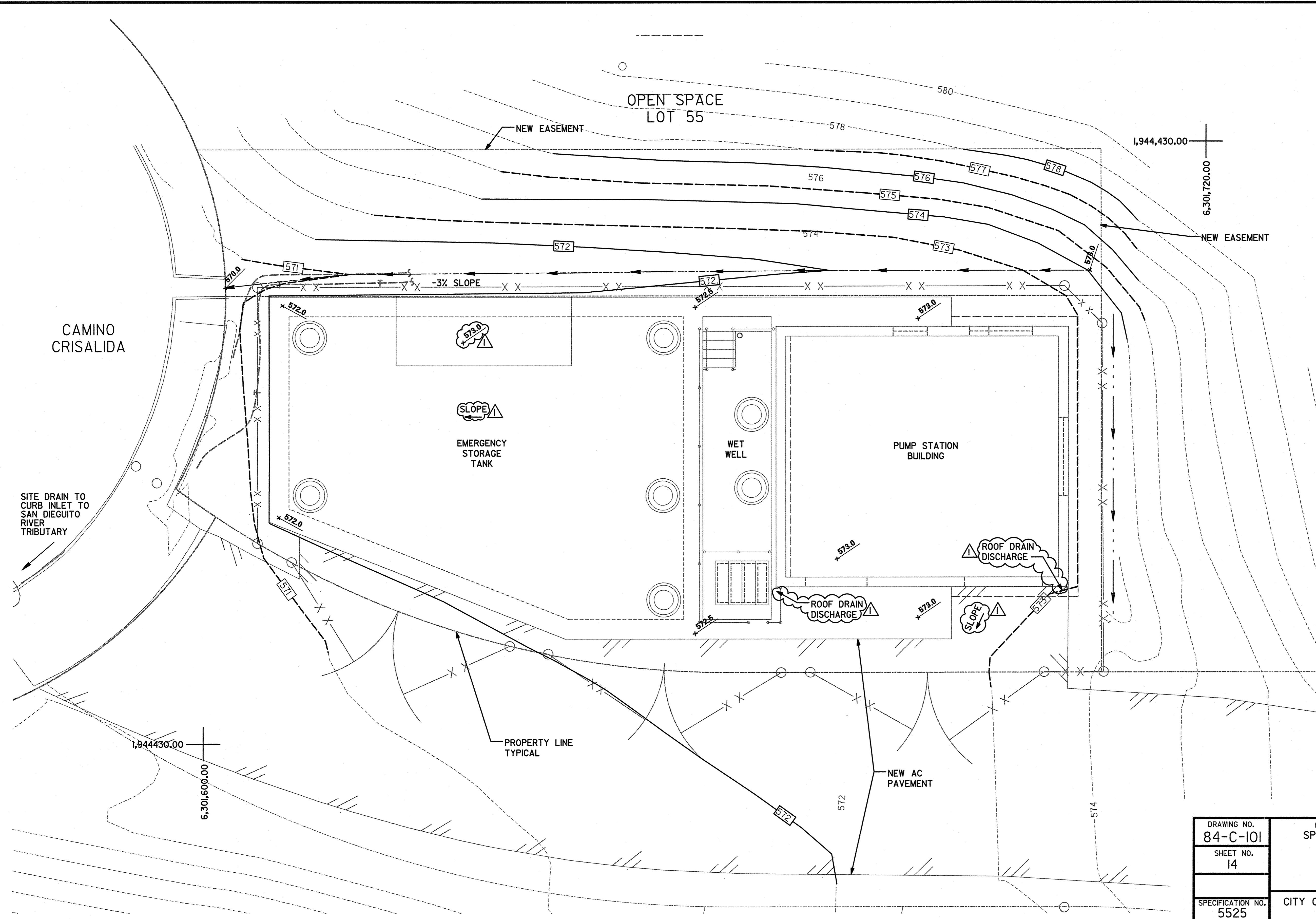


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BEST MANAGEMENT PRACTICES (BMP) NOTE:

- CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).
- CONTRACTOR IS RESPONSIBLE TO PERFORM ALL APPLICABLE BMP'S IDENTIFIED WITHIN THE WATER POLLUTION CONTROL PLAN (WPCP) TO ELIMINATE/ REDUCE BOTH THE STORM WATER AND NON-STORM WATER RELATED RUN-OFF DURING CONSTRUCTION.

STORMWATER NOTES:

- NO AREAS OF POTENTIAL SOIL EROSION HAVE BEEN IDENTIFIED.
- EXISTING DRAINAGE GOES TO EXISTING TYPE B-1 INLET IN CAMINO CRISALIDA. SEE REFERENCE DRAWINGS 23389-D.

CONSTRUCTION SITE STORMWATER PRIORITY (INSPECTION FREQUENCY): LOW

DRAWING NO. 84-C-101	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 14	SPS 84 GRADING PLAN	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 14 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	<i>Hos C. Arce</i> FOR CITY ENGINEER	DATE 10.25.11
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY
CHECKED BY: INSPECTOR	APPROVED	DATE
	FILED	
	PROJECT MANAGER <i>Bob Joe</i>	
	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES	
	CONTRACTOR	DATE STARTED
	INSPECTOR	DATE COMPLETED

WARNING

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SCALE: HORIZONTAL 1" = 5'-0" VERTICAL

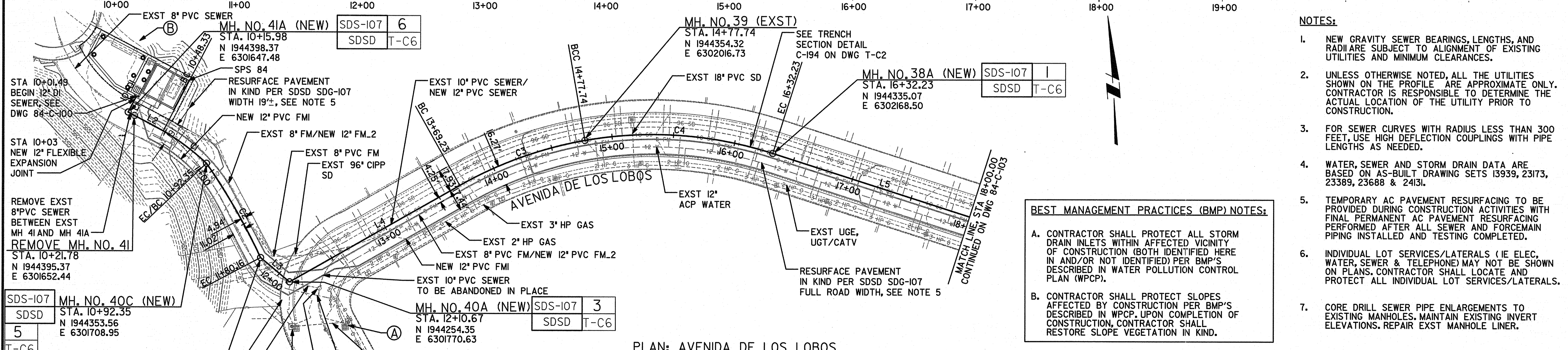
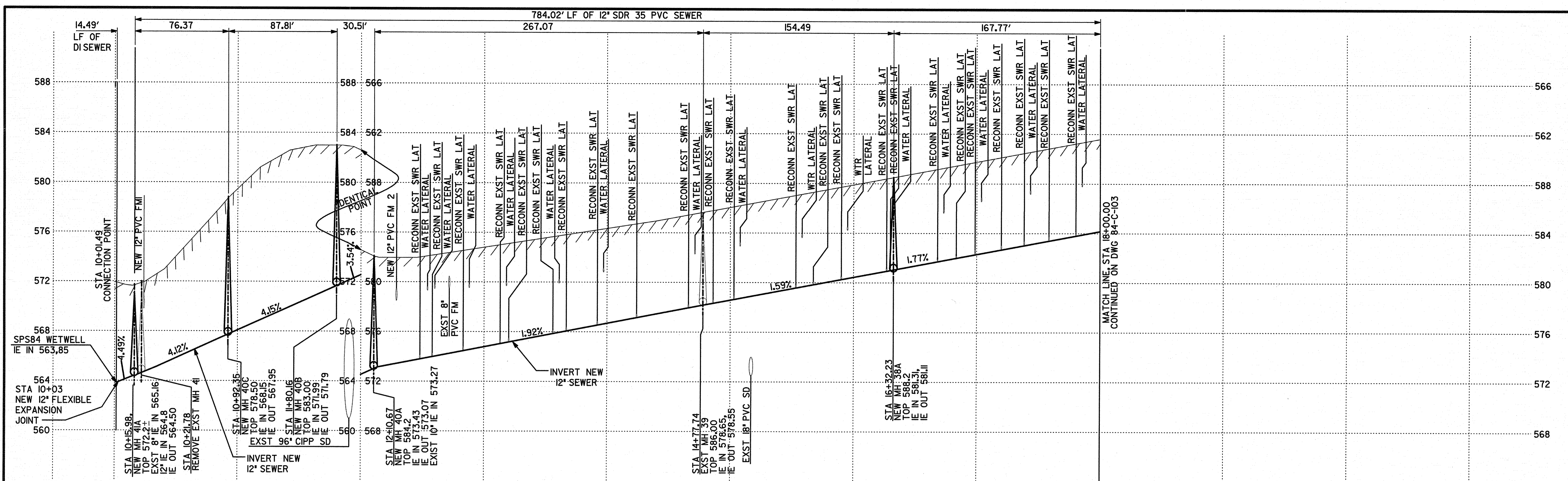
CITY OF SAN DIEGO PUBLIC WORKS PROJECT

DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

7/18/2011 7:50:27 AM

26202-84-C-102.dgn



- NOTES:**
- NEW GRAVITY SEWER BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 - UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 - FOR SEWER CURVES WITH RADIUS LESS THAN 300 FEET, USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS-BUILT DRAWING SETS 13939, 23173, 23389, 23688 & 24131.
 - TEMPORARY AC PAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL SEWER AND FORCEMAIN PIPING INSTALLED AND TESTING COMPLETED.
 - INDIVIDUAL LOT SERVICES/LATERALS (IE ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - CORE DRILL SEWER PIPE ENLARGEMENTS TO EXISTING MANHOLES, MAINTAIN EXISTING INVERT ELEVATIONS. REPAIR EXST MANHOLE LINER.

BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

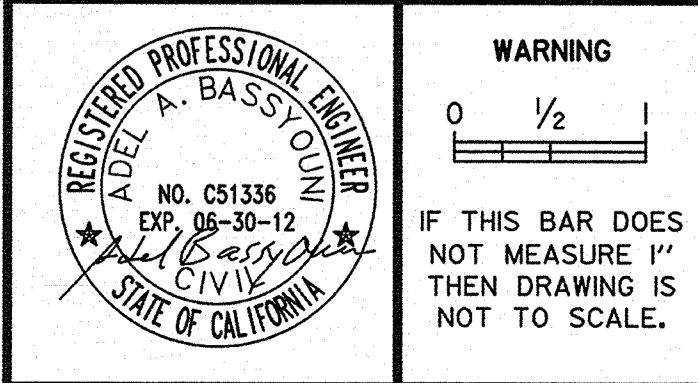
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5	SDS-107	MH. NO. 40C (NEW)	STA. 10+92.35 N 1944353.56 E 6301708.95	6
6	SDS-107	MH. NO. 41A (NEW)	STA. 10+15.98 N 1944398.37 E 6301647.48	T-C6
7	SDS-107	MH. NO. 39 (EXST)	STA. 14+77.74 N 1944354.32 E 6302016.73	T-C6
8	SDS-107	MH. NO. 38A (NEW)	STA. 16+32.23 N 1944335.07 E 6302168.50	T-C6
9	SDS-107	MH. NO. 40A (NEW)	STA. 12+10.67 N 1944254.35 E 6301770.63	T-C6
10	SDS-107	MH. NO. 40 (EXST)	STA. 12+10.67 N 1944254.35 E 6301770.63	T-C6

SEWER CURVE TABLE

NO	DELTA	RADIUS	LENGTH	NOTES
C1	12° 36' 38"	200	44.02	12" PVC SEWER MAIN
C2	10° 03' 46"	500	87.81	12" PVC SEWER MAIN
C3	19° 25' 45"	320	108.51	12" PVC SEWER MAIN
C4	27° 39' 39"	320	154.49	12" PVC SEWER MAIN

SEWER LINE TABLE

NO	BEARING	LENGTH	NOTES
L1	S 30° 56' 21" W	14.49	12" PVC SEWER MAIN
L2	S 58° 50' 49" E	32.35	12" PVC SEWER MAIN
L3	S 46° 48' 53" E	30.5	12" PVC SEWER MAIN
L4	N 63° 56' 59" E	158.56	12" PVC SEWER MAIN
L5	S 68° 56' 10" E	167.77	12" PVC SEWER MAIN



HDR
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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE
HORIZONTAL 1"=40'
VERTICAL 1"=4'

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-C-102
SHEET NO. 15
SPECIFICATION NO. 5525

CITY OF SAN DIEGO, CALIFORNIA
SHEET 15 OF 118 SHEETS

WATER WBS S-00308
SEWER WBS

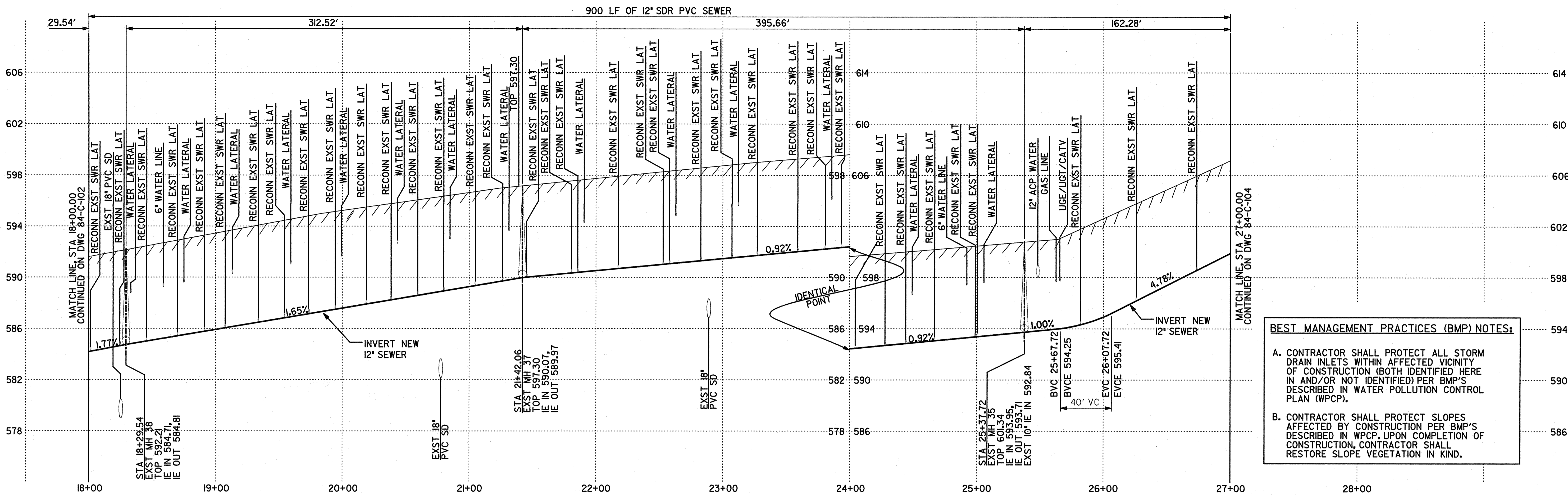
APPROVED BY: *Hos C. Arce* 7-26-11
FOR CITY ENGINEER
DATE

CONTRACTOR: *Polay, Inc.*
DATE STARTED
DATE COMPLETED

302-1737
LAMBERT COORDINATES
36196-15-D

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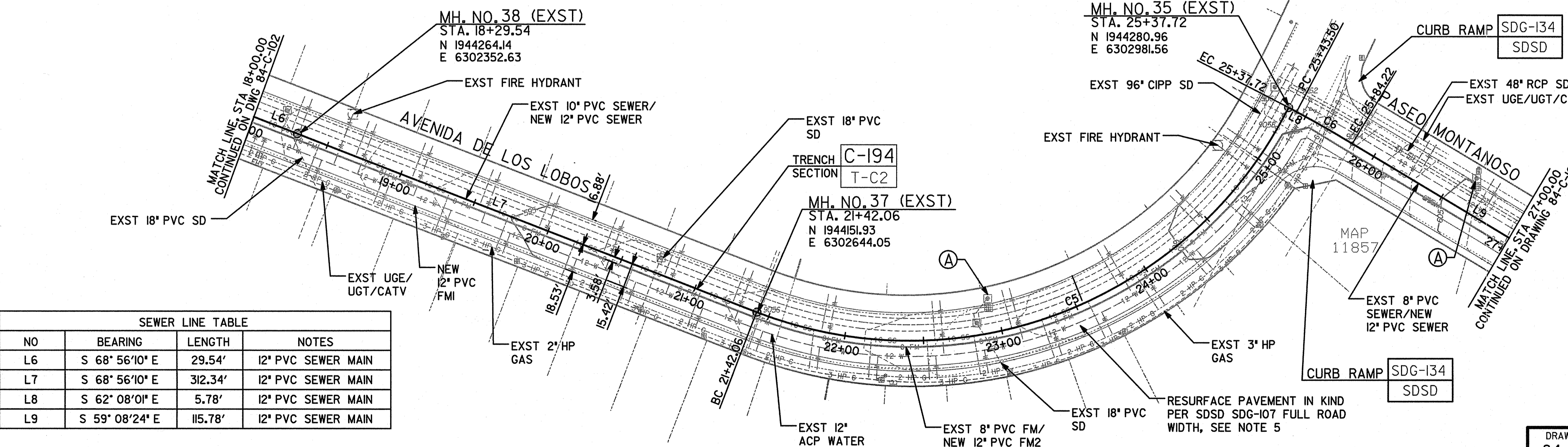


BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

- NOTES:**
- NEW GRAVITY SEWER BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 - UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 - FOR SEWER CURVES WITH RADIUS LESS THAN 300 FEET, USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS-BUILT DRAWING SETS 13939, 23173, 23389, 23688 & 24131.
 - TEMPORARY AC PAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL SEWER AND FOREMAIN PIPING INSTALLED AND TESTING COMPLETED.
 - INDIVIDUAL LOT SERVICES/LATERALS (IE ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - CORE DRILL SEWER PIPE ENLARGEMENTS TO EXISTING MANHOLES. MAINTAIN EXISTING INVERT ELEVATIONS. REPAIR EXISTING MANHOLE LINER.

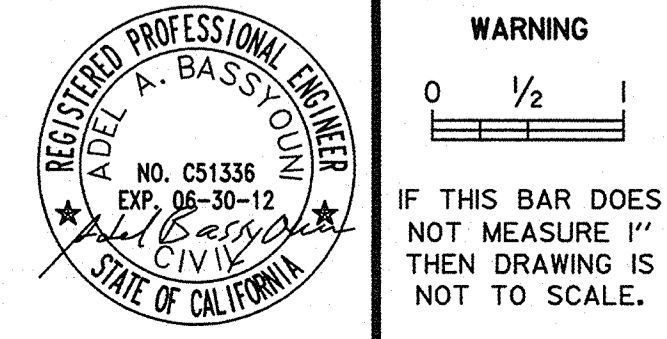


SEWER LINE TABLE			
NO	BEARING	LENGTH	NOTES
L6	S 68° 56' 10" E	29.54'	12" PVC SEWER MAIN
L7	S 68° 56' 10" E	312.34'	12" PVC SEWER MAIN
L8	S 62° 08' 01" E	5.78'	12" PVC SEWER MAIN
L9	S 59° 08' 24" E	115.78'	12" PVC SEWER MAIN

SEWER CURVE TABLE				
NO	DELTA	RADIUS	LENGTH	NOTES
C5	83° 55' 52"	270.09'	395.65'	12" PVC SEWER MAIN
C6	3° 13' 09"	724.75'	40.72'	12" PVC SEWER MAIN

PLAN: AVENIDA DE LOS LOBOS AND PASEO MONTANOSO

DRAWING NO. 84-C-103	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 16	GRAVITY SEWER PLAN AND PROFILE - 2	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 16 OF 118 SHEETS	WATER SEWER WBS S-00308
APPROVED BY: <i>[Signature]</i> FOR CITY ENGINEER	DATE 7-26-11	PROJECT MANAGER <i>[Signature]</i>
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CHECKED BY: INSPECTOR	DATE STARTED	DATE COMPLETED
CONTRACTOR		36196-16 -D



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8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
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**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



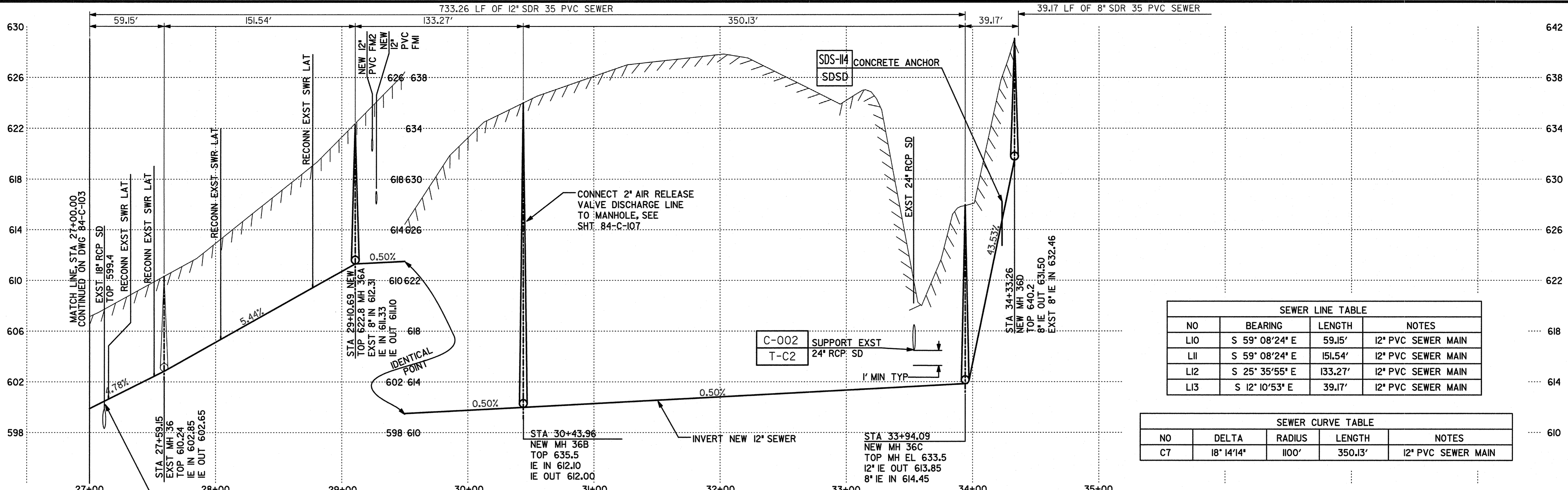
DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

SCALE: HORIZONTAL 1" = 40', VERTICAL 1" = 4'

WARNING: IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

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SEWER LINE TABLE			
NO	BEARING	LENGTH	NOTES
L10	S 59° 08' 24" E	59.15'	12" PVC SEWER MAIN
L11	S 59° 08' 24" E	151.54'	12" PVC SEWER MAIN
L12	S 25° 35' 55" E	133.27'	12" PVC SEWER MAIN
L13	S 12° 10' 53" E	39.17'	12" PVC SEWER MAIN

SEWER CURVE TABLE				
NO	DELTA	RADIUS	LENGTH	NOTES
C7	18° 14' 14"	1100'	350.13'	12" PVC SEWER MAIN

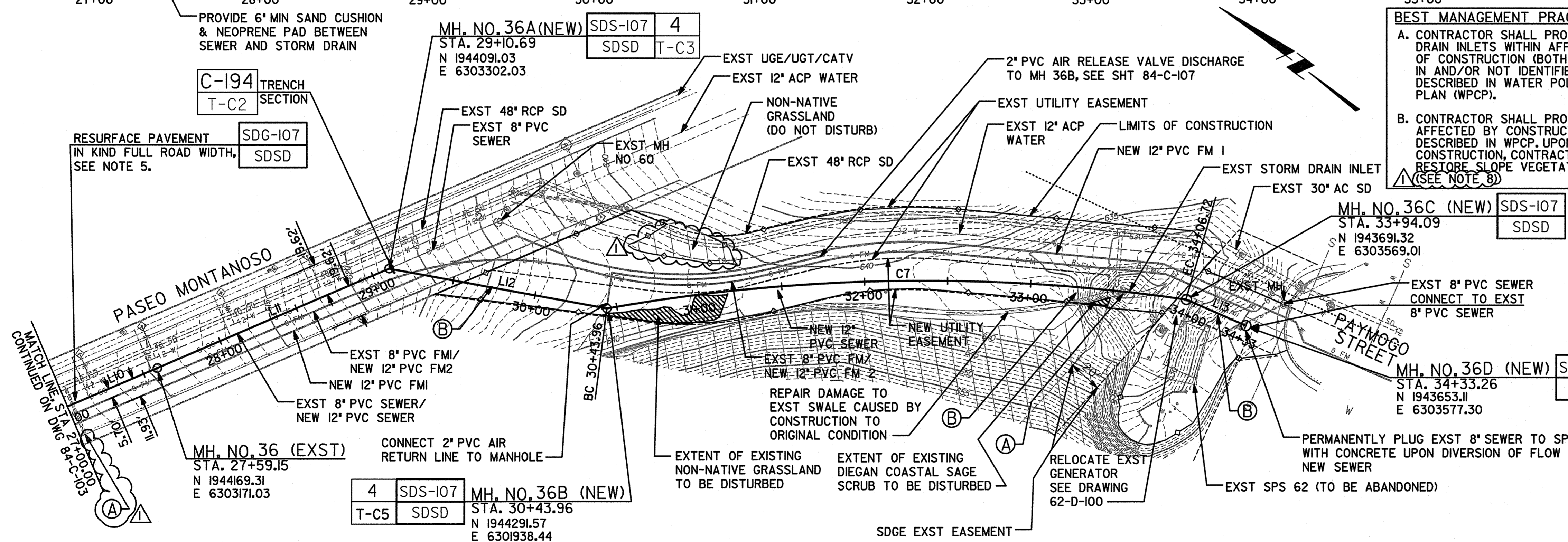
BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

(SEE NOTE 8)

- NOTES:**
- NEW GRAVITY SEWER BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
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 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS-BUILT DRAWING SETS I3939, 23173, 23389, 23688 & 24131.
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 - INDIVIDUAL LOT SERVICES/LATERALS (IE ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - CORE DRILL SEWER PIPE ENLARGEMENTS TO EXISTING MANHOLES. MAINTAIN EXISTING INVERT ELEVATIONS. REPAIR EXISTING MANHOLE LINER.
 - RESTORATION OF VEGETATION WITHIN UTILITY EASEMENTS SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02900, LANDSCAPING.

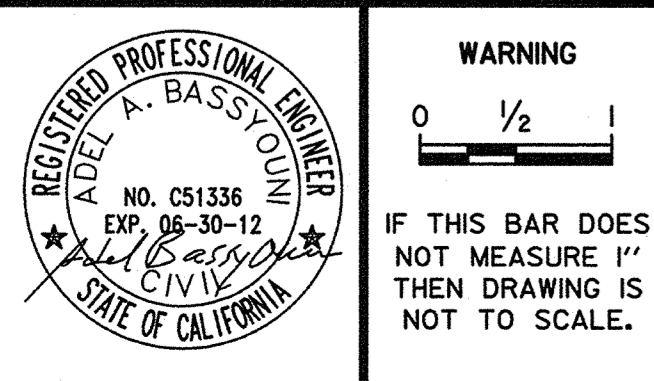


PLAN: PASEO MONTANOSO AND PAYMOGO STREET

CONSTRUCTION SITE STORM WATER PRIORITY (INSPECTION FREQUENCY): LOW

DRAWING NO. 84-C-104	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 17	GRAVITY SEWER PLAN AND PROFILE - 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 17 OF 118 SHEETS	WATER WBS SEWER WBS	S-00308
APPROVED BY: FOR CITY ENGINEER	DATE 10.25.11	BY	DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	APPROVED	DATE
CHECKED BY: INSPECTOR	DATE STARTED	DATE COMPLETED	
CONTRACTOR		36196-17 -D	

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			



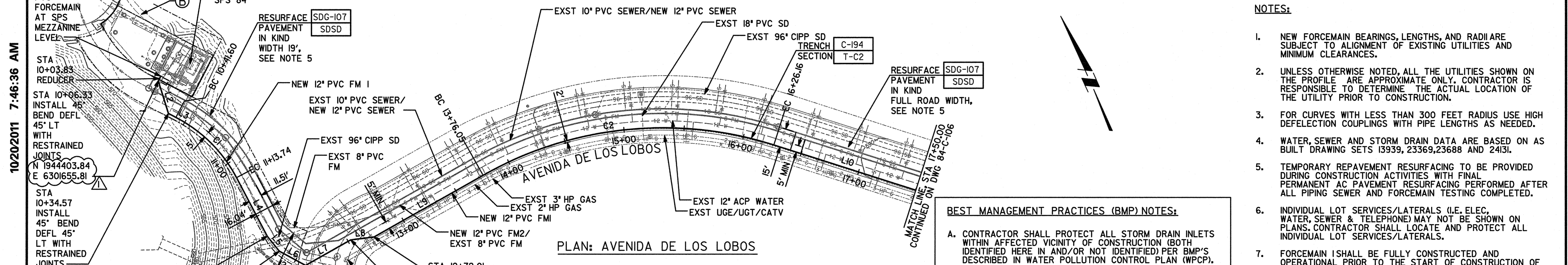
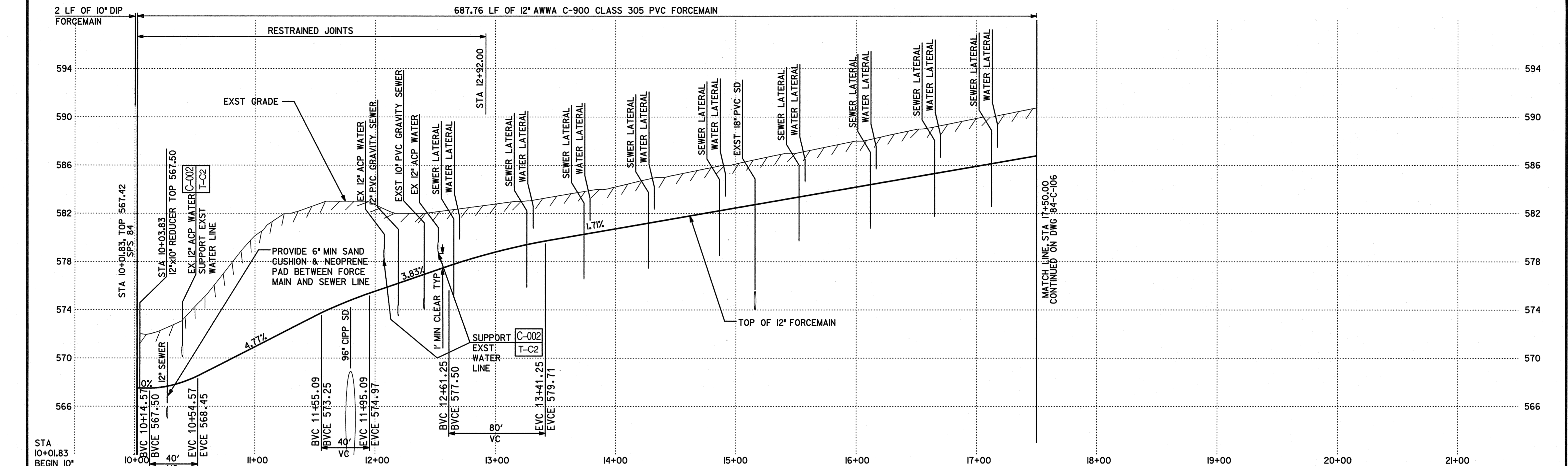
WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL 1" = 40', VERTICAL 1" = 4'

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



- NOTES:**
1. NEW FORCEMAIN BEARINGS, LENGTHS, AND RADI ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 2. UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 3. FOR CURVES WITH LESS THAN 300 FEET RADIUS USE HIGH DEFECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 4. WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS I3939, 23369, 23688 AND 24131.
 5. TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
 6. INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 7. FORCEMAIN SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.

BEST MANAGEMENT PRACTICES (BMP) NOTES:

- A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).
- B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

SEWER LINE TABLE

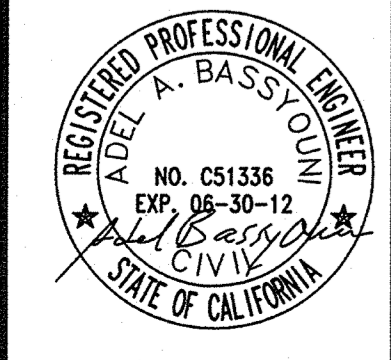
NO.	BEARING	LENGTH	NOTES
L1	S 30° 56' 08" W	4.5	12" PVC FORCE MAIN
L2	S 14° 03' 52" E	28.24	12" PVC FORCE MAIN
L3	S 59° 08' 00" E	7.03	12" PVC FORCE MAIN
L4	S 24° 23' 56" E	54.85	12" PVC FORCE MAIN
L5	S 35° 38' 56" E	16	12" PVC FORCE MAIN
L6	S 58° 08' 56" E	21	12" PVC FORCE MAIN
L7	N 63° 55' 32" E	43.05	12" PVC FORCE MAIN
L8	N 86° 25' 32" E	19.54	12" PVC FORCE MAIN
L9	N 63° 55' 32" E	104.05	12" PVC FORCE MAIN
L10	S 68° 56' 10" E	123.84	12" PVC FORCE MAIN

SEWER CURVE TABLE

NO.	DELTA	RADIUS	LENGTH	NOTES
CI	34° 44' 07"	119*	72.14	12" PVC FORCE MAIN
C2	47° 8' 18"	304	250.11	12" PVC FORCE MAIN

* SEE NOTE 3

10/20/2011 7:46:36 AM
26202-84-C-105.dgn



WARNING
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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

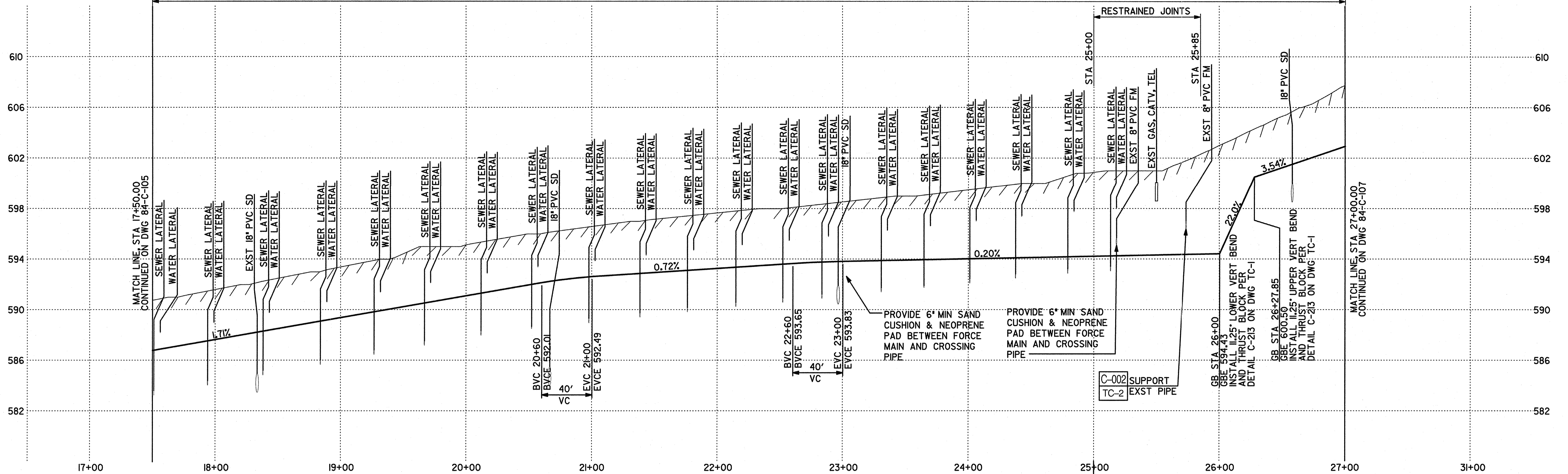
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



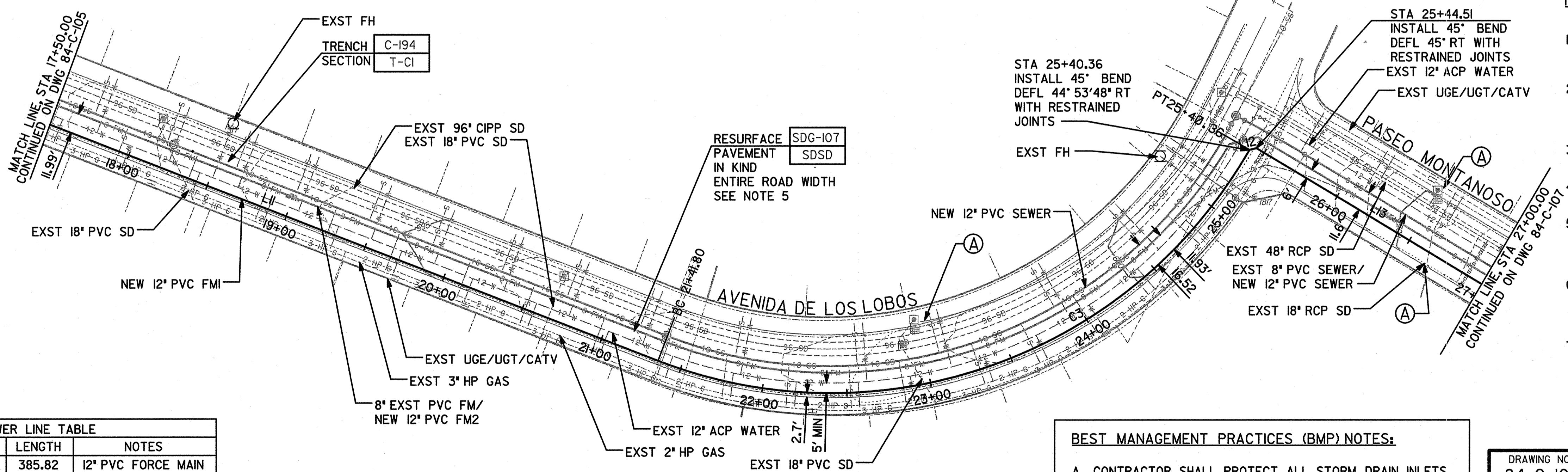
DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

DRAWING NO. 84-C-105	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 18	SEWER FORCE MAIN I PLAN AND PROFILE - I		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 18 OF 118 SHEETS		WATER SEWER WBS S-00308
APPROVED BY: <i>Hossein</i> 10.25.11 FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR			
DESCRIPTION: <i>302-1737</i> BY: <i>Paul M. Lee</i> APPROVED: <i>Paul M. Lee</i> DATE: <i>10.25.11</i> CONTROL CERTIFICATION LAMBERT COORDINATES 36196-18-D			



- NOTES:**
1. NEW FORCEMAIN BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 2. UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 3. FOR CURVES WITH LESS THAN 300 FEET USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 4. WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS I3939, 23369, 23688 AND 24131.
 5. TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
 6. INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 7. FORCEMAIN SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.



PLAN: AVENIDA DE LOS LOBOS & PASEO MONTANOSO

SEWER LINE TABLE			
NO.	BEARING	LENGTH	NOTES
L11	S 68° 56' 10" E	385.82	12" PVC FORCE MAIN
L12	N 75° 57' 38" E	4.15	12" PVC FORCE MAIN
L13	S 59° 02' 22" E	155.49	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO.	DELTA	RADIUS	LENGTH	NOTES
C3	81° 02' 36"	286*	404.54	12" PVC FORCE MAIN

* SEE NOTE 3

BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCL).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCL. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

DRAWING NO. 84-C-106	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 19	SEWER FORCEMAIN 1 PLAN AND PROFILE - 2	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 19 OF 118 SHEETS	WATER WBS SEWER WBS S-00308

APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	<p><i>Hosca Arca</i> 7-26-11</p> <p>DATE</p>	<p>DATE STARTED</p> <p>DATE COMPLETED</p>	<p>CONTROL CERTIFICATION</p> <p>302-1737</p> <p>LAMBERT COORDINATES</p> <p>36196- 19 -D</p>
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DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

7/18/2011 8:02:51 AM

26202-84-C-106.dgn

REGISTERED PROFESSIONAL ENGINEER
ADEL A. BASSYOUNI
NO. C51336
EXP. 06-30-12
CIVIL
STATE OF CALIFORNIA

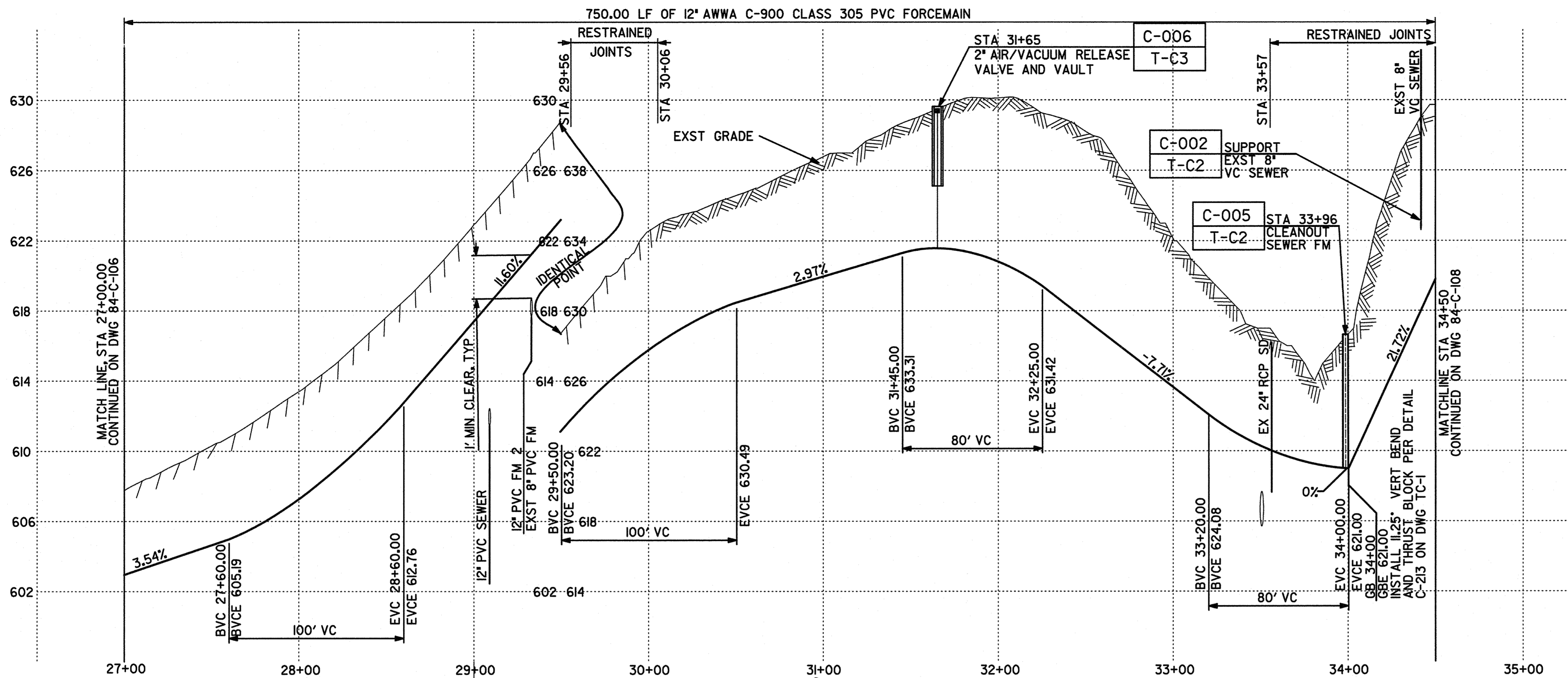
WARNING

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CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

26202-84-C-107.dgn MATCH LINE STA 13+00.00/20/2011 7:47:58 AM



SEWER LINE TABLE			
NO.	BEARING	LENGTH	NOTES
L14	S 59° 02'22" E	275.74	12" PVC FORCE MAIN
L15	S 14° 08'23" E	19.66	12" PVC FORCE MAIN
L16	S 49° 44'36" E	25.18	12" PVC FORCE MAIN
L17	S 30° 3'12" E	129.28	12" PVC FORCE MAIN
L18	S 12° 07'07" E	79.21	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO.	DELTA	RADIUS	LENGTH	NOTES
C4	35° 36'13"	220*	136.71	12" PVC FORCE MAIN
C5	19° 13'24"	251*	84.21	12" PVC FORCE MAIN

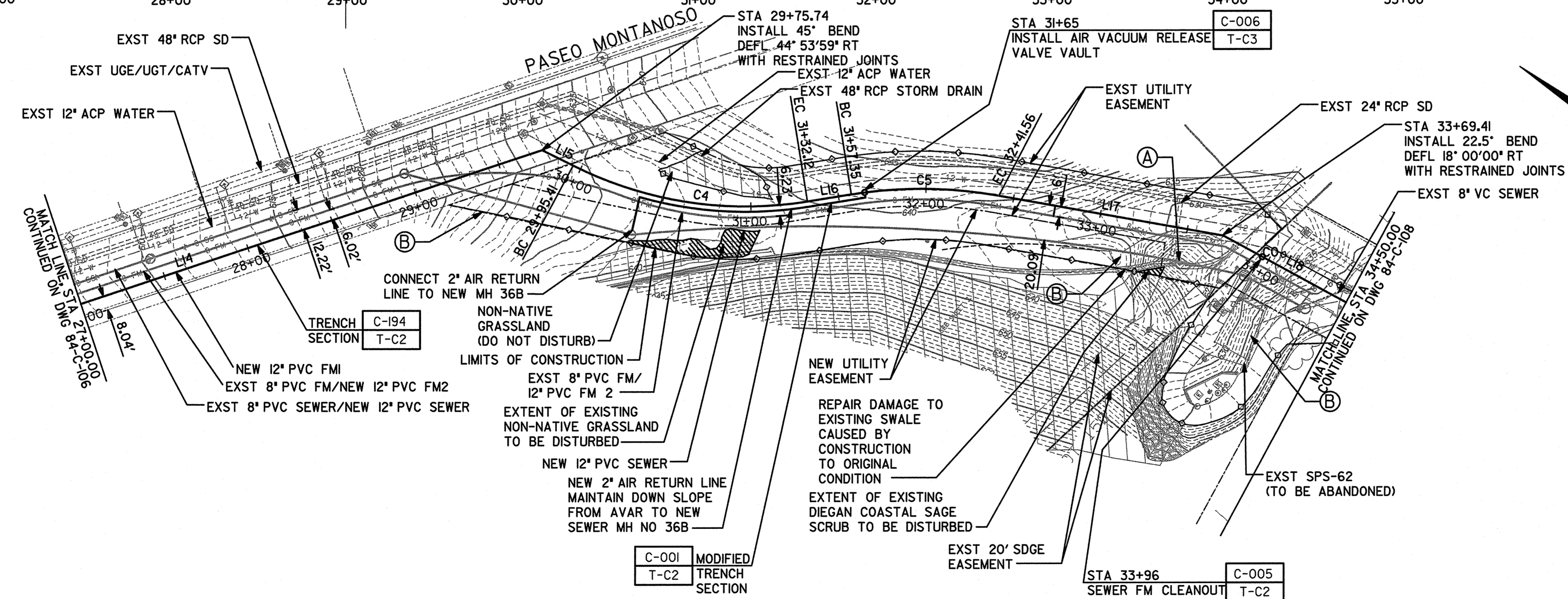
*SEE NOTE 3

BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND (SEE NOTE 8).

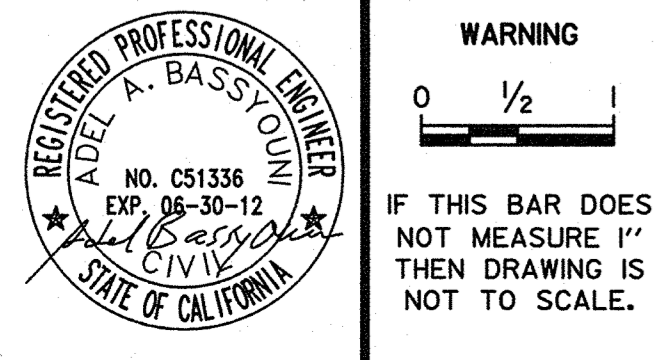
- NOTES:**
- NEW FORCEMAIN BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 - UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 - FOR CURVES WITH LESS THAN 300 FEET RADIUS USE HIGH DEFELECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS I3939, 23369, 23688 AND 24131.
 - TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
 - INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - FORCEMAIN 1 SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.
 - RESTORATION OF VEGETATION WITHIN UTILITY EASEMENTS SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02900, LANDSCAPING.



PLAN: PASEO MONTANOSO/ PAYMOGO STREET

CONSTRUCTION SITE STORM WATER PRIORITY (INSPECTION FREQUENCY): LOW

DRAWING NO. 84-C-107	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 20	FORCEMAIN 1 PLAN AND PROFILE - 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 20 OF 118 SHEETS	WATER WBS SEWER WBS	S-00308
APPROVED BY: FOR CITY ENGINEER	10.25.11		
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
INSPECTOR			
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
		36196-20-D	



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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE
HORIZONTAL 1" = 40'
VERTICAL 1" = 4'

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

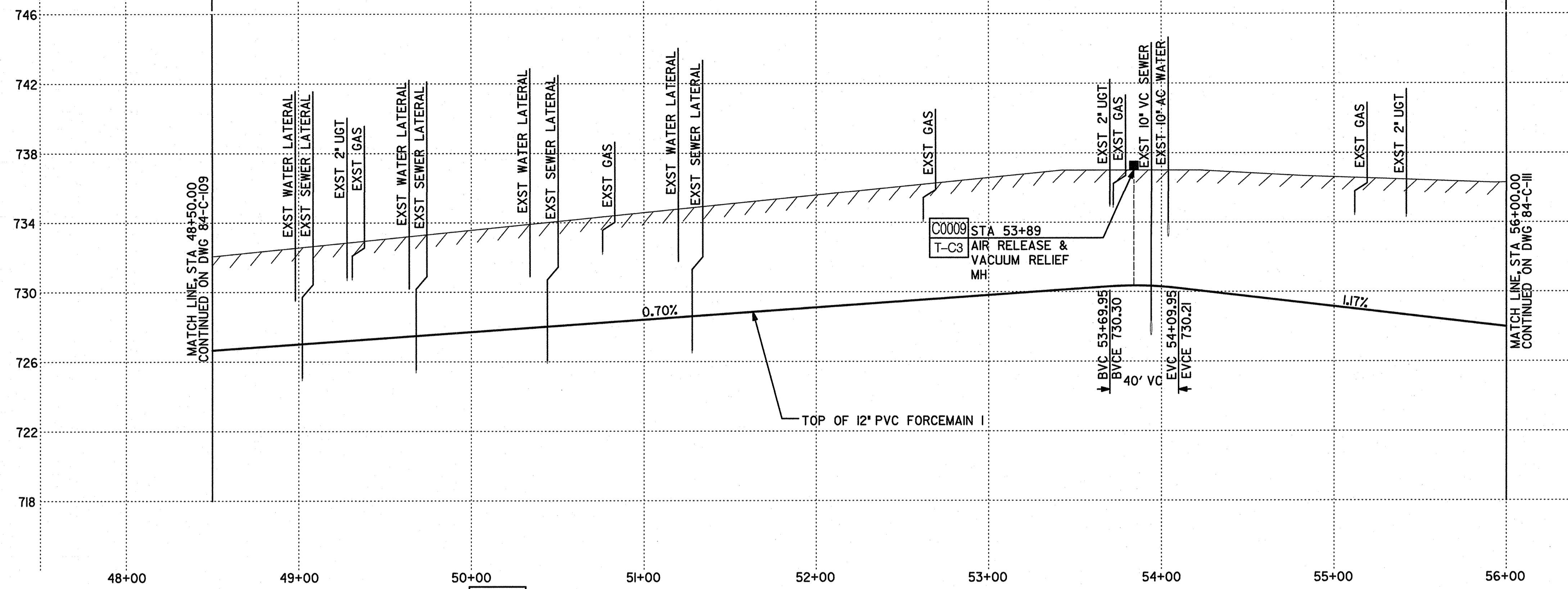


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

7/18/2011 8:22:38 AM

26202-84-C-110.dgn

750 LF OF 12" AWWA C-900 CLASS 305 PVC FORCE MAIN



BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

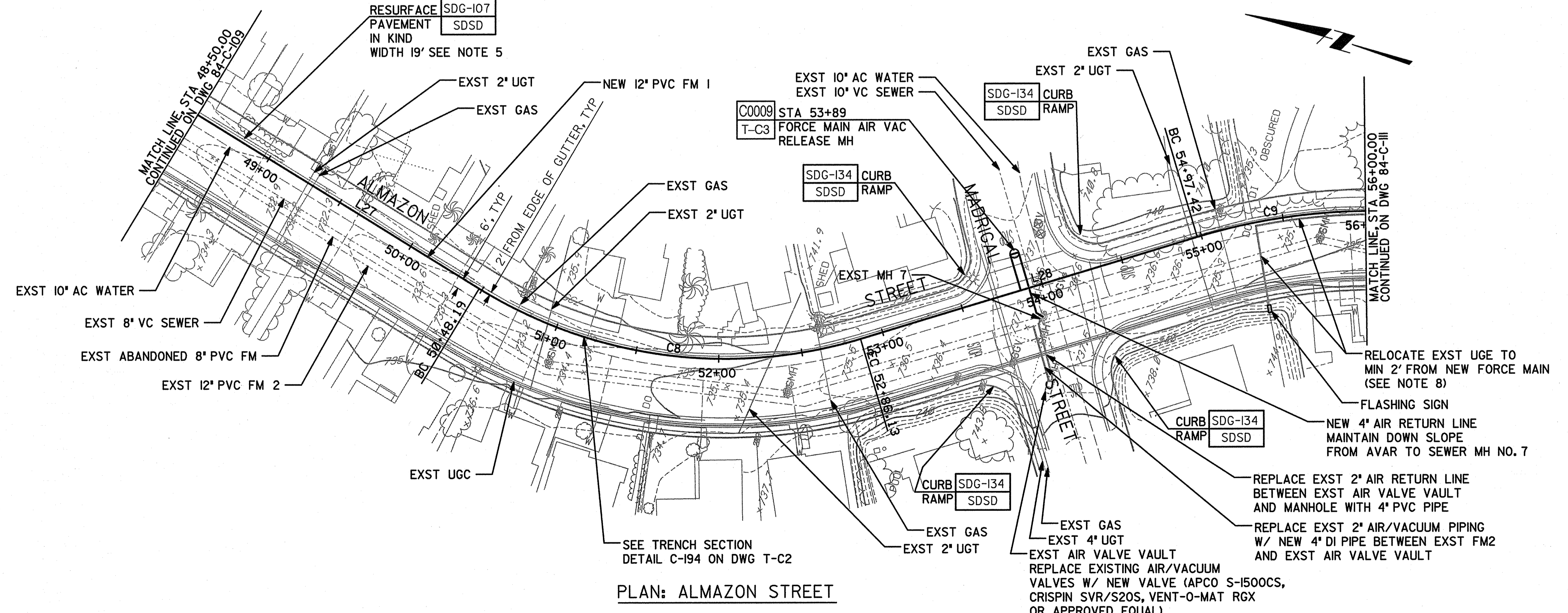
SEWER LINE TABLE			
NO.	BEARING	LENGTH	NOTES
L27	S 15° 46' 47" W	198.19	12" PVC FORCE MAIN
L28	S 32° 25' 01" E	211.29	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO.	DELTA	RADIUS	LENGTH	NOTES
C8	48° 06' 24"	283*	237.94	12" PVC FORCE MAIN
C9	16° 02' 32"	366	102.58	12" PVC FORCE MAIN

* SEE NOTE 3

NOTES:

- NEW FORCEMAIN BEARINGS, LENGTHS, AND RADII ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
- UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
- FOR CURVES WITH LESS THAN 300 FEET RADIUS USE HIGH DEFELECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
- WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS 13939, 23369, 23688 AND 24131.
- TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
- INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
- FORCEMAIN I SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.
- UNDERGROUND ELECTRIC TO FLASHING SIGN SHALL BE RELOCATED TO ACCOMMODATE INSTALLATION OF NEW 12" PVC FORCE MAIN I BETWEEN STA 55+33 AND STA 57+21.



PLAN: ALMAZON STREET

DRAWING NO. 84-C-110	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 23	SEWER FORCEMAIN I PLAN AND PROFILE - 6	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 23 OF 118 SHEETS	WATER SEWER WBS S-00308
APPROVED BY: <i>[Signature]</i> 7-26-11 FOR CITY ENGINEER		PROJECT MANAGER
CHECKED BY:		CONTROL CERTIFICATION
CONSTRUCTION ENGINEER		302-1737
CHECKED BY:		LAMBERT COORDINATES
INSPECTOR		CONTRACTOR
INSPECTOR		DATE STARTED
INSPECTOR		DATE COMPLETED

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

WARNING

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR

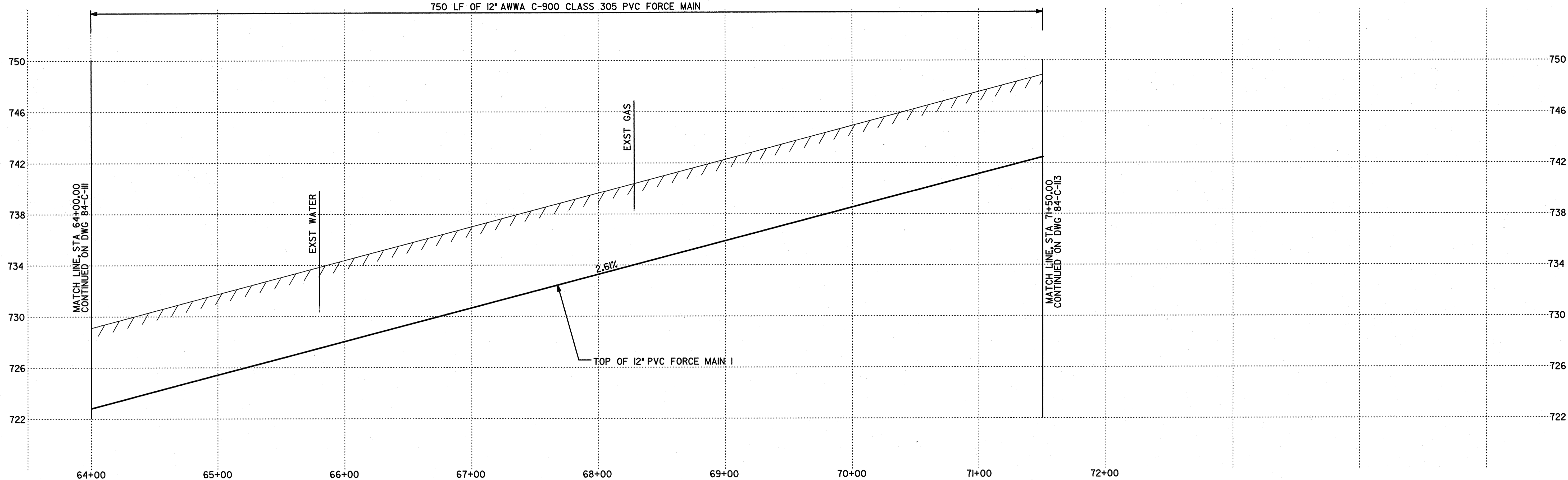
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL 1" = 40', VERTICAL 1" = 4'

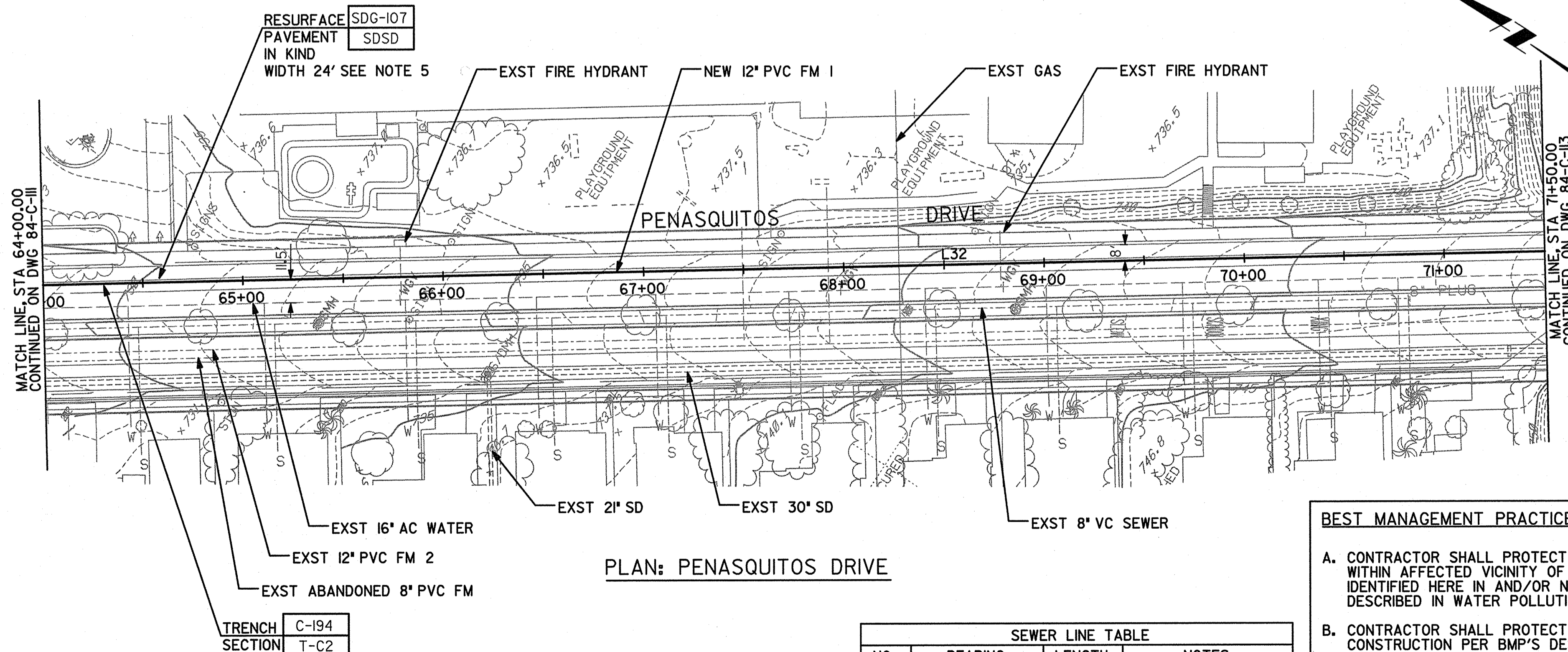
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



750 LF OF 12" AWWA C-900 CLASS 305 PVC FORCE MAIN



- NOTES:**
1. NEW FORCEMAIN BEARINGS, LENGTHS, AND RADI ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 2. UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 3. FOR CURVES WITH LESS THAN 300 FEET USE HIGH DEFELECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 4. WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS 13939, 23369, 23688 AND 24131.
 5. TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
 6. INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 7. FORCEMAIN 1 SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.



PLAN: PENASQUITOS DRIVE

SEWER LINE TABLE			
NO.	BEARING	LENGTH	NOTES
L32	S 34° 46'38" E	750.00	12" PVC FORCE MAIN

BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

DRAWING NO. 84-C-112	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 25	SEWER FORCEMAIN 1 PLAN AND PROFILE - 8	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 25 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	DATE
CHECKED BY: CONSTRUCTION ENGINEER	BY	DATE
CHECKED BY: INSPECTOR	DATE STARTED	DATE COMPLETED
CONTROL CERTIFICATION		298-1737 LAMBERT COORDINATES
CONTRACTOR		36196-25-D

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

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WARNING

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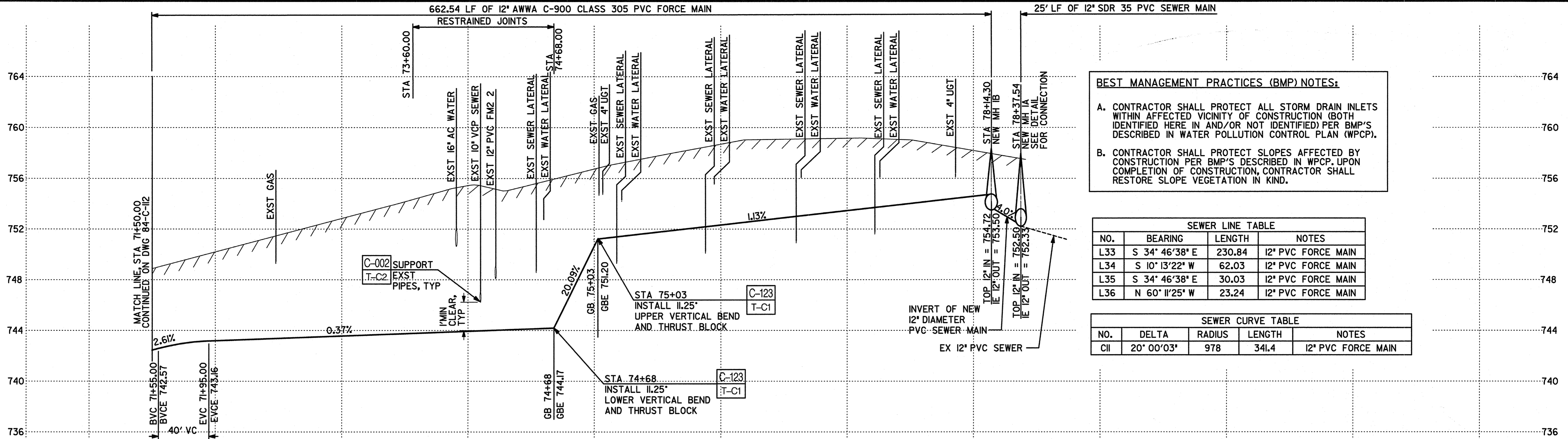
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

SCALE	HORIZONTAL	1" = 40'
	VERTICAL	1" = 4'

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26202-84-C-113.dgn



BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

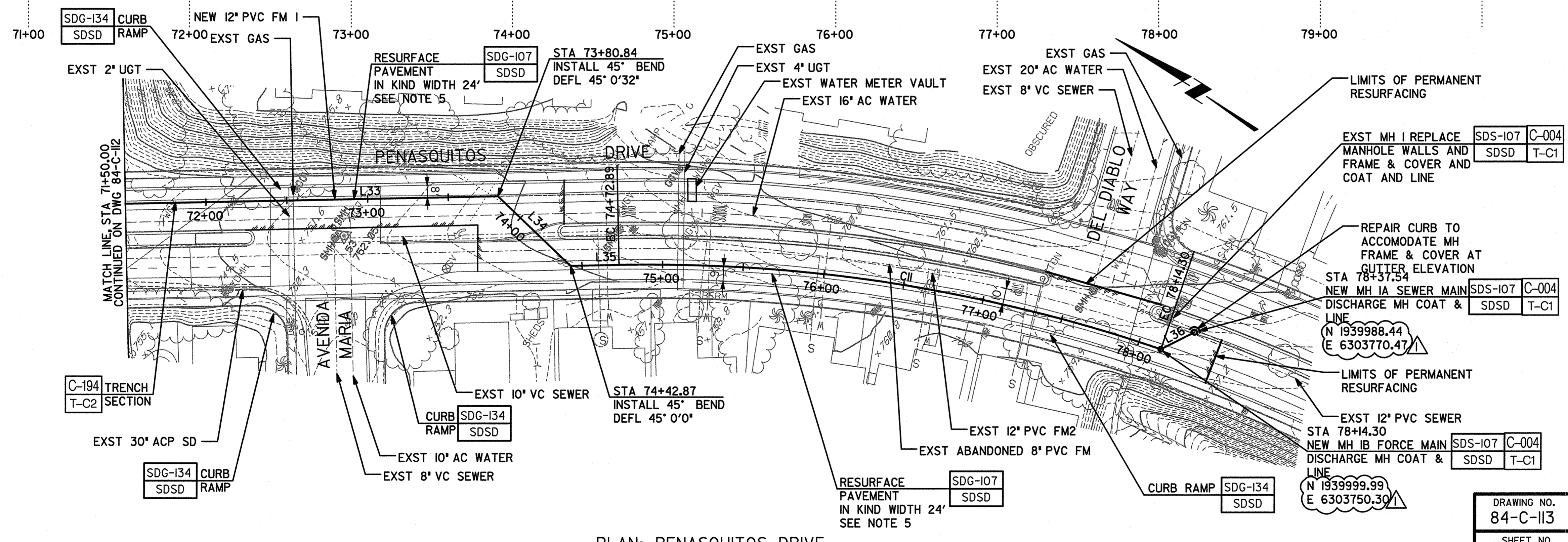
B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

SEWER LINE TABLE			
NO.	BEARING	LENGTH	NOTES
L33	S 34° 46' 38" E	230.84	12" PVC FORCE MAIN
L34	S 10° 13' 22" W	62.03	12" PVC FORCE MAIN
L35	S 34° 46' 38" E	30.03	12" PVC FORCE MAIN
L36	N 60° 11' 25" W	23.24	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO.	DELTA	RADIUS	LENGTH	NOTES
C11	20° 00' 03"	978	341.4	12" PVC FORCE MAIN

NOTES:

- NEW FORCEMAIN BEARINGS, LENGTHS, AND RADI ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
- UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
- FOR CURVES WITH LESS THAN 300 FEET USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
- WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS 19399, 23369, 23688 AND 24131.
- TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL PIPING SEWER AND FORCEMAIN TESTING COMPLETED.
- INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
- FORCEMAIN 1 SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.



PLAN: PENASQUITOS DRIVE

DRAWING NO. 84-C-113	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 26	SEWER FORCEMAIN 1 PLAN AND PROFILE - 9		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 26 OF 118 SHEETS	WATER WBS SEWER WBS S-00308	
APPROVED BY: <i>Hose Arar</i> 10.25.11		DATE	
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY:			
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR	DATE STARTED		
INSPECTOR	DATE COMPLETED		
			36196-26 -D

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			



WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR

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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

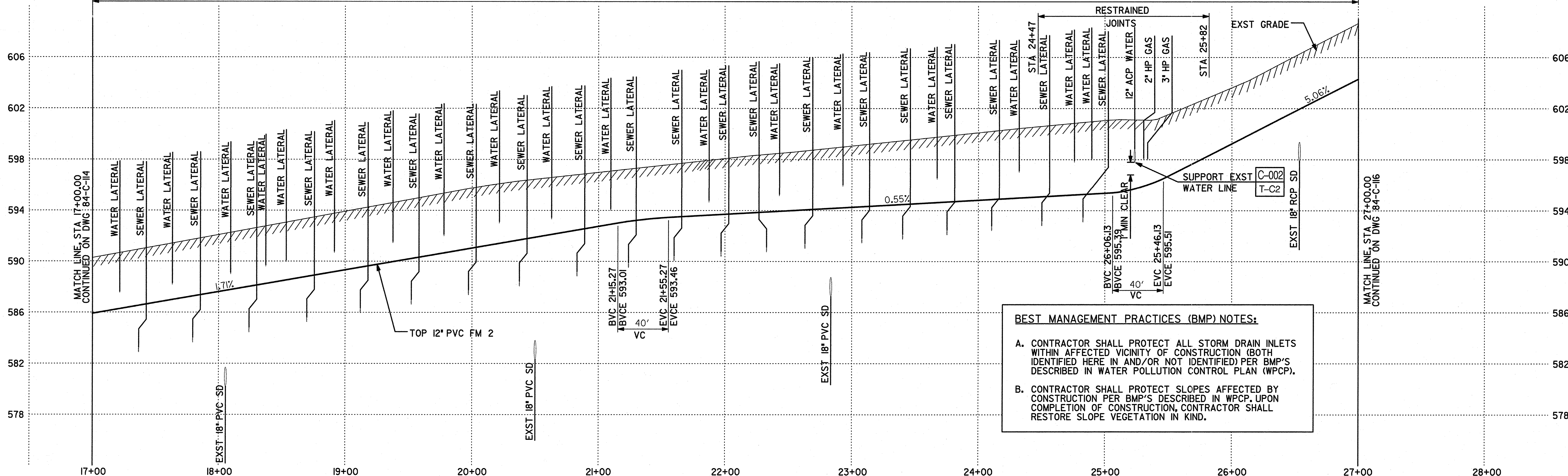
SCALE

HORIZONTAL	1" = 40'
VERTICAL	1" = 4'

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



1000 LF OF 12" AWWA C-900 CLASS 305 PVC FORCEMAIN

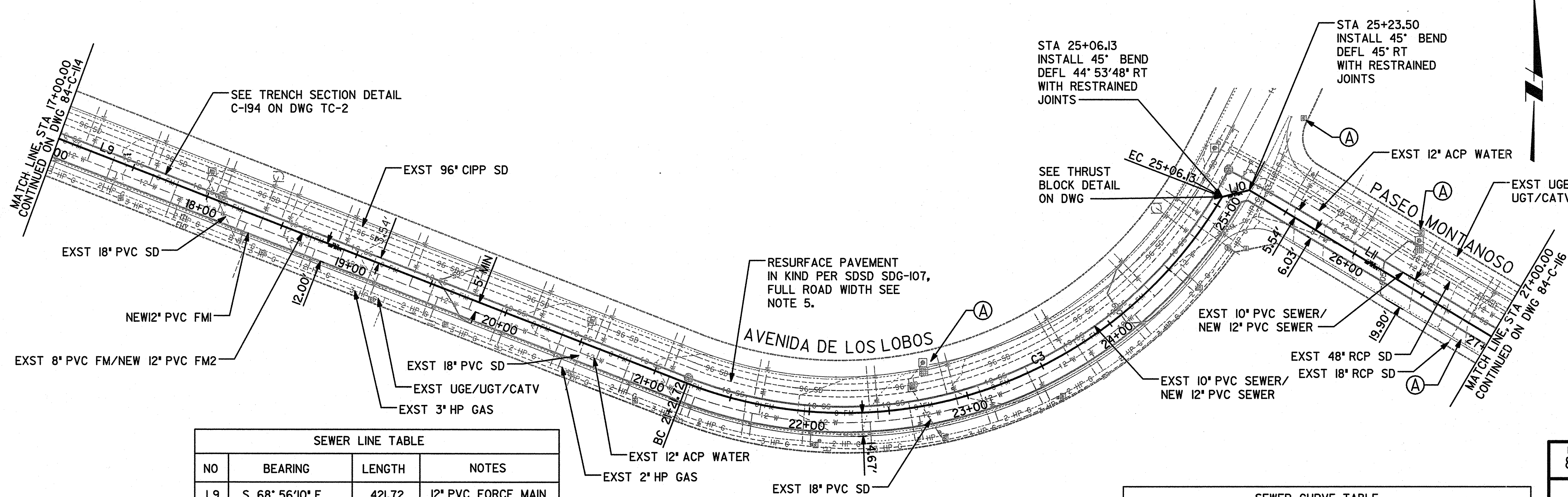


BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND.

- NOTES:**
- NEW FORCEMAIN BEARINGS, LENGTHS, AND RADI ARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 - UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 - FOR CURVES WITH LESS THAN 300 FEET RADIUS USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS I3939, 23369, 23688 AND 24131.
 - TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL SEWER AND FORCEMAIN TESTING IS COMPLETED.
 - INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - FORCEMAIN 1 SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.
 - REMOVAL OF THE EXISTING 8" PVC FORCEMAIN IS REQUIRED FOR THE INSTALLATION OF FORCEMAIN 2 EXCEPT WHERE NOTED FOR ABANDONMENT IN PLACE.



SEWER LINE TABLE			
NO	BEARING	LENGTH	NOTES
L9	S 68° 56'10" E	421.72	12" PVC FORCE MAIN
L10	N 75° 57'38" E	17.38	12" PVC FORCE MAIN
L11	S 59° 02'22" E	176.50	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO	DELTA	RADIUS	LENGTH	NOTES
C3	80° 22'55"	*274.00	384.40	12" PVC FORCE MAIN

* SEE NOTE 3

PLAN: AVENIDA DE LOS LOBOS AND PASEO MONTANOSO

DRAWING NO. 84-C-115	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 28	SEWER FORCE MAIN 2 PLAN AND PROFILE - 2		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 28 OF 118 SHEETS		WATER SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hoggins, A. J. 7-26-11		PROJECT MANAGER Paul A. Jee
CHECKED BY: CONSTRUCTION ENGINEER			CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
INSPECTOR	DATE STARTED		36196-28-D
	DATE COMPLETED		

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

7/18/2011 8:32:56 AM 26202-84-C-115.dgn

REGISTERED PROFESSIONAL ENGINEER
ADEL A. BASSOUNI
NO. C51336
EXP. 06-30-12
CIVIL
STATE OF CALIFORNIA

WARNING

0 1/2 1

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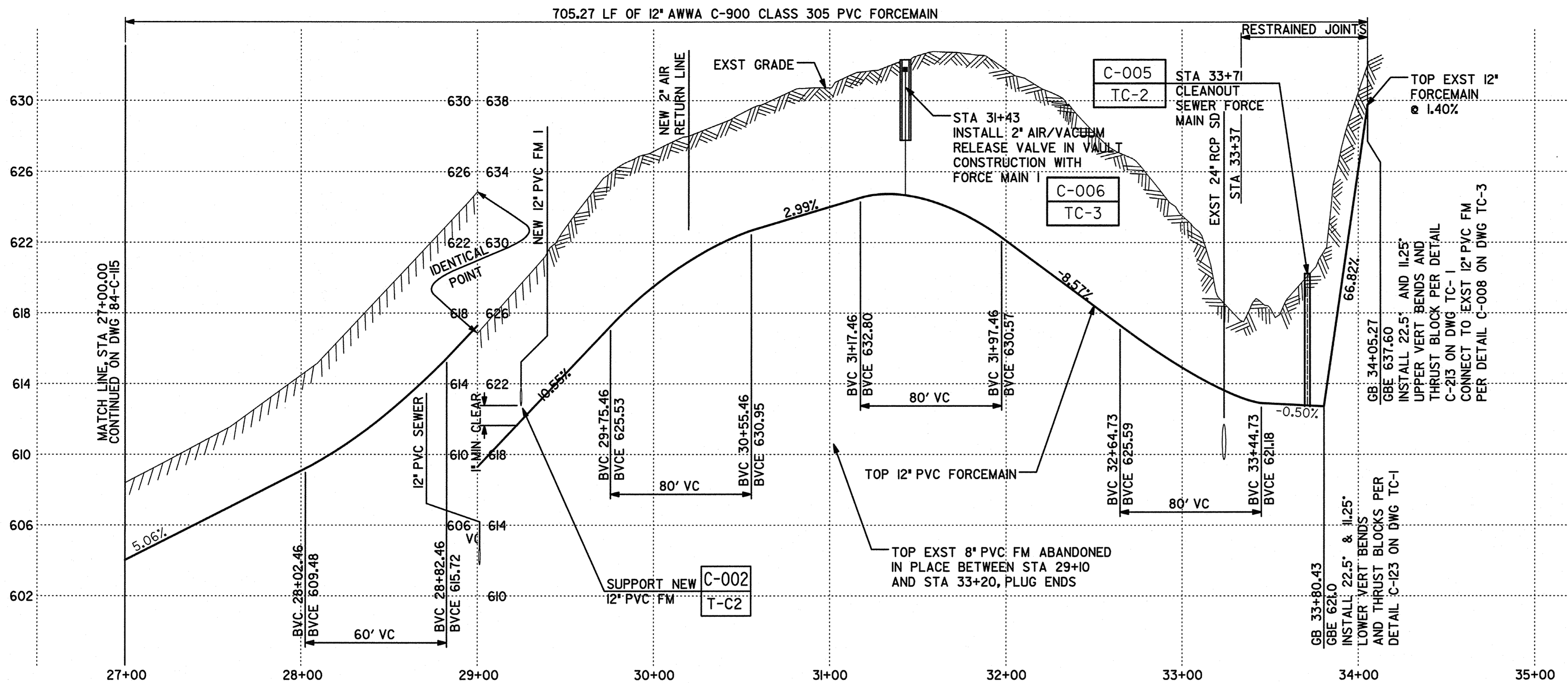
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

SCALE	HORIZONTAL	1" = 40'
	VERTICAL	1" = 4'



10/20/2011 8:27:43 AM

26202-84-C-116.dgn



SEWER LINE TABLE			
NO	BEARING	LENGTH	NOTES
LI2	S 59° 02' 22" E	166.01	12" PVC FORCE MAIN
LI3	S 49° 44' 36" E	30.18	12" PVC FORCE MAIN
LI4	S 30° 31' 12" E	131.30	12" PVC FORCE MAIN
LI5	S 12° 07' 07" E	56.15	12" PVC FORCE MAIN

SEWER CURVE TABLE				
NO	DELTA	RADIUS	LENGTH	NOTES
C4	38° 56' 38"	*200.00	135.94	12" PVC FORCE MAIN
C5	29° 38' 52"	*200.00	103.49	12" PVC FORCE MAIN
C6	19° 13' 24"	*245.00	56.83	12" PVC FORCE MAIN

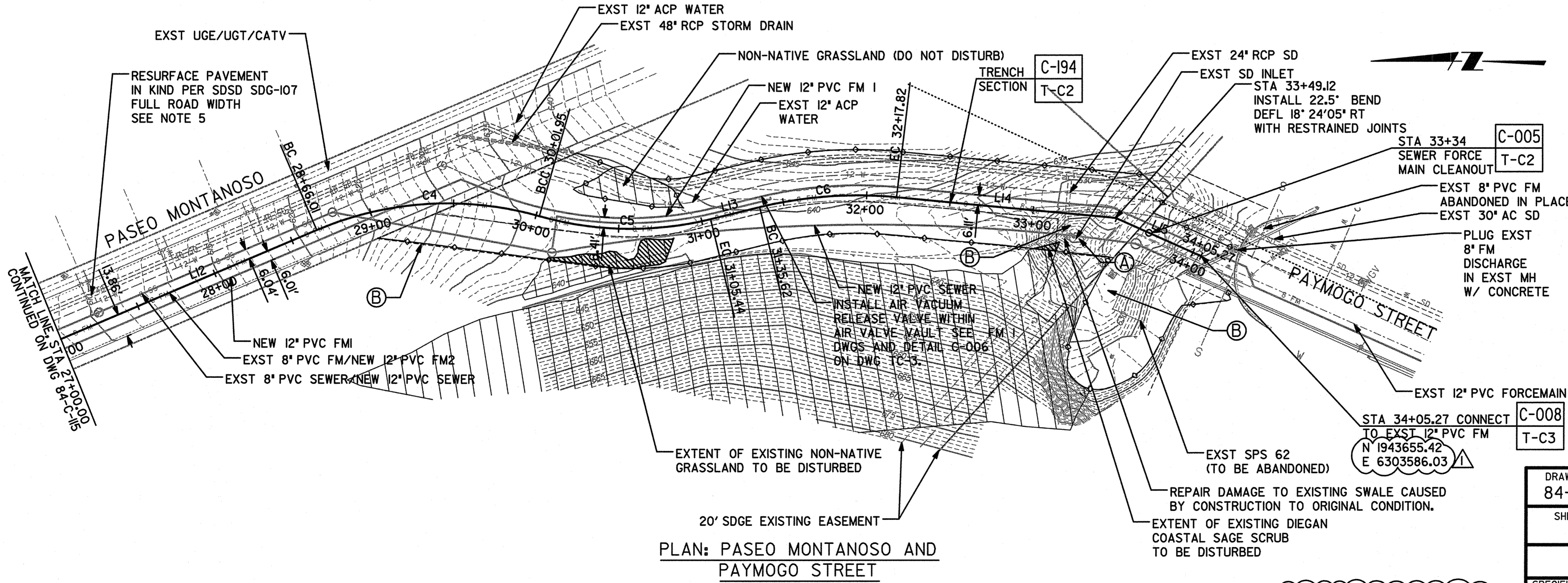
*SEE NOTE 3

BEST MANAGEMENT PRACTICES (BMP) NOTES:

A. CONTRACTOR SHALL PROTECT ALL STORM DRAIN INLETS WITHIN AFFECTED VICINITY OF CONSTRUCTION (BOTH IDENTIFIED HERE IN AND/OR NOT IDENTIFIED) PER BMP'S DESCRIBED IN WATER POLLUTION CONTROL PLAN (WPCP).

B. CONTRACTOR SHALL PROTECT SLOPES AFFECTED BY CONSTRUCTION PER BMP'S DESCRIBED IN WPCP. UPON COMPLETION OF CONSTRUCTION, CONTRACTOR SHALL RESTORE SLOPE VEGETATION IN KIND (SEE NOTE 9).

- NOTES:**
- NEW FORCEMAIN BEARINGS, LENGTHS, AND RADIARE SUBJECT TO ALIGNMENT OF EXISTING UTILITIES AND MINIMUM CLEARANCES.
 - UNLESS OTHERWISE NOTED, ALL THE UTILITIES SHOWN ON THE PROFILE ARE APPROXIMATE ONLY. CONTRACTOR IS RESPONSIBLE TO DETERMINE THE ACTUAL LOCATION OF THE UTILITY PRIOR TO CONSTRUCTION.
 - FOR CURVES WITH LESS THAN 300 FEET RADIUS USE HIGH DEFLECTION COUPLINGS WITH PIPE LENGTHS AS NEEDED.
 - WATER, SEWER AND STORM DRAIN DATA ARE BASED ON AS BUILT DRAWING SETS 13939, 23369, 23688 AND 24131.
 - TEMPORARY REPAVEMENT RESURFACING TO BE PROVIDED DURING CONSTRUCTION ACTIVITIES WITH FINAL PERMANENT AC PAVEMENT RESURFACING PERFORMED AFTER ALL SEWER AND FORCEMAIN TESTING IS COMPLETED.
 - INDIVIDUAL LOT SERVICES/LATERALS (I.E. ELEC, WATER, SEWER & TELEPHONE) MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL LOCATE AND PROTECT ALL INDIVIDUAL LOT SERVICES/LATERALS.
 - FORCEMAIN 1 SHALL BE FULLY CONSTRUCTED AND OPERATIONAL PRIOR TO THE START OF CONSTRUCTION OF FORCEMAIN 2.
 - REMOVAL OF THE EXISTING 8" PVC FORCEMAIN IS REQUIRED FOR THE INSTALLATION OF FORCEMAIN 2 EXCEPT WHERE NOTED FOR ABANDONMENT IN PLACE.
 - RESTORATION OF VEGETATION WITHIN UTILITY EASEMENTS SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 02900, LANDSCAPING.



PLAN: PASEO MONTANOSO AND PAYMOGO STREET

CONSTRUCTION SITE STORM WATER PRIORITY (INSPECTION FREQUENCY): LOW

DRAWING NO. 84-C-116	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 29	SEWER FORCE MAIN 2 PLAN AND PROFILE - 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 29 OF 118 SHEETS	WATER WBS SEWER WBS S-00308	
APPROVED BY: FOR CITY ENGINEER	10-25-11	DATE	
CHECKED BY: CONSTRUCTION ENGINEER		BY	
CHECKED BY: INSPECTOR		APPROVED	
		DATE	
		FILED	
		PROJECT MANAGER	
		CONTROL CERTIFICATION	
		302-1737	
		LAMBERT COORDINATES	
		CONTRACTOR	
		DATE STARTED	
		DATE COMPLETED	
			36196-29-D

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SCALE

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VERTICAL	1" = 4'

**CITY OF SAN DIEGO
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DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

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IRRIGATION LEGEND													
SYMBOL	DESCRIPTION	PSI	RADIUS	GALLONS PER MINUTE						MANUFACTURER	MODEL	DETAIL	DWG. NO.
				360°	270°	210°	180°	120°	90°				
	12" POP-UP MULTI STREAM ROTATING NOZZLE	40	19'	2.22	-	-	1.49	-	1.15	HUNTER	MPR40-12-CV-2000	C	L-6
	12" POP-UP MULTI STREAM ROTATING NOZZLE	40	14'	1.50	-	-	1.12	-	.94	HUNTER	MPR40-12-CV-1000	C	L-6
	AUTOMATIC CONTROLLER - SIZE AS INDICATED ON PLAN AUTOMATIC RAIN SHUTOFF DEVICE STAINLESS STEEL ENCLOSURE DESIGNED FOR 8 STATION CONTROLLER; PEDESTAL MOUNT; APPROVED BY AGENCY									IRRI TROL WCS STRONG BOX	MC-E RAINGUARD SB-18SS	C	L-3
	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER* - SIZE AS INDICATED ON PLAN BACKFLOW PREVENTER ENCLOSURE (STAINLESS STEEL MESH)									WILKINS STRONG BOX	*975XLS SBBC-30SS	B	L-4
	PRESSURE REDUCING VALVE & WYE STRAINER. SIZE AS INDICATED ON PLAN. FACTORY SET AT (65) PSI. WYE STRAINER WITH 60 MESH SCREEN									WILKINS WILKINS	*500 YSBR *YB W/ 60 MESH SCREEN	B	L-4
	MASTER CONTROL VALVE (NORMALLY OPEN FOR USE WITH FLOW METER) (MINIMUM OPERATING RATE OF 1 GPM) - SIZE AS INDICATED ON PLAN									SUPERIOR	*3300 (OPEN 1 GPM)	B	L-5
	FLOW SENSOR (AC OPERATED FOR USE WITH ELECTRICAL CONNECTION - CONSTANT SIGNAL) & LOCAL ADJUSTABLE RELAY CONTROL (L.A.R.C.)									DATA INDUSTRIAL DATA INDUSTRIAL	IR250 B 800	A	L-5
	QUICK COUPLING VALVE - 1" - VALVE BOX AS REQUIRED BY AGENCY									RAINBIRD	*44 LRC	A	L-6
	BALL VALVE-SIZE AS INDICATED ON PLAN									SPEARS	TRU-UNION	C	L-5
	REMOTE CONTROL VALVE (MINIMUM .01 GPM) SIZE INDICATED ON PLAN									RAINBIRD	PEB	B	L-6
	MAIN PRESSURE LINE (COPPER) INSTALLED BETWEEN PUMP AND BACKFLOW (MINIMUM DEPTH 18")									COPPER		A	L-3
	MAIN PRESSURE LINE (CLASS 315 PVC FOR 2" & LARGER) (SCHEDULE 40 PVC FOR PIPE 1-1/2" & SMALLER) (MINIMUM DEPTH 18")									PW. SWANSON OR APPROVED EQUAL		A	L-3
	LATERAL NON-PRESSURE LINE SCHEDULE 40 (3/4" MINIMUM SIZE PIPE)									PW. SWANSON OR APPROVED EQUAL		A	L-3
	PIPE SLEEVES SCHEDULE 40 PVC(2 SIZES LARGER THAN MAIN OR LATERAL LINE)									PW. SWANSON OR APPROVED EQUAL		A	L-3
	PULL BOX									BROOKS, CARSON OR APPROVED EQ.		-	-
	DIRECT BURIAL CONTROL WIRE (SOLID COPPER-COLOR CODED) WIRE CONNECTION									PEN-TITE OR APPROVED EQUAL		B	L-3
												A	L-4

GPM ADJUSTED FOR 12" SPRAY POP-UP (+.75 GPM)
GPM ADJUSTED FOR 12" ROTOR POP-UPS (+.75 GPM)

GENERAL IRRIGATION NOTES:

1. LOCATION OF IRRIGATION EQUIPMENT IS SHOWN DIAGRAMMATICALLY ONLY. PIPING, VALVES, AND OTHER IRRIGATION FIXTURES SHALL BE LOCATED IN PLANTING AREAS WHENEVER POSSIBLE.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FAMILIARIZE HIM OR HERSELF WITH ALL GRADE DIFFERENCES, LOCATION OF WALLS, RETAINING WALLS AND OTHER OBSTRUCTIONS. CONTRACTOR SHALL COORDINATE WORK WITH THE WORK OF OTHER TRADES FOR THE LOCATION AND THE INSTALLATION OF PIPE SLEEVES THROUGH WALLS, UNDER ROADWAYS, PAVING, STRUCTURES AND OTHER OBSTRUCTIONS.
3. LANDSCAPE CONTRACTOR SHALL COORDINATE THE INSTALLATION OF PVC ELECTRICAL CONDUIT ELL (FOR CONTROL WIRE FOR IRRIGATION CONTROLLER WITH ELECTRICIAN.
4. CONTROL WIRES UNDER PAVING SHALL BE INSTALLED IN PVC SLEEVES. COORDINATE SLEEVE INSTALLATION WITH OTHER TRADES TO ENSURE PROPER AND TIMELY INSTALLATION IN LOCATIONS REQUIRED.
5. CONTRACTOR SHALL NOT WILLFULLY INSTALL THE SYSTEM AS DESIGNED WHEN IT IS OBVIOUS IN THE FIELD THAT UNKNOWN OBSTRUCTIONS OR GRADE DIFFERENCES EXIST THAT WERE NOT KNOWN DURING DESIGN PHASE. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING CONDITIONS ON SITE AND CONTRACTING THE PROJECT ENGINEER. CONTRACTOR SHALL MAKE APPROPRIATE ADJUSTMENTS TO ENSURE THAT IRRIGATION COVERAGE IS 100% IN ALL PLANTING AREA AS ACCEPTED BY THE PROJECT ENGINEER.
6. THE CONTRACTOR SHALL PROVIDE AN UP-TO-DATE AND COMPLETE 'AS-BUILT' RECORD SET OF PRINTS WHICH SHALL BE CORRECTED AND SHOW EVERY CHANGE FROM THE ORIGINAL DRAWINGS. BEFORE THE TIME OF THE FINAL OBSERVATION, THE CONTRACTOR SHALL TRANSFER ALL INFORMATION FROM THE 'AS-BUILT' SET TO A REPRODUCIBLE BOND COPY OR MYLAR, PROCURED FROM THE PROJECT ENGINEER. ALL WORK SHALL BE NEAT AND LEGIBLE.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TESTING, RELOCATING AND READJUSTING IRRIGATION EQUIPMENT, CUTTING AND CAPPING OF EXISTING IRRIGATION PIPE PRIOR TO BIDDING THE PROJECT.
9. THE CONTRACTOR BIDDING SHALL VERIFY ON-SITE THE WORK TO BE DONE AND THE LIMIT OF WORK LINE FOR THOSE AREAS WITH THE PROJECT ENGINEER.

IRRIGATION NOTES:

1. SYSTEMS ARE DESIGNED FOR 80 PSI AT POINT OF CONNECTION. MINIMUM PRESSURE IS 40 PSI AT ROTOR HEADS.
2. EXISTING STATIC PRESSURE AT THE POINT OF CONNECTION IS 119 PSI (+/-10 PSI) AS RECORDED ON MAY 26, 2011 BY LOIS WITH THE SAN DIEGO WATER DEPARTMENT.
3. CONTRACTOR SHALL VERIFY EXISTING WATER PRESSURE BEFORE INSTALLING IRRIGATION SYSTEM.
4. BACKFLOW PREVENTER SHALL BE TESTED FOR PERFORMANCE AND CONFORMANCE WITH CODE REQUIREMENTS. SCREEN BACKFLOW PREVENTER WITH PLANT MATERIAL.
5. INSTALL HOSE BIBB VALVES AND REMOTE CONTROL VALVES PERPENDICULAR AND ADJACENT TO WALKS AND CURBS.
6. INSTALL ALL VALVES IN PLANTING AREAS AND ADJACENT TO PAVING WHERE POSSIBLE. PLACE NO MORE THAN THREE RCV BOXES TOGETHER AS INDICATED ON PLAN.
7. POP-UP HEADS SHALL BE LOCATED ADJACENT TO ALL PEDESTRIAN AREAS. ALL POP-UP HEADS SHALL BE INSTALLED SO THAT THE TOP OF THE IRRIGATION HEAD IS FLUSH WITH ADJACENT SURFACE AS INDICATED ON DETAIL.
8. ADJUST SPRINKLER HEADS TO KEEP SPRAY OFF WALKS, WALLS, AND UTILITIES.
9. CONTROLLER SHALL BE PROGRAMMED SO THAT WATER APPLICATION SHALL NOT EXCEED SOIL INFILTRATION RATE OR CAUSE RUN-OFF. APPLICATION RATE SHALL BE SUFFICIENT TO PREVENT ROOT STRESS.
10. INSTALL RAIN CUP FOR RAIN SHUTOFF DEVICE IN AN OPEN AREA AS APPROVED BY THE OWNER'S REPRESENTATIVE. DO NOT INSTALL BELOW BUILDING EAVES OR WHERE INACCESSIBLE TO RAINFALL. CUP MAY BE INSTALLED ON TOP OF A 6 FOOT GALVANIZED POST (PAINTED BLACK).

• CONTRACTOR MAY SALVAGE AND RE-USE EXISTING ON-SITE BACKFLOW PREVENTER AS APPROVED BY ENGINEER:

- A. EXISTING BACKFLOW PREVENTER IS A 'REDUCED PRESSURE PRINCIPAL BACKFLOW PREVENTER.'
- B. EXISTING BACKFLOW PREVENTER SHALL PASS INSPECTION FROM INDEPENDENT TESTING AGENCY.
- C. EXISTING BACKFLOW PREVENTER SHALL PROVIDE OPTIMAL PRESSURE TO ALL IRRIGATION HEADS.
- D. EXISTING BACKFLOW PREVENTER IS A 3/4" TO 2" SIZE.

MINIMUM DEPTH OF COVER OVER PIPE AND WIRE ARE:

PIPE UNDER TRAFFIC LOADS: 36" MINIMUM DEPTH
 MAIN PRESSURE LINES: 18" MINIMUM DEPTH
 LATERAL NON-PRESSURE LINES: 12" MINIMUM DEPTH
 CONTROL WIRING: 18" MINIMUM DEPTH
 CONTROL WIRING PIPE UNDER TRAFFIC LOADS: 30" MINIMUM DEPTH

ABANDONMENT OF IRRIGATION SYSTEM:

AFTER ESTABLISHMENT OF PLANTING IS APPROVED IN WRITING BY THE CITY, THE IRRIGATION SYSTEM SHALL BE ABANDONED IN PLACE. CONTRACTOR SHALL CUT AND CAP THE MAINLINE AT THE POINT OF CONNECTION AND TERMINATE POWER SERVICE TO THE CONTROLLER FOR VANDAL RESISTANCE AND SAFETY.

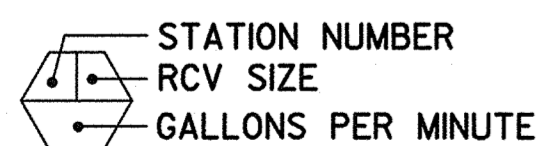
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LANDSCAPE ARCHITECTURE
URBAN DESIGN

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CONVENTIONAL RCV



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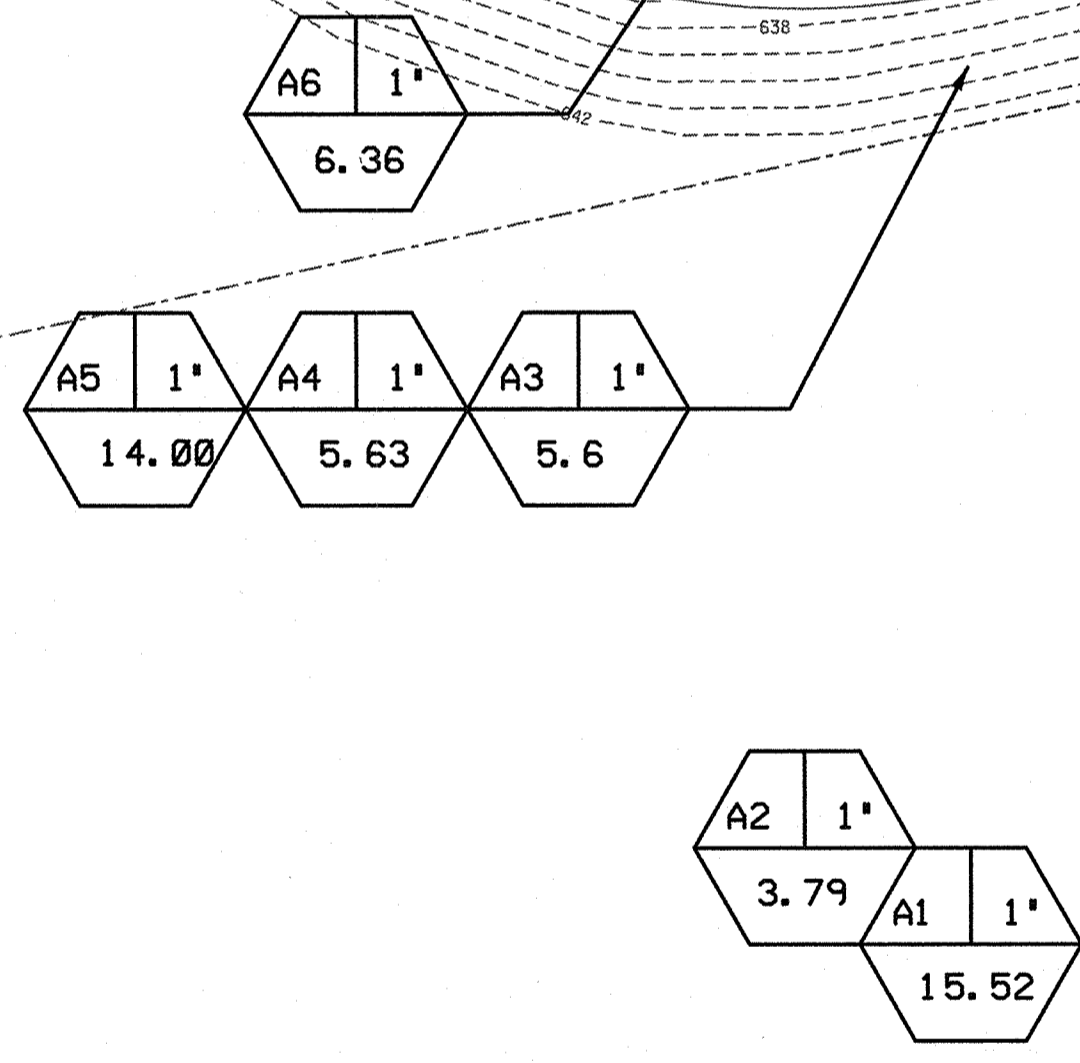
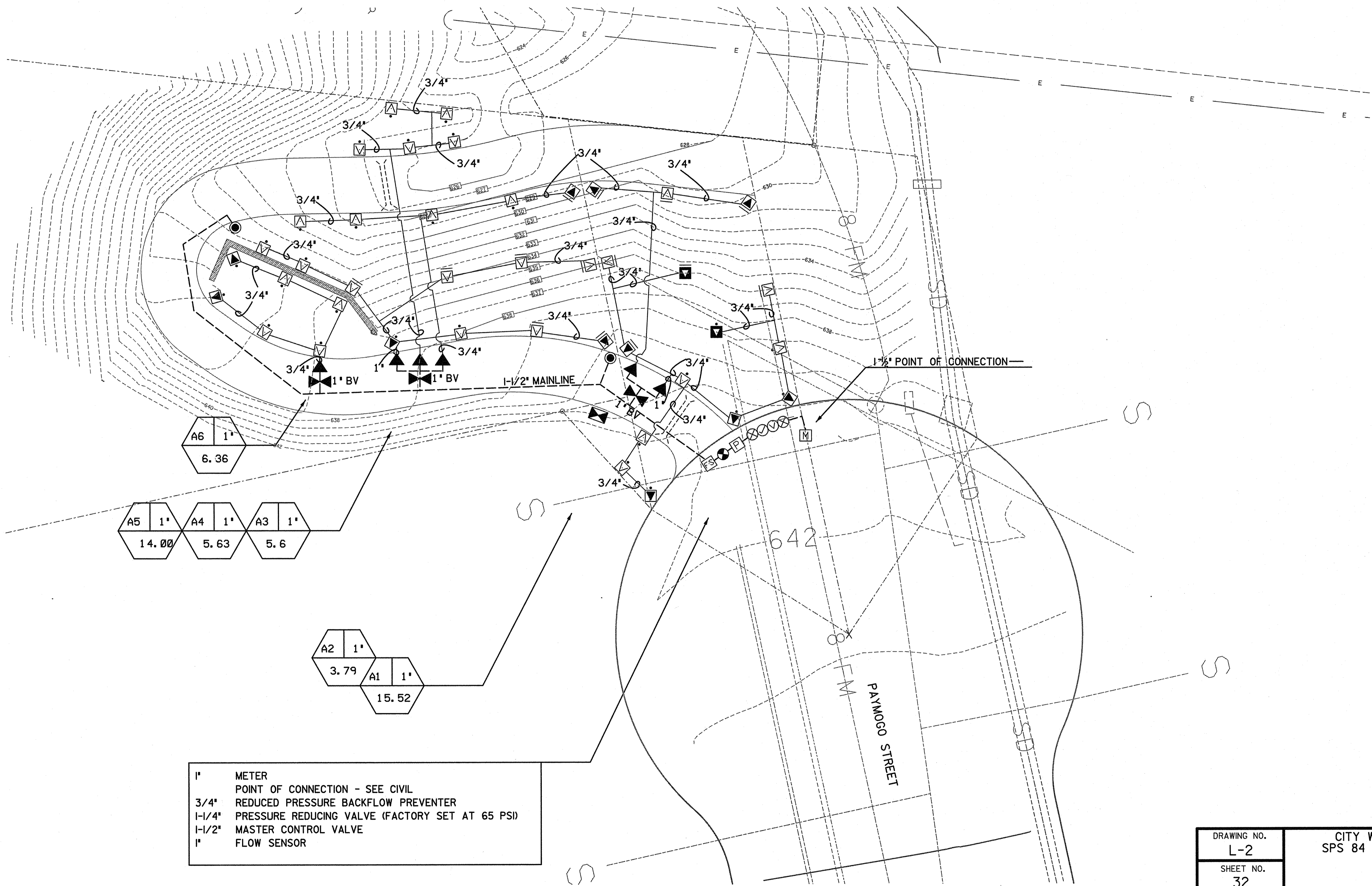
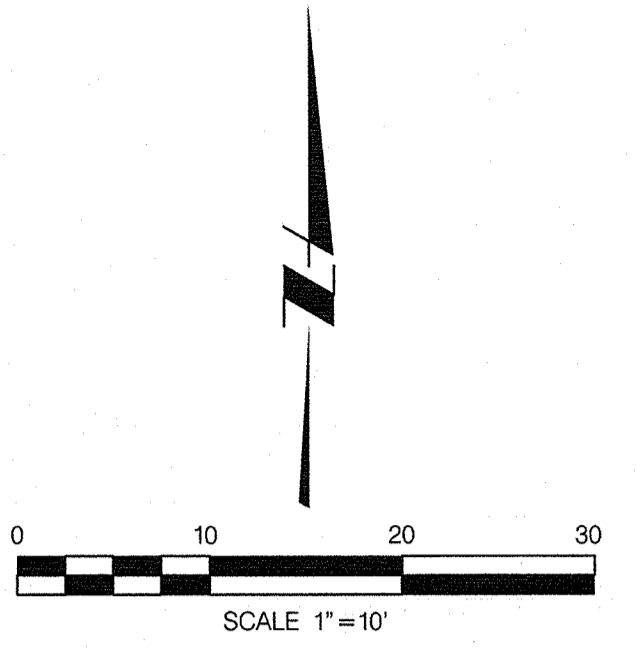
SCALE HORIZONTAL VERTICAL

**CITY OF SAN DIEGO
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DRAWING STATUS									
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1	9/21/11		IRRIGATION ABANDONMENT NOTE	MTS	GG				

DRAWING NO. L-1	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 31	IRRIGATION LEGEND AND NOTES		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 31 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hogel Ayer 10-25-11		PROJECT MANAGER P. J. Taylor
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY: INSPECTOR			
			CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CONTRACTOR INSPECTOR	DATE STARTED	DATE COMPLETED	36196- 31 -D



1" METER
 POINT OF CONNECTION - SEE CIVIL
 3/4" REDUCED PRESSURE BACKFLOW PREVENTER
 1-1/4" PRESSURE REDUCING VALVE (FACTORY SET AT 65 PSI)
 1-1/2" MASTER CONTROL VALVE
 1" FLOW SENSOR

DRAWING NO. L-2	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 32	IRRIGATION PLAN	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 32 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	<i>Hosni Arar</i> 7-26-11	DATE
CHECKED BY:	DESCRIPTION	BY
CONSTRUCTION ENGINEER	APPROVED	DATE
CHECKED BY:	FILED	
INSPECTOR	CONTRACTOR	DATE STARTED
	INSPECTOR	DATE COMPLETED
		36196- 32 -D

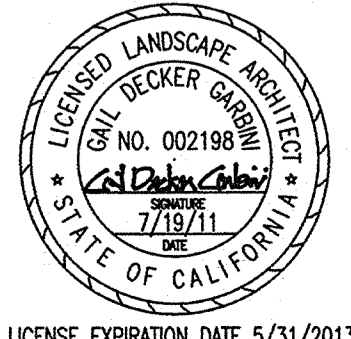
DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE

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SCALE HORIZONTAL 1" = 10'
 VERTICAL

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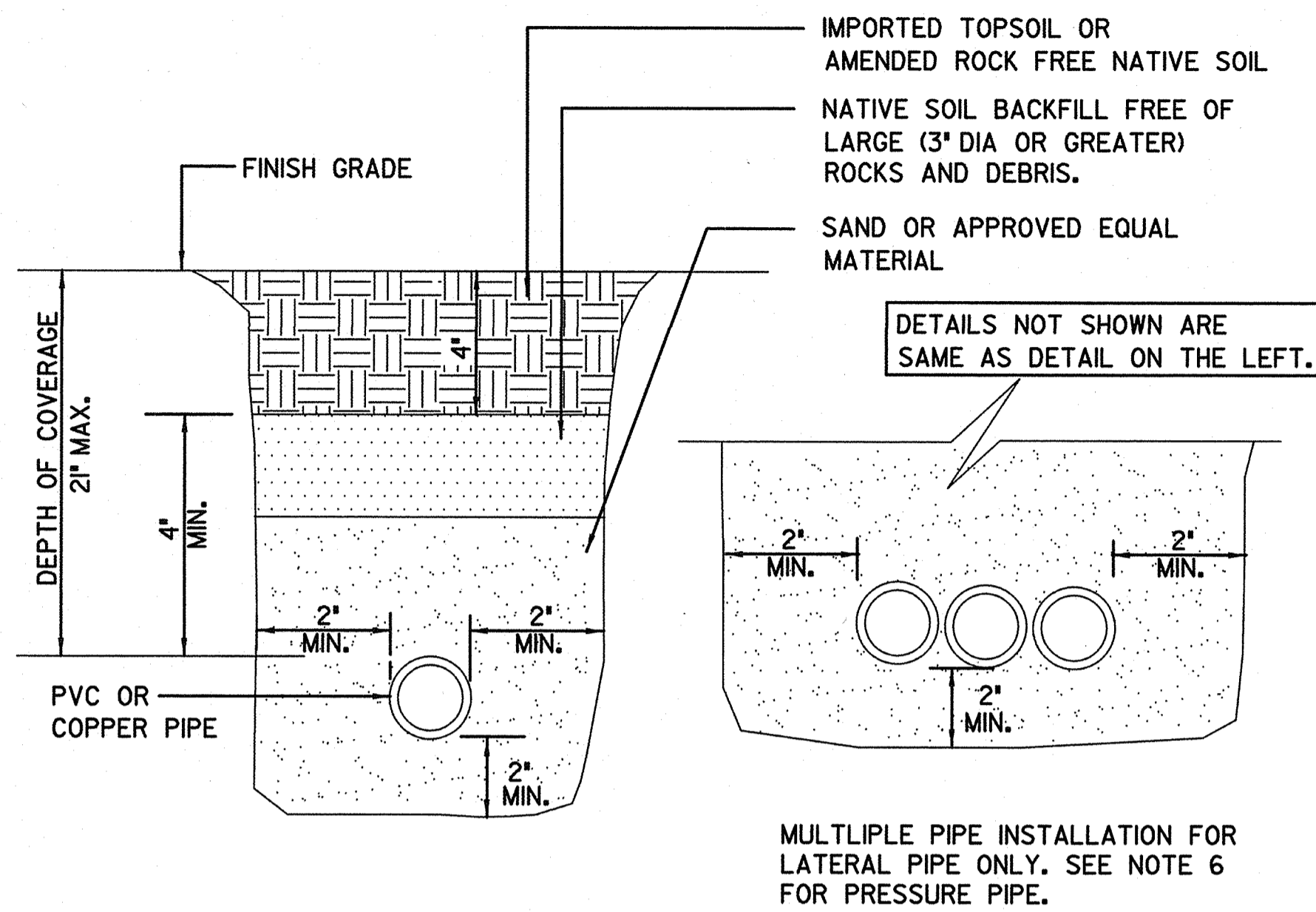
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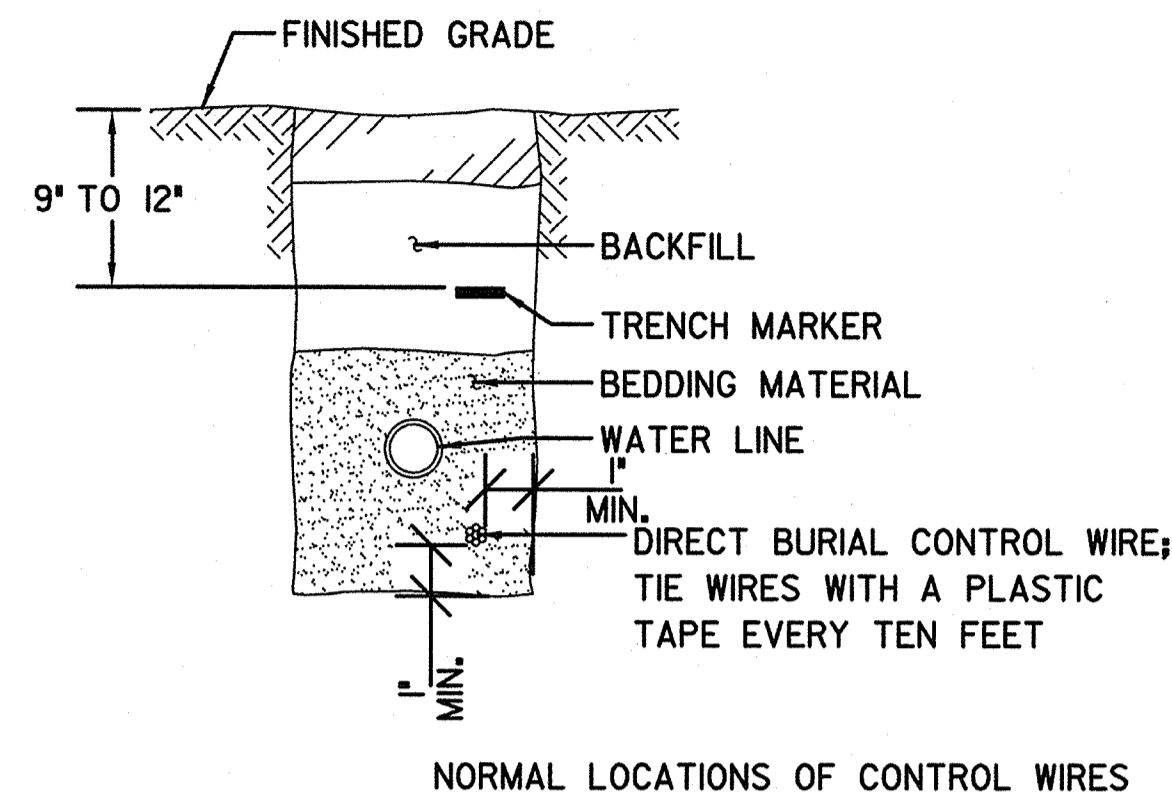
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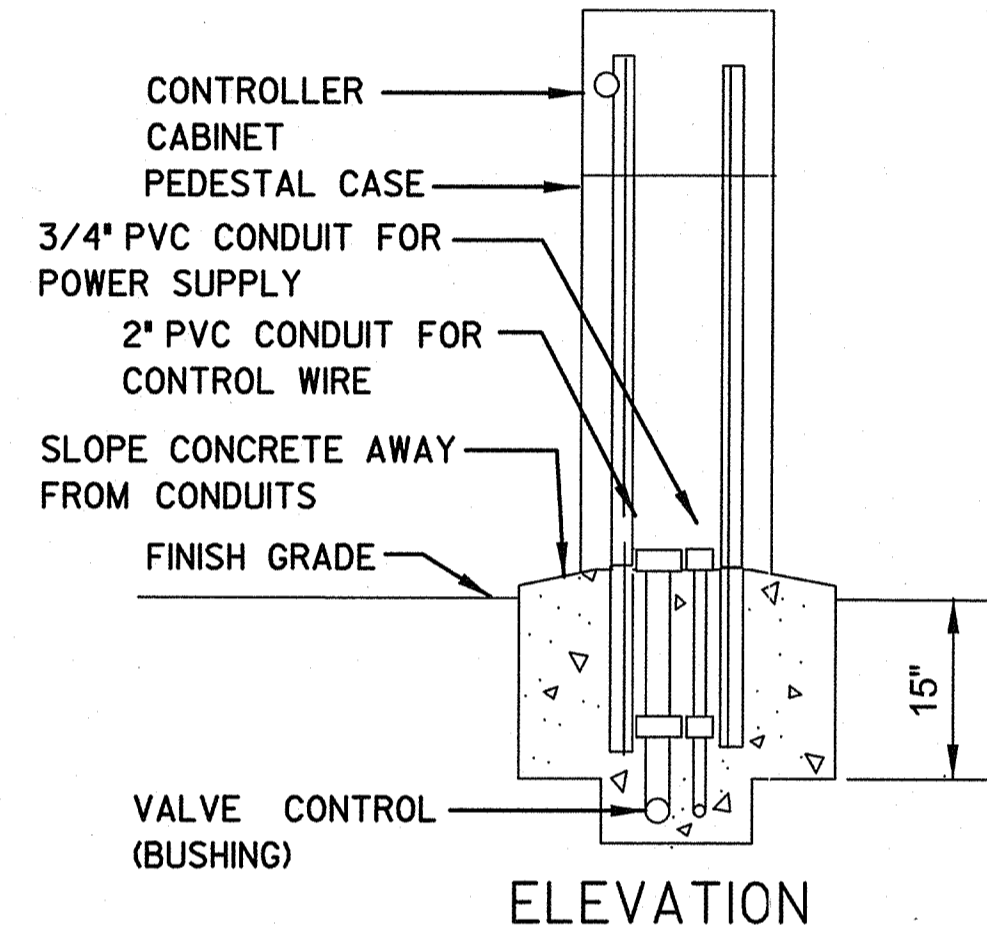
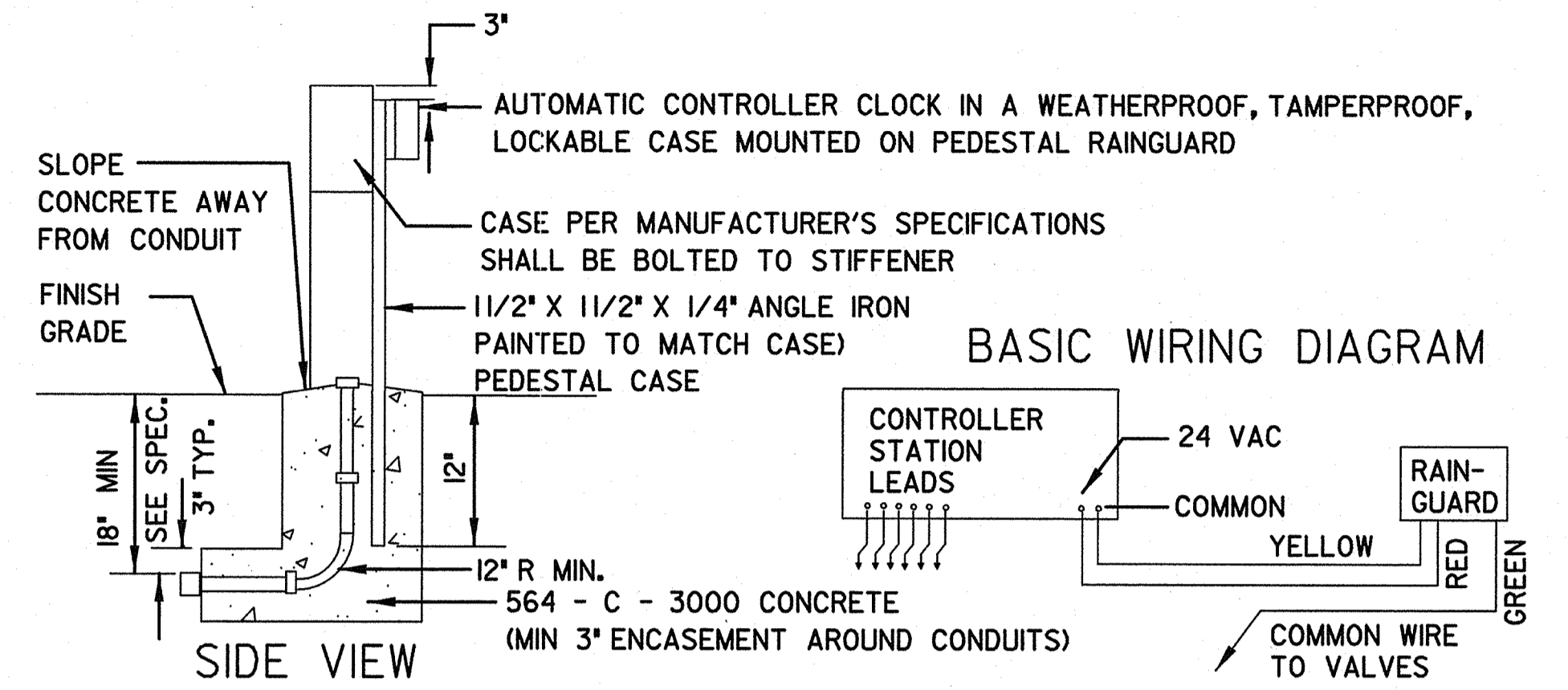
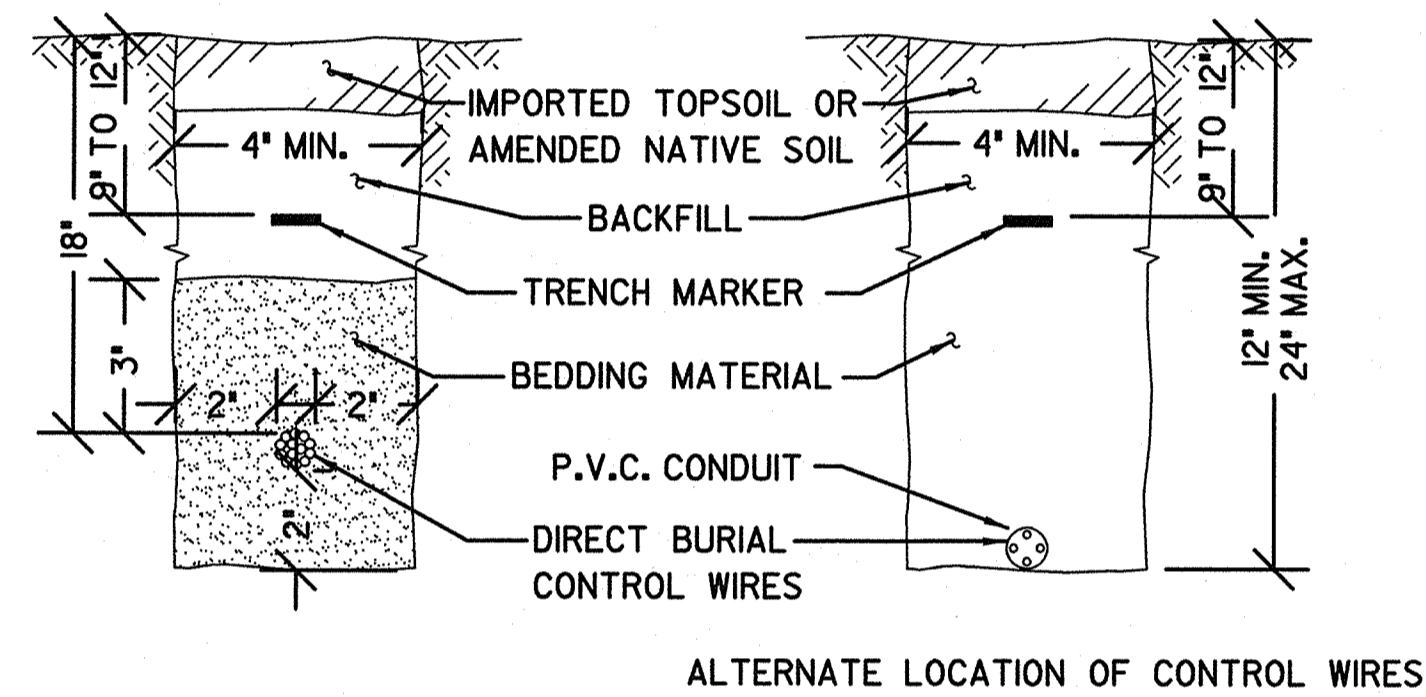
- NOTES
- BACKFILL MATERIAL SHALL BE COMPACTED TO A RELATIVE COMPACTION OF 90% OR MORE.
 - ALL P.V.C. PIPE SHALL LAY FREE IN THE TRENCH WITH NO INDUCED STRAIN AND WITH SUFFICIENT ALLOWANCE FOR EXPANSION AND CONTRACTION AS RECOMMENDED BY THE MANUFACTURER.
 - TEFLON TAPE, 3/4" WIDE SHALL BE USED ON ALL THREADED CONNECTIONS.
 - THE LETTER W SHALL BE STAMPED OR CHISELED ON THE IMPROVEMENT (CURB-SIDEWALK) DIRECTLY ABOVE THE PRESSURE PIPELINE.
 - ALL PLASTIC PRESSURE PIPE UNDER PAVEMENT SHALL BE INSTALLED IN A P.V.C. SLEEVE.
 - MINIMUM CLEARANCE BETWEEN PRESSURE PIPES SHALL BE 2 INCHES.
 - MINIMUM DEPTH OF COVER OVER PIPE AND WIRE ARE:
 PIPE UNDER TRAFFIC LOADS: 36" MINIMUM DEPTH
 MAIN PRESSURE LINES: 18" MINIMUM DEPTH
 LATERAL NON-PRESSURE LINES: 12" MINIMUM DPETH
 CONTROL WIRING: 18" MINIMUM DEPTH
 CONTROL WIRING PIPE UNDER TRAFFIC LOADS: 30" MINIMUM DEPTH

A TRENCH FOR PIPE DETAIL NO SCALE



- NOTES:
- BEDDING MATERIAL SHALL HAVE A SAND EQUIVALENT OF 50, MINIMUM.
 - PLACE A 3" WIDE RED CONTINUOUS PLASTIC TAPE TRENCH MARKER, 9" TO 12" BELOW FINISH GRADE, DIRECTLY ABOVE THE DIRECT BURIAL CONTROL WIRES.

B DIRECT BURIAL CONTROL WIRE NO SCALE



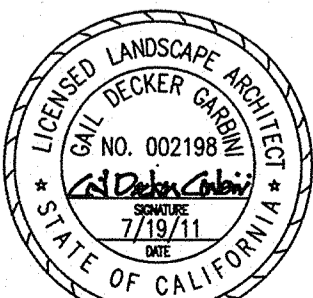
- NOTES:
- WHERE TWO OR MORE CONTROLLERS ARE MOUNTED ON COMMON CONCRETE BASE, A MINIMUM OF THREE INCHES SHALL BE LEFT BETWEEN CONTROLLER CABINETS.
 - ANCHOR CONTROLLER PEDESTAL TO BASE AS REQUIRED BY MANUFACTURER.
 - MAKE ALL ELECTRICAL CONNECTIONS INSIDE CONTROLLER CABINET.
 - FOR LOCATION OF SUPPLY CONDUIT AND CONDUCTORS, SEE ELECTRICAL PLANS.
 - STIFFENERS SHALL BE FASTENED TO CONTROLLER AND PEDESTAL CASES BY 3/16" X 3/4" O.N. CADMIUM PLATED STOVE BOLTS NOT MORE THAN 12" ON CENTER (MINIMUM 6 BOLTS PER STIFFENER).
 - CONTROLLER SHALL BE GROUNDED AT POWER SUPPLY BY GROUND WIRE.
 - SEE WIRING DIAGRAM FOR CONNECTIONS BETWEEN SOIL MOISTURE CONTROL PANEL AND CONTROLLER.

C AUTOMATIC CONTROLLER PEDESTAL MOUNT WITH RAINGUARD DETAIL NO SCALE



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SCALE HORIZONTAL
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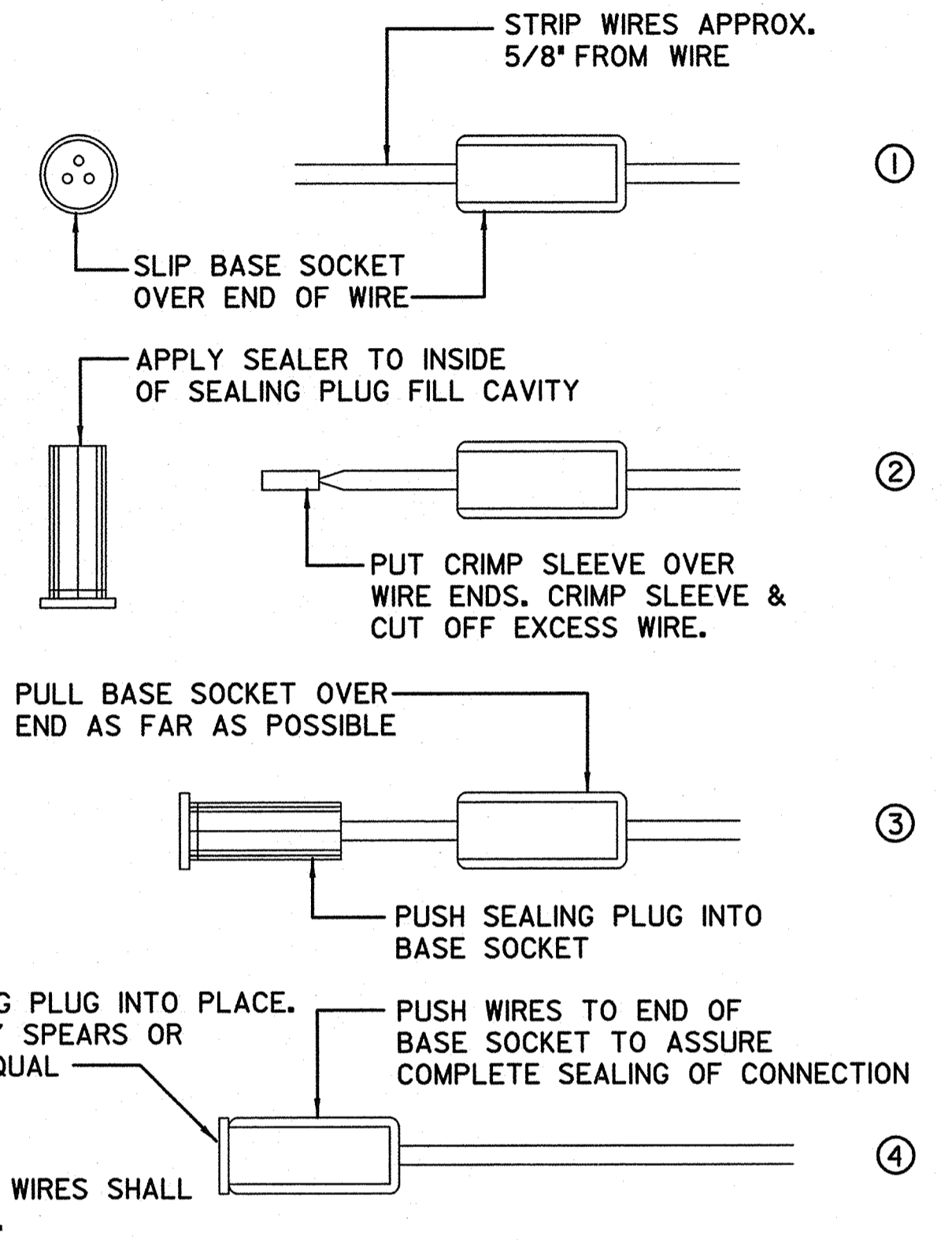


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

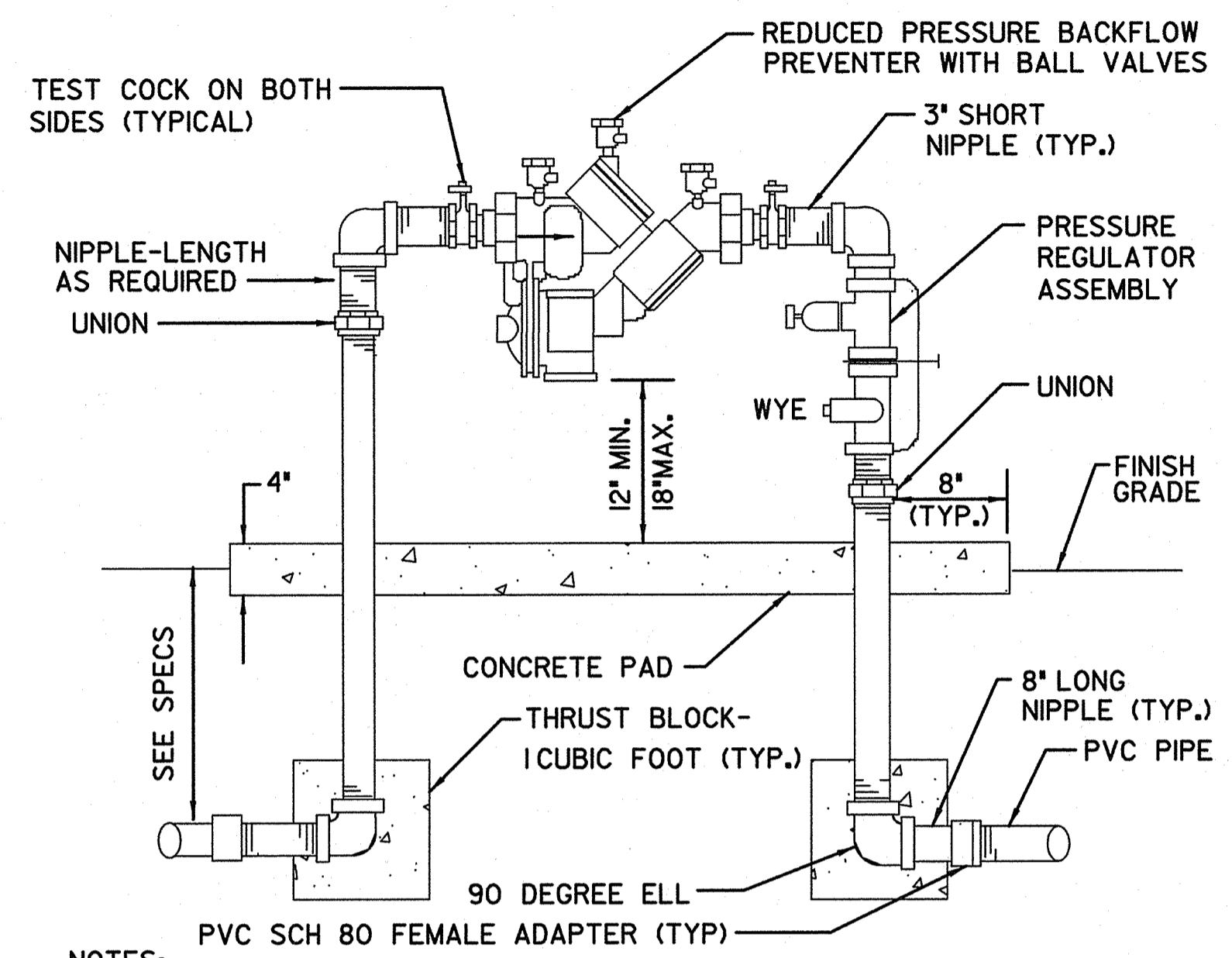
DRAWING NO. L-3	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 33	IRRIGATION DETAILS - 1		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 33 OF 118 SHEETS	WATER WBS SEWER WBS	S-00308
APPROVED BY: FOR CITY ENGINEER	<i>Hosco Arar</i> 7-26-11	DATE	
CHECKED BY: CONSTRUCTION ENGINEER			
INSPECTOR			
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
			302-1737 LAMBERT COORDINATES 36196-33-D

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(A) WIRE CONNECTOR NO SCALE

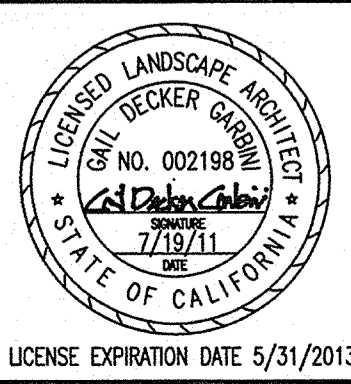


- NOTES:**
1. ADJUST SHRUB PLANTING TO SCREEN BACKFLOW PREVENTER ASSEMBLY.
 2. ALL EQUIPMENT INCLUDING UNIONS, ELBOWS AND NIPPLES SHALL BE BRASS.
 3. CLOSE NIPPLES SHALL NOT BE USED.
 4. TEFLON TAPE 3/4" WIDE SHALL BE USED ON ALL THREADED CONNECTIONS.
 5. CONCRETE PAD SHALL BE 18" WIDE AND SHALL BE SET 1" ABOVE FINISH GRADE IN LAWN AREAS AND 2" ABOVE FINISH GRADE IN SHRUB AREAS.
 6. BACKFLOW PREVENTER ASSEMBLY SHALL BE TESTED UPON INSTALLATION BY A CERTIFIED BACKFLOW DEVICE TESTER. CONTRACTOR SHALL PROVIDE THE ENGINEER WITH WRITTEN TEST RESULTS COMPLETED BY CERTIFIED BACKFLOW TESTER PRIOR TO THE BACKFLOW PREVENTER ASSEMBLY'S ACCEPTANCE BY THE LANDSCAPE ARCHITECT.

(B) REDUCED PRESSURE BACKFLOW PREVENTER WITH PRESSURE REGULATOR ASSEMBLY NO SCALE



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LANDSCAPE ARCHITECTURE
URBAN DESIGN
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SAN DIEGO, CALIFORNIA 92101
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WARNING
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SAN DIEGO, CA 92123-1502
(858) 712-8400 FAX (858) 712-8333
SCALE: HORIZONTAL, VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

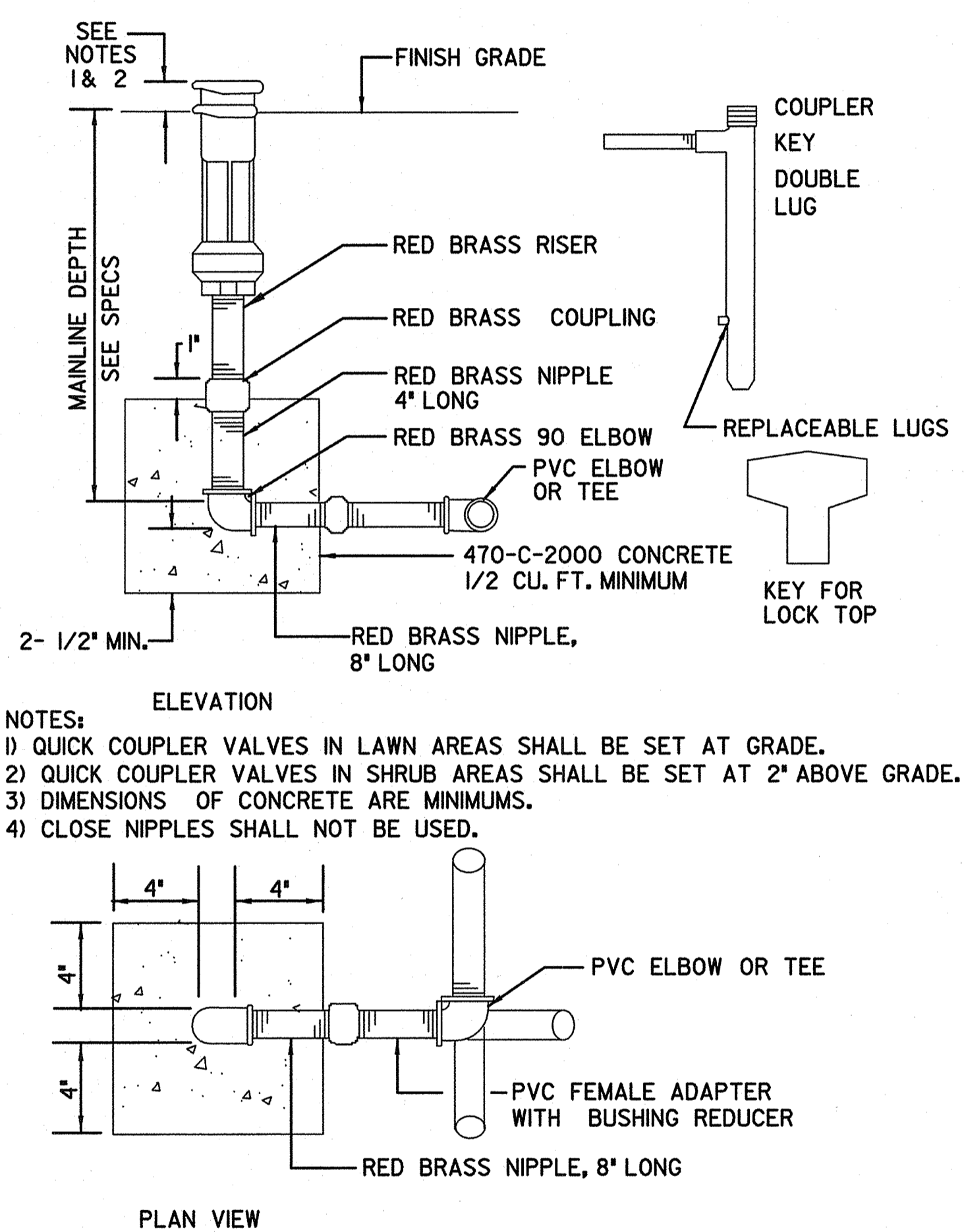


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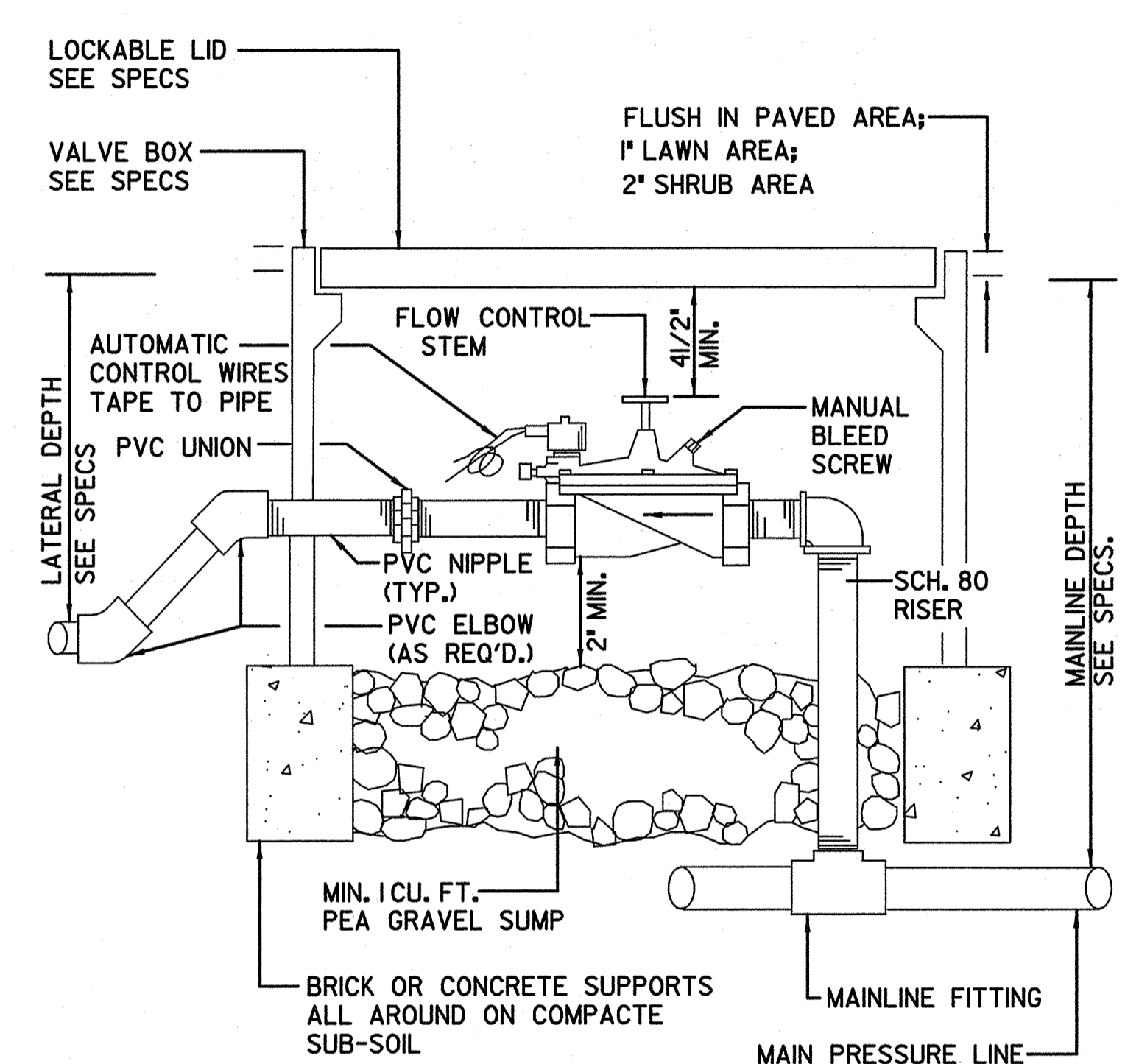
DRAWING NO. L-4	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 34	IRRIGATION DETAILS - 2	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 34 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION: <i>Hose & Area</i>	DATE: 7-26-11
CHECKED BY:	BY: <i>[Signature]</i>	APPROVED: <i>[Signature]</i>
CONSTRUCTION ENGINEER CHECKED BY:	DATE	FILMED
INSPECTOR	DATE STARTED	DATE COMPLETED
CONTRACTOR	INSPECTOR	36196-34-D

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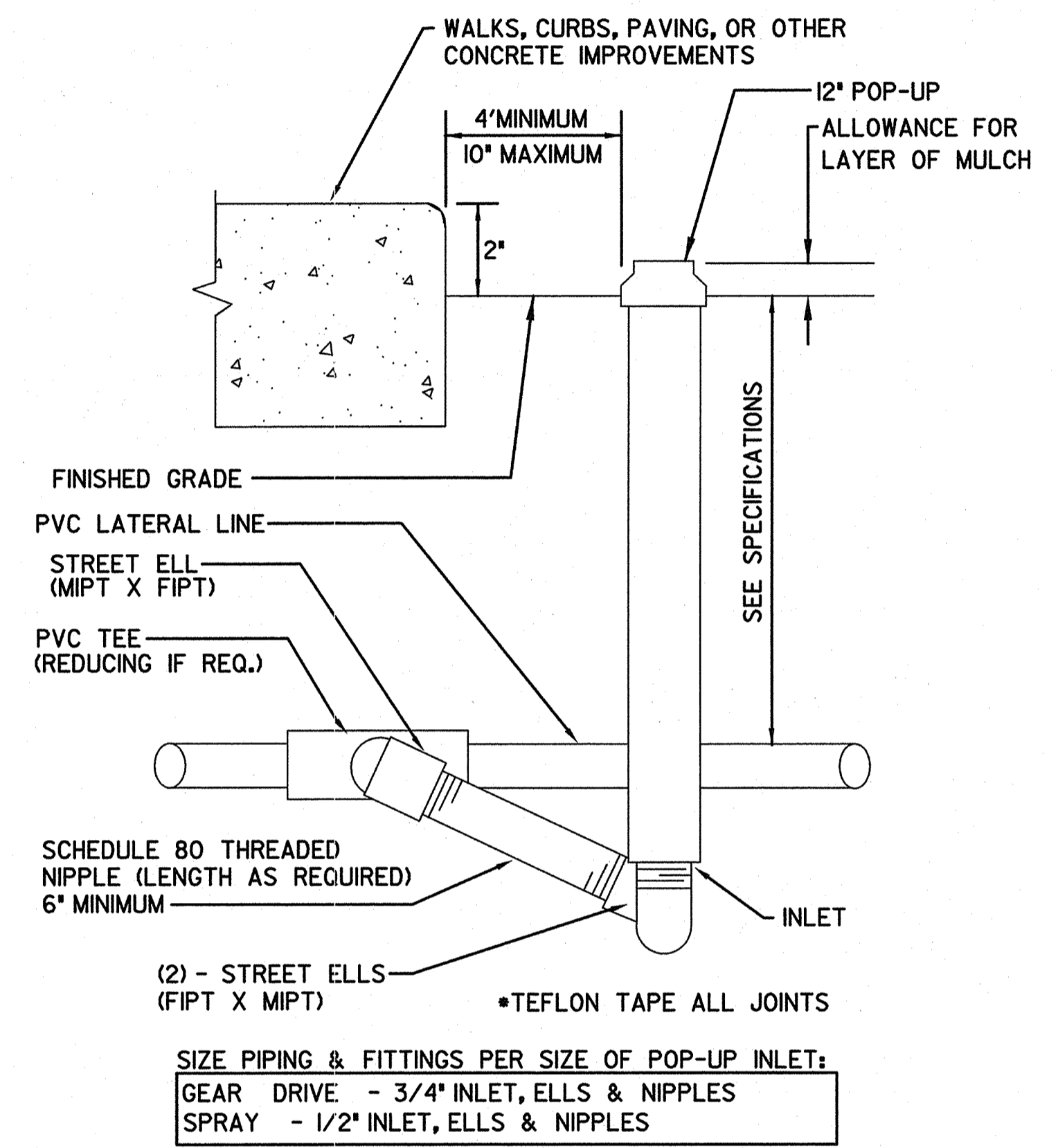
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A QUICK COUPLING VALVE DETAIL
NO SCALE



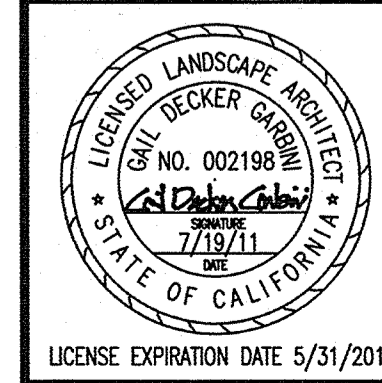
B REMOTE CONTROL VALVE DETAIL
NO SCALE



C 12" GEAR DRIVE & SPRAY POP-UP DETAIL
NO SCALE



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LANDSCAPE ARCHITECTURE
URBAN DESIGN
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619 232-4747 fax 619 232-4510



WARNING
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SAN DIEGO, CA 92123-1502
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SCALE: HORIZONTAL, VERTICAL

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DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

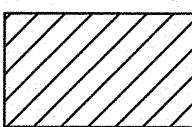
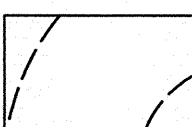
DRAWING NO. L-6	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 36	IRRIGATION DETAILS - 4		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 36 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hoschi Ayon 7-26-11		DATE
CHECKED BY:	DESCRIPTION	BY	APPROVED DATE FILMED
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
			CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
			36196- 36 -D

1

PLANT MATERIAL LEGEND							
SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	MINIMUM HEIGHT AND SPREAD	REMARKS	DETAIL	DRAWING
ERL. CON.	ERIOPHYLLUM CONFERTIFLORUM	GOLDEN YARROW	IGAL.	6' x 8'	FULL CLUMPS, GOOD COLOR, VIGOROUS	B	L-9
LOT. SCO.	LOTUS SCOPARIUS	DEERWEED	IGAL.	6' x 8'	FULL AND BUSHY TO GROUND, GOOD COLOR, VIGOROUS	B	L-9
MIM. AUR.	MIMULUS AURANTIACUS	STICKY MONKEY-FLOWER	IGAL.	8' x 6'	FULL CLUMPS, GOOD COLOR, VIGOROUS	B	L-9
NAS. PUL.	NASSELLA PULCHRA	PURPLE NEEDLEGRASS	IGAL.	8' x 4'	FULL CLUMPS, GOOD COLOR, VIGOROUS	B	L-9
VIG. LAC.	VIGUIERA LACINIATA	SAN DIEGO SUNFLOWER	IGAL.	6' x 8'	FULL AND BUSHY TO GROUND, GOOD COLOR, VIGOROUS	B	L-9

PLANTING NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UNDERGROUND UTILITIES.
2. THE LANDSCAPE CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM ALL BUILDINGS AND STRUCTURES. LANDSCAPE AREA SHALL BE FINISH GRADED AT A MINIMUM OF 2%.
3. LANDSCAPE AREAS SHALL BE FINISH GRADED TO REMOVE ONE INCH AND LARGER AND EXCESS SOIL. CONTRACTOR SHALL STOCKPILE EXCESS SOIL AND HAUL AWAY AT END OF PROJECT.
4. FINISH GRADE SHALL BE 2 TO 3 INCHES BELOW TOP OF PAVING IN ALL PLANTING AREAS.
5. THE RECOMMENDATIONS OF THE SOILS REPORT FOR AMENDING THE SOIL SHALL SUPERSEDE THE RECOMMENDATIONS LISTED IN THE SPECIFICATIONS. CONTRACTOR SHALL SUBMIT AN AGRICULTURAL SUITABILITY AND FERTILITY ANALYSIS OF REPRESENTATIVE SOIL SAMPLES TO THE PROJECT ENGINEER PRIOR TO ANY PLANTING WORK.
6. ALL PLANT MATERIAL SHALL BE APPROVED BY THE PROJECT ENGINEER PRIOR TO PLANTING. ALL PLANT MATERIAL NOT APPROVED SHALL BE REMOVED FROM THE SITE.
7. PLACEMENT OF PLANT MATERIAL SHALL BE APPROVED BY THE PROJECT ENGINEER PRIOR TO EXCAVATION FOR HOLES.
8. TREES SHALL BE LOCATED A MINIMUM OF 5 FEET FROM STRUCTURES. CENTER OF SHRUBS AND GROUNDCOVER SHALL BE LOCATED A MINIMUM AND UNIFORM DISTANCE OF 24 INCHES FROM WALLS AND CONCRETE IMPROVEMENTS. DISTANCE SHALL BE APPROVED BY PROJECT ENGINEER PRIOR TO INSTALLATION.
9. LOCATE AND ALIGN DOUBLE STAKES FOR TREES PERPENDICULAR TO PREVAILING WINDS.
10. THE MAINTENANCE PERIOD WILL BEGIN ONLY UPON ACCEPTANCE IN WRITING BY THE OWNER.
11. QUANTITIES SHOWN ON PLANTING PLAN ARE FOR THE CONVENIENCE OF THE CONTRACTOR. PLANT SYMBOLS INDICATED SUPERSEDE QUANTITIES SHOWN.
12. CONTRACTOR SHALL INSTALL ROOT BARRIERS FOR ALL TREES WHICH ARE LOCATED WITHIN 5 FEET OF ANY HARDSCAPE, PAVEMENT OR CURB. EXTEND 8 FEET FROM CENTERLINE OF TREE IN BOTH DIRECTIONS ALONG CONCRETE IMPROVEMENT (A SINGLE LENGTH OF 18 INCH DEEP ROOTGUARD FOR A SINGLE TREE WOULD BE 16 FEET). INSTALL PER MANUFACTURER'S INSTRUCTION.
13. A 3" LAYER OF TYPE 1 BARK MULCH SHALL BE INSTALLED IN ALL PLANTING AREAS WITH SLOPES LESS THAN 3:1 AND WITHIN WATER DAMS/BERMS. (REFER TO SPECS.)

LANDSCAPE CONSTRUCTION MATERIAL LEGEND					
SYMBOL	DESCRIPTION	MANUFACTURER / SUPPLIER	COLOR / FINISHES / REMARKS	DETAIL	DRAWING
	STABILIZED DECOMPOSED GRANITE	SOUTHWEST BOULDER & STONE, INC. (OR APPROVED EQUAL) 5002 2ND STREET FALLBROOK, CA 92028 (960) 451-3333	SOUTHWEST BROWN FINES / STABILIZED	C	L-9
	COMPOSITE HEADER	EPIC PLASTICS LOCAL SALES REP: O'CONNOR SALES (1.800.789.3848)	PRODUCT: EPIC EDGE COLOR: CARMEL BROWN SIZE 1X6	C	L-9

11/7/2011 11:33:36 AM



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SCALE
HORIZONTAL
VERTICAL

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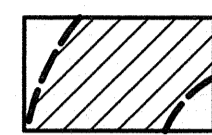


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	11/7/11		REVISED PLANT MATERIAL	MTS	GG				

DRAWING NO. L-7	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 37	PLANTING LEGEND AND NOTES		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 37 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hosei Ayan 11-14-11		DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY: INSPECTOR			
	CONTRACTOR	DATE STARTED	
	INSPECTOR	DATE COMPLETED	
			302-1737 LAMBERT COORDINATES 36196- 37 -D

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EXTENT OF 100' DEFENSIBLE SPACE FROM EXISTING STRUCTURE
(LIMITS OF ZONE TWO BRUSH MANAGEMENT)



C
L-9 10' WIDE DECOMPOSED GRANITE TRAIL
SEE CIVIL PLANS FOR GRADING AND STAKING
LOCATE PER CIVIL PLANS

10' WIDE DECOMPOSED GRANITE TRAIL SHALL
EXTEND BEYOND EASEMENT TO EXISTING
TRAIL (IF EXISTING TRAIL IS LOCATED
BEYOND EDGE OF EASEMENT). CONTRACTOR
SHALL DETERMINE ADDITIONAL TRAIL
DISTANCE THAT MAY BE REQUIRED BEFORE
BIDDING-ON PROJECT. CONTRACTOR SHALL
OBTAIN RESIDENT ENGINEER'S WRITTEN
APPROVAL OF TRAIL LAYOUT / STAKING
PRIOR TO INSTALLATION OF TRAIL.

(Ma) 51 | MIM. AUR.
IGAL

(VL) 50 | VIG. LAC.
IGAL

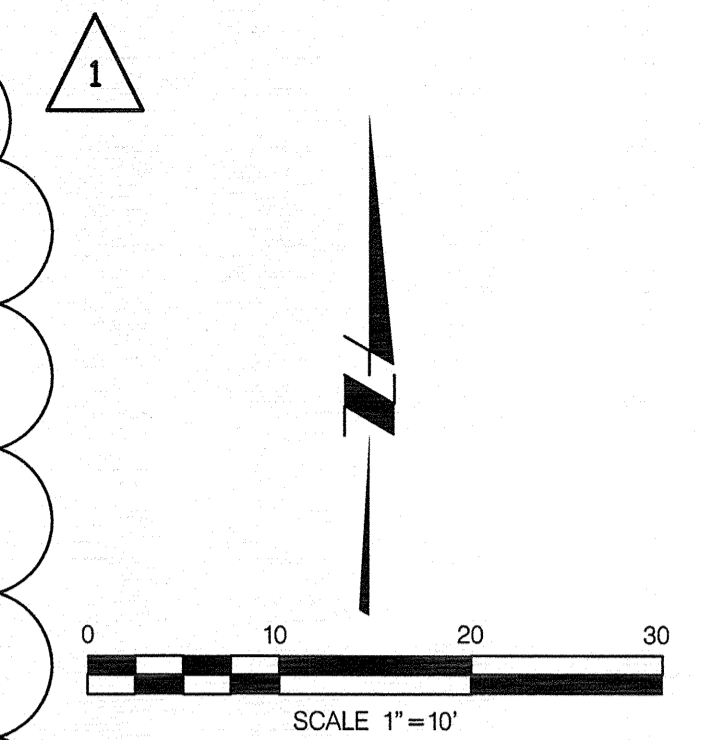
(Ls) 99 | LOT. SCO.
IGAL

(Ec) 100 | ERI. CON.
IGAL

(No) 108 | NAS. PUL.
IGAL

EXISTING STRUCTURE

PAYMOCO STREET



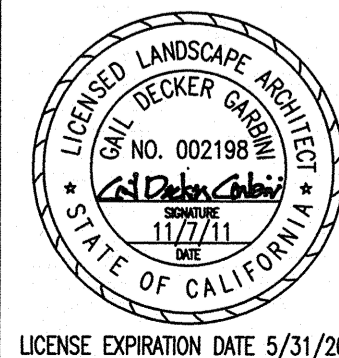
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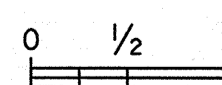


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URBAN
DESIGN

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SCALE

HORIZONTAL 1" = 10'-0"
VERTICAL

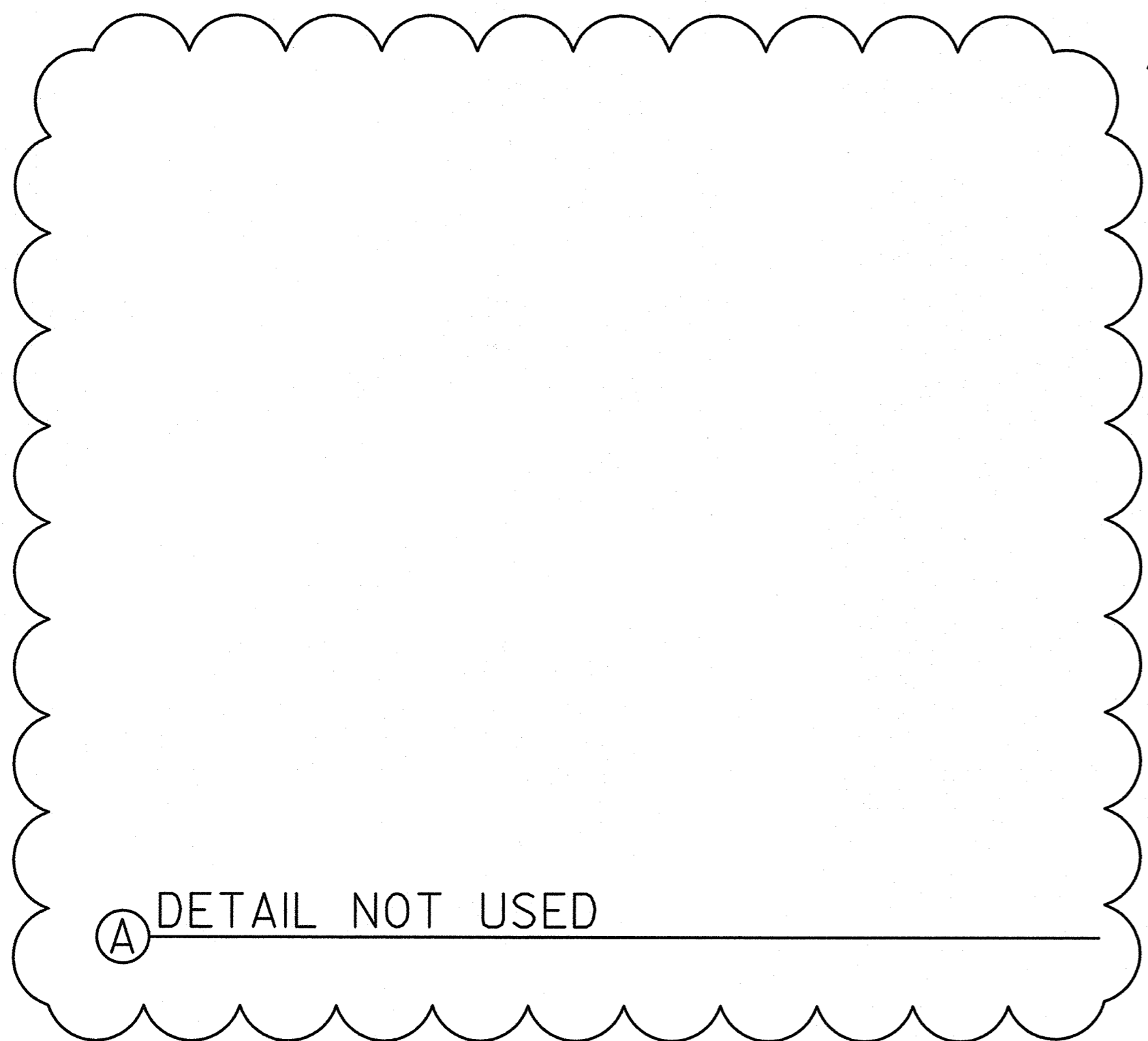
**CITY OF SAN DIEGO
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DRAWING STATUS

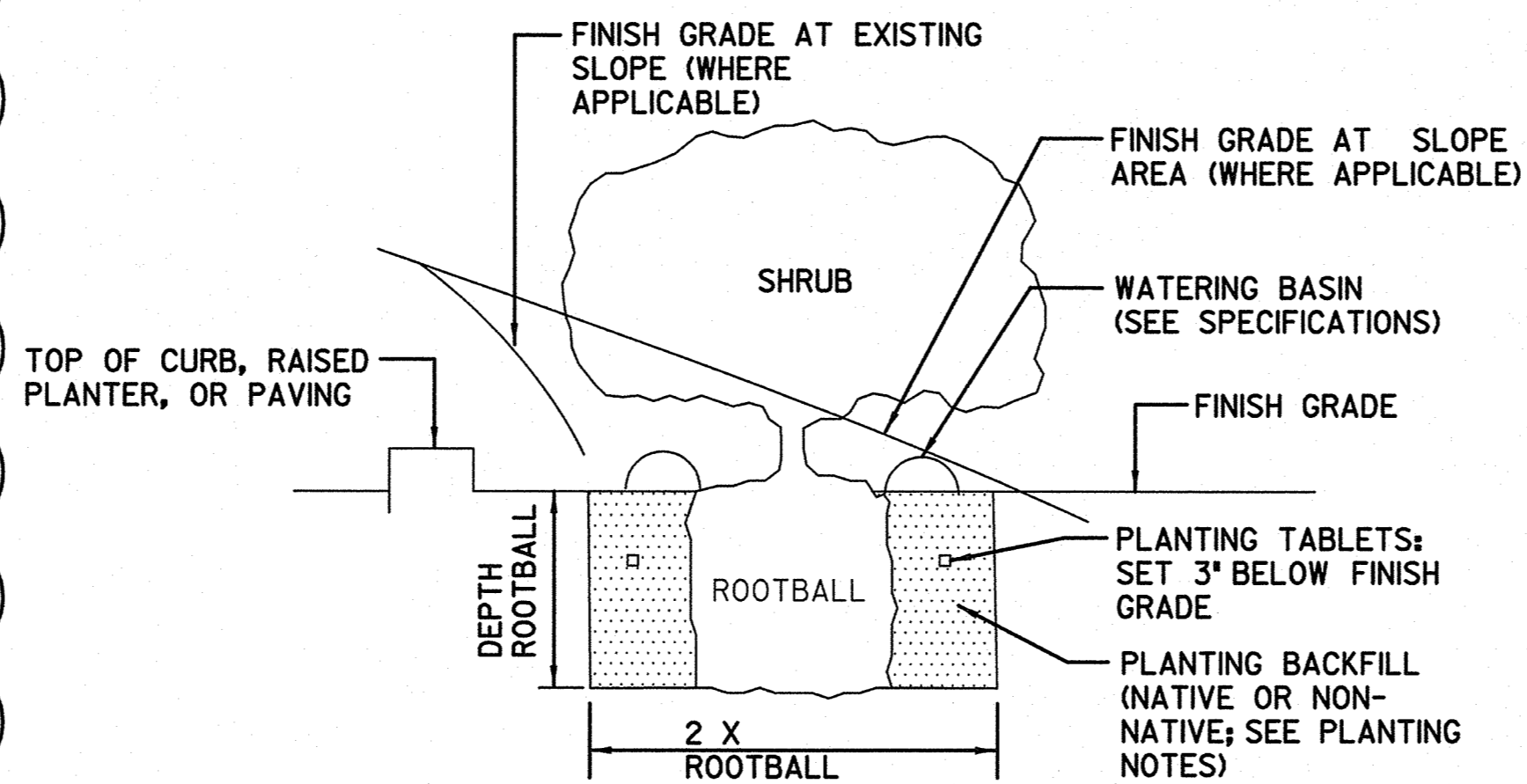
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1	11/7/11		REVISED PLANTING LAYOUT	MTS	GG				

DRAWING NO. L-8	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT											
SHEET NO. 38	PLANTING PLAN											
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 38 OF 118 SHEETS	WATER WBS SEWER WBS S-00308										
APPROVED BY: FOR CITY ENGINEER	<table border="1"> <tr> <td>DESCRIPTION</td> <td>BY</td> <td>APPROVED</td> <td>DATE</td> <td>FILMED</td> </tr> <tr> <td></td> <td></td> <td></td> <td>11-14-11</td> <td></td> </tr> </table>		DESCRIPTION	BY	APPROVED	DATE	FILMED				11-14-11	
DESCRIPTION	BY	APPROVED	DATE	FILMED								
			11-14-11									
CHECKED BY: CONSTRUCTION ENGINEER	PROJECT MANAGER											
CHECKED BY: INSPECTOR	CONTROL CERTIFICATION											
	302-1737 LAMBERT COORDINATES											
CONTRACTOR INSPECTOR	DATE STARTED	DATE COMPLETED										
		36196- 38 - D										

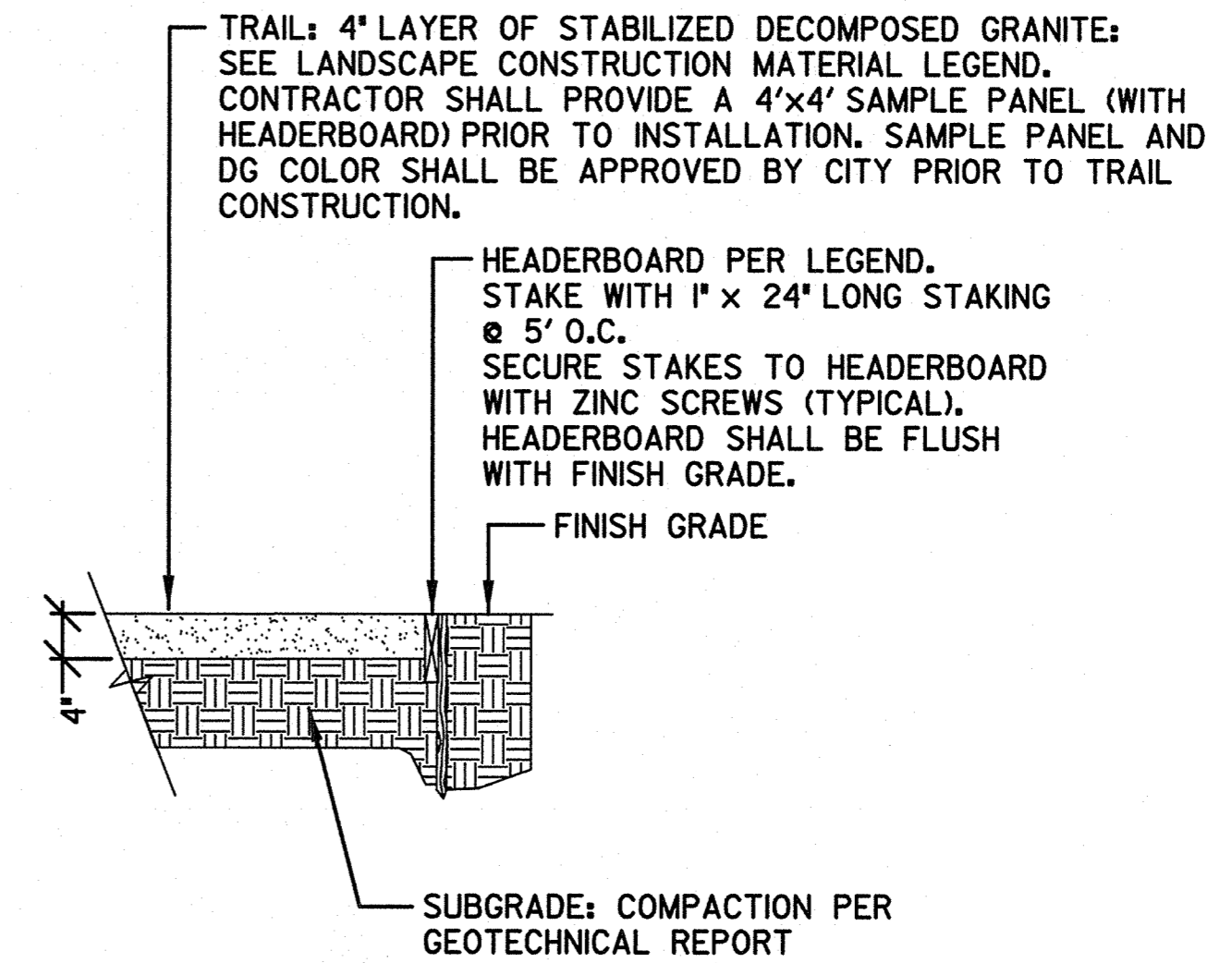


A DETAIL NOT USED

1



B SHRUB PLANTING
DETAIL NO SCALE



C DECOMPOSED GRANITE TRAIL
NO SCALE



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LANDSCAPE ARCHITECTURE
URBAN DESIGN

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SAN DIEGO, CA 92123-1502
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SCALE HORIZONTAL VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



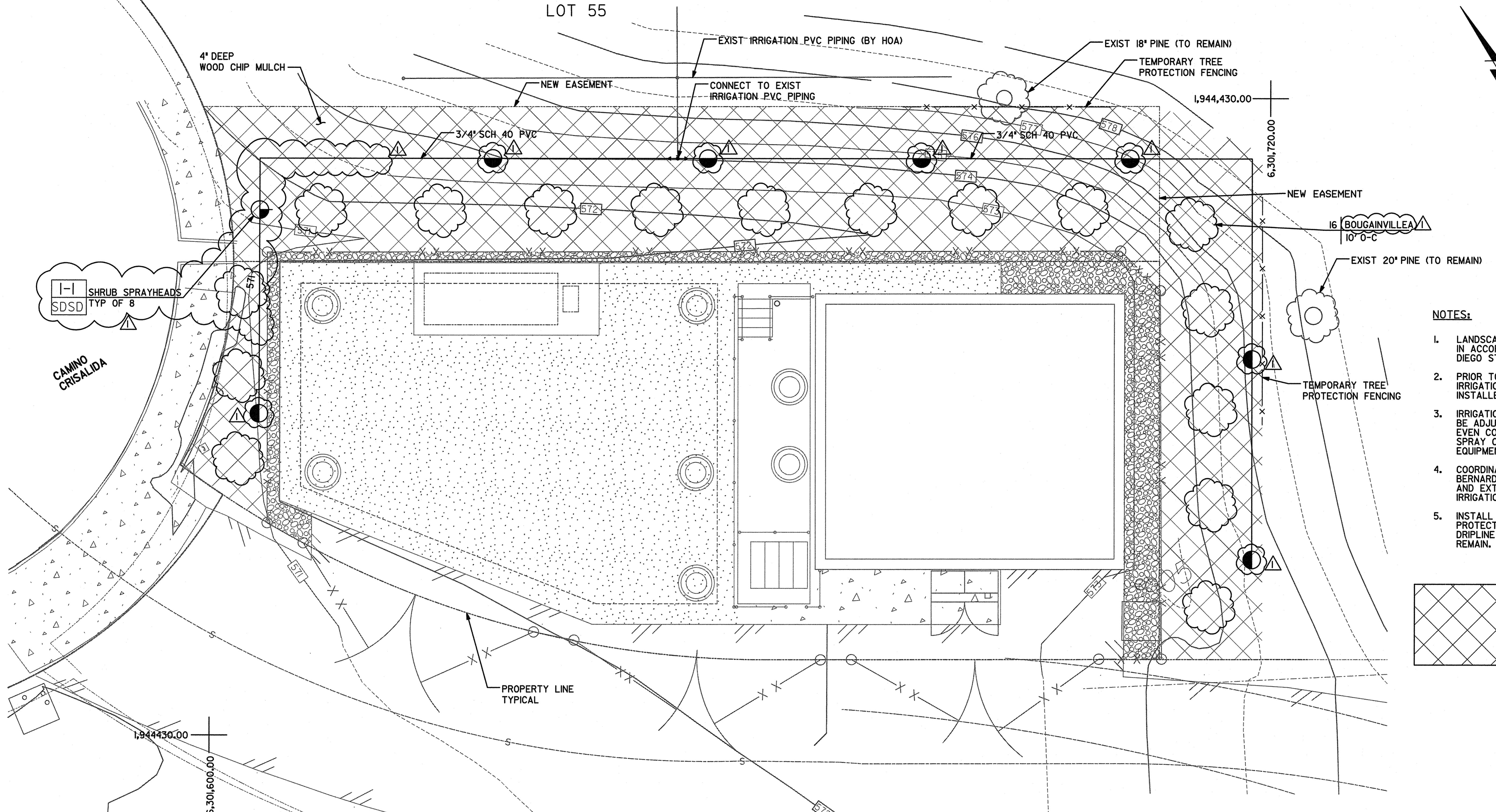
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DRAWING NO. L-9	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT				
SHEET NO. 39	PLANTING DETAILS				
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 39 OF 118 SHEETS			WATER WBS	
				SEWER WBS	S-00308
APPROVED BY: FOR CITY ENGINEER	Hosci Ara 10-25-11				
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED	DATE	FILMED
CHECKED BY: INSPECTOR					
	CONTRACTOR				DATE STARTED
	INSPECTOR				DATE COMPLETED
					302-1737 LAMBERT COORDINATES
					36196-39-D

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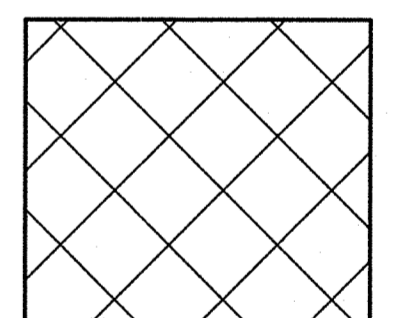
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OPEN SPACE
LOT 55



NOTES:

1. LANDSCAPING SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF SAN DIEGO STANDARD DRAWING L-2.
2. PRIOR TO INSTALLING PLANTS THE IRRIGATION SYSTEM SHALL BE INSTALLED AND OPERATIONAL.
3. IRRIGATION SPRAY HEADS SHALL BE ADJUSTED TO PROVIDE FOR EVEN COVERAGE AND TO KEEP SPRAY OFF STRUCTURES, EQUIPMENT AND WALKWAYS.
4. COORDINATE WITH CAMINO BERNARDO HOA FOR CONNECTION AND EXTENSION OF EXISTING IRRIGATION SYSTEM.
5. INSTALL TEMPORARY TREE PROTECTION FENCING AT THE DRIPLINE OF THE TREES TO REMAIN.



4" DEEP WOOD CHIP MULCH

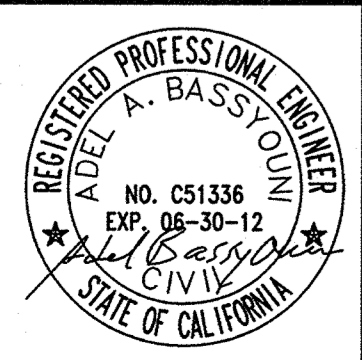
IRRIGATION LEGEND						
SYMBOL	DESCRIPTION	PSI	RADIUS	GPM 90°	GPM 180°	MANUFACTURER
	SHRUB FIXED SPRAY SPRINKLER	40	10'	1.15	1.49	TORO
						570 SHRUB SPRAY BODY W/ PRECISION SERIES SPRAY NOZZLE

IRRIGATION WORK TO BE IN ACCORDANCE WITH SPECIFICATION SECTION 02810, LANDSCAPE IRRIGATION SYSTEM.

PLANT MATERIAL LEGEND					
SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	MINIMUM HEIGHT AND SPREAD	REMARKS
	BOUGAINVILLEA 'TORCH GLOW'	BOUGAINVILLEA	15 GAL.	24' X 16'	SEE NOTE 1 FULL AND BUSHY GOOD COLOR

LANDSCAPING WORK TO BE IN ACCORDANCE WITH SPECIFICATION SECTION 02900, LANDSCAPING.

DRAWING NO. 84-L-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 40	SPS 84 LANDSCAPE AND IRRIGATION PLAN		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 40 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: <i>Hog C. Agan</i> FOR CITY ENGINEER		DATE 10-25-11	
CHECKED BY:	DESCRIPTION	BY	APPROVED DATE FILMED
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR	DATE STARTED	CONTROL CERTIFICATION	
INSPECTOR	DATE COMPLETED	302-1737 LAMBERT COORDINATES	
		36196-40-D	



WARNING

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SCALE: HORIZONTAL 1" = 5'-0"
VERTICAL

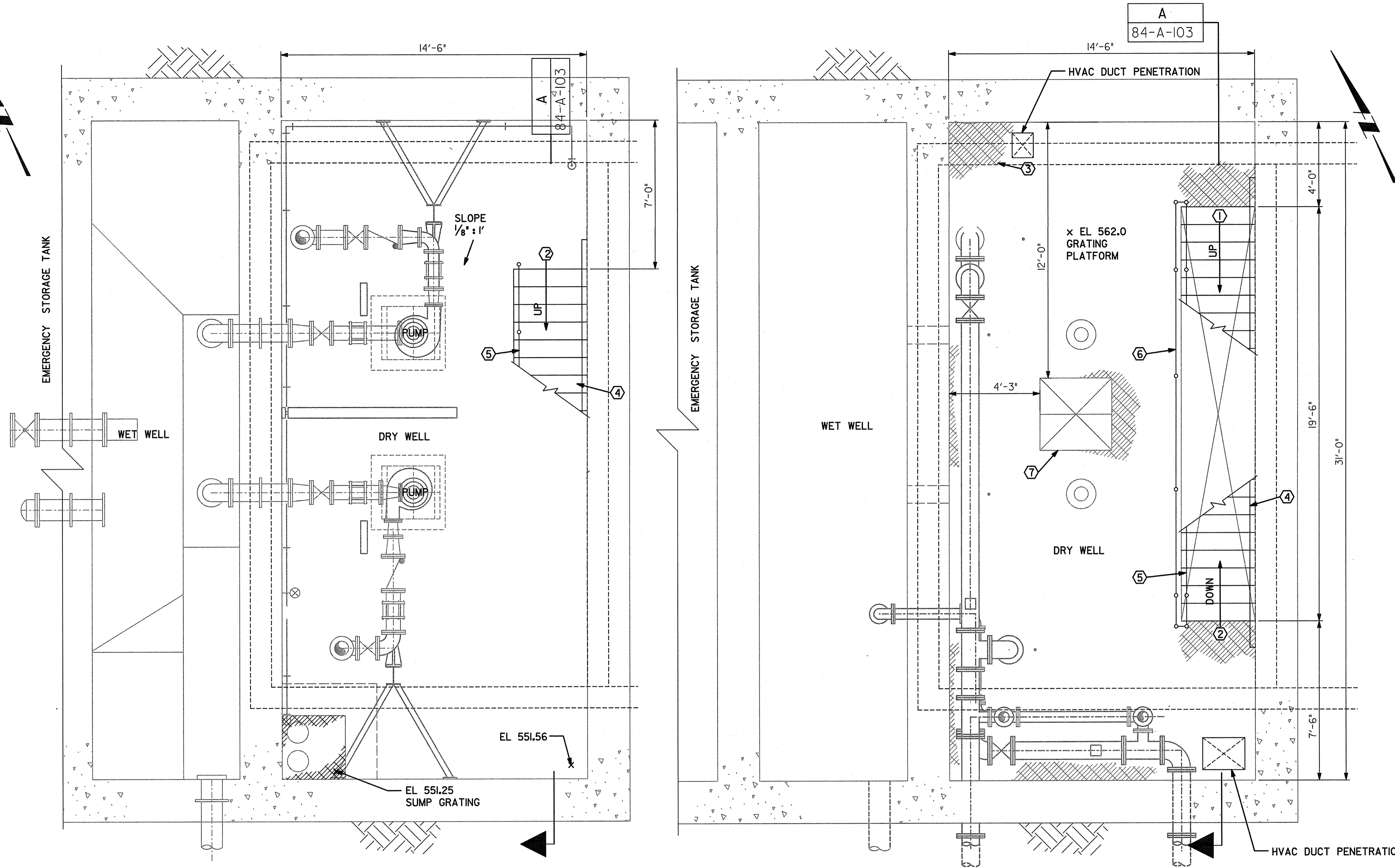
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS										
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC	
1	10/11		BLDG PERMIT	DG	SB	AB				

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SPS84-A-102.DGN



- KEYNOTES:**
- ① ALUMINUM STAIRS, 19 EQUAL HEIGHT RISERS. MAXIMUM HEIGHT 7', MINIMUM HEIGHT 6 1/2". 18 TREADS AT 11" DEEP. HEIGHT = 11'-0".
 - ② ALUMINUM STAIRS, 19 EQUAL HEIGHT RISERS. MAXIMUM HEIGHT 7', MINIMUM HEIGHT 6 1/2". 18 TREADS AT 11" DEEP. HEIGHT = 10'-8".
 - ③ METAL GRATING PLATFORM. SEE STRUCTURAL DRAWINGS.
 - ④ 1 1/2" Ø WALL MOUNTED HANDRAIL @ 2'-6" ABOVE NOSING. EXTEND 1' BEYOND TREAD.
 - ⑤ HANDRAIL. RAILS = 1-1/2" Ø. TOP OF RAILING = 2'-10" ABOVE NOSING. 1-1/2" Ø INTERMEDIATE RAILING MUST BE FABRICATED SO AS TO NOT ALLOW A SPHERE 12" Ø TO PASS THROUGH.
 - ⑥ GUARDRAIL. RAILS = 2" Ø. TOP OF RAILING = 3'-6" ABOVE FINISH FLOOR. INTERMEDIATE RAILINGS MUST BE FABRICATED SO AS TO NOT ALLOW A SPHERE 12" Ø TO PASS THROUGH. PROVIDE A TOE GUARD AT FLOOR LEVEL THAT HAS A CONTINUOUS HEIGHT OF 3-1/2".
 - ⑦ 3'-6"x3'-6" DOUBLE LEAF ACCESS HATCH

GENERAL NOTES:

1. STAIRS SHALL COMPLY WITH 2010 CALIFORNIA BUILDING CODE SECTION 1009.1, EXCEPTION 1 AND SECTION 1009.4.
2. STAIRS AND GRATING PLATFORMS SHALL BE AS SPECIFIED IN SECTION 05500 IN THE CONTRACT DOCUMENTS.

PUMP LEVEL

MEZZANINE LEVEL

WARNING

0 1/2 1

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SCALE HORIZONTAL 3/8" = 1'-0"
VERTICAL

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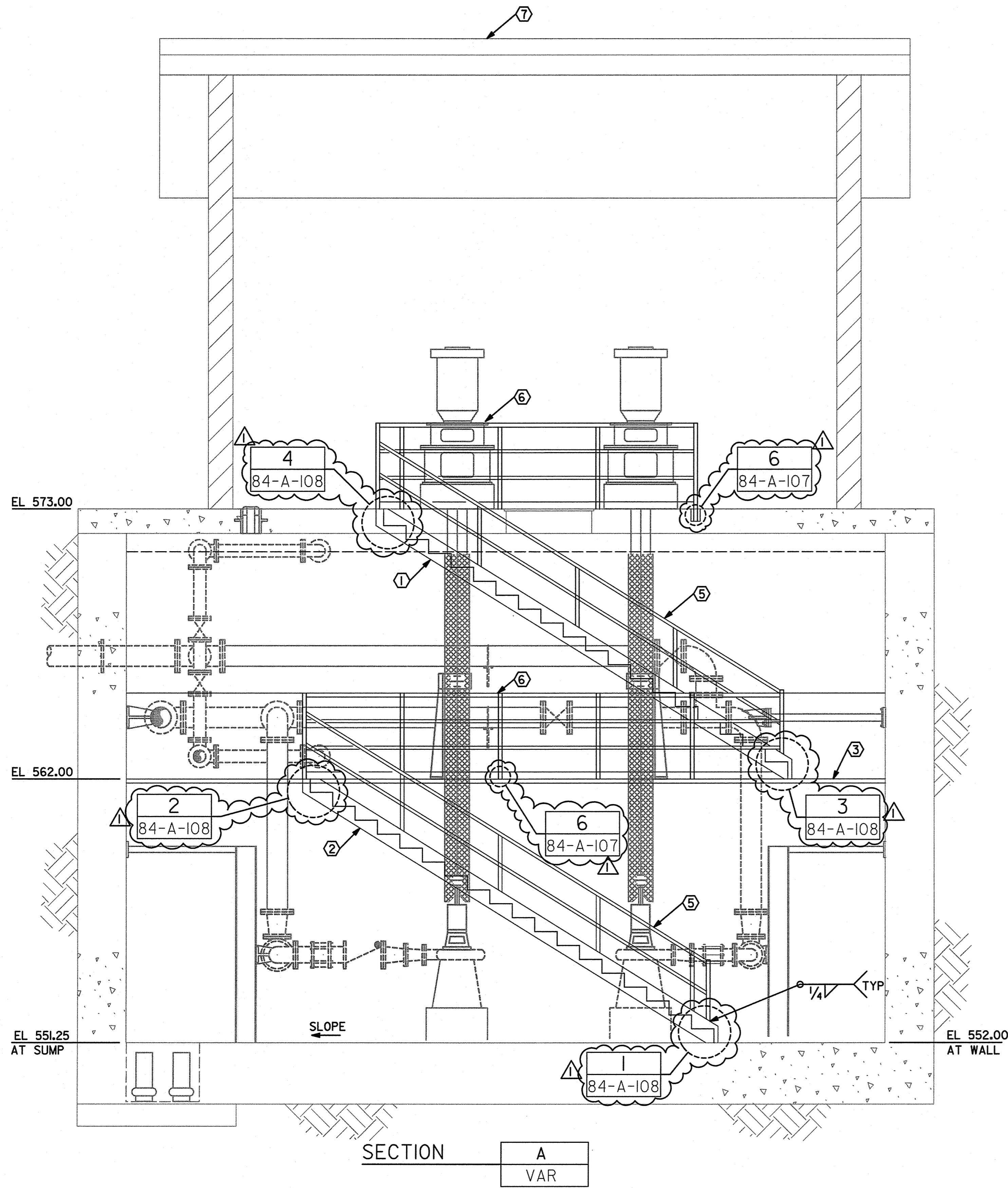


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-A-102	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 42	PUMP ROOM AND MEZZANINE FLOOR PLANS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 42 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hosni Ayar 7-26-11 FOR CITY ENGINEER DATE	
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION BY APPROVED DATE FILMED Paul K. Lee PROJECT MANAGER	
CHECKED BY: INSPECTOR	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196- 42 -D	
CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED	

10/20/2011 8:35:57 AM

SPS84-A-103.DGN



KEYNOTES:

- ① ALUMINUM STAIRS, 19 EQUAL HEIGHT RISERS. MAXIMUM HEIGHT 7', MINIMUM HEIGHT 6 1/2'. 18 TREADS AT 11" DEEP, HEIGHT = 11'-0". STRINGER SHALL BE MINIMUM C12 x 8, 64. ATTACH STAIRS TO LANDINGS USING 3/4" DIA 316 STAINLESS STEEL BOLTS, NUTS AND WASHERS.
- ② ALUMINUM STAIRS, 19 EQUAL HEIGHT RISERS. MAXIMUM HEIGHT 7', MINIMUM HEIGHT 6 1/2'. 18 TREADS AT 11" DEEP, HEIGHT = 10'-8". STRINGER SHALL BE MINIMUM C12 x 8, 64. ATTACH STAIRS TO LANDINGS USING 3/4" DIA 316 STAINLESS STEEL BOLTS, NUTS AND WASHERS.
- ③ METAL GRATING PLATFORM. SEE STRUCTURAL DRAWINGS.
- ④ 1/2" DIA WALL MOUNTED HANDRAIL @ 2'-6" ABOVE NOSING.
- ⑤ HANDRAIL. RAILS = 1-1/2" DIA. TOP OF RAILING = 2'-10" ABOVE NOSING. 1-1/2" DIA INTERMEDIATE RAILING MUST BE FABRICATED SO AS TO NOT ALLOW A SPHERE 12" DIA TO PASS THROUGH.
- ⑥ GUARDRAIL. RAILS = 2" DIA. TOP OF RAILING = 3'-6" ABOVE FINISH FLOOR. INTERMEDIATE RAILINGS MUST BE FABRICATED SO AS TO NOT ALLOW A SPHERE 12" DIA TO PASS THROUGH. PROVIDE A TOE GUARD AT FLOOR LEVEL THAT HAS A CONTINUOUS HEIGHT OF 3-1/2".
- ⑦ ROOF UNDERLAYMENT, ASPHALT FELT, PORTLAND CEMENT ROOF TILES AND APPURTENANCES PER SECTION 07320.

SECTION A
VAR

DRAWING NO. 84-A-103	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 43	BUILDING SECTIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 43 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	<p>Hosni Acar 10-25-11</p> <p>DESCRIPTION BY APPROVED DATE FILMED</p> <p>302-1737 LAMBERT COORDINATES</p> <p>CONTRACTOR DATE STARTED INSPECTOR DATE COMPLETED</p>	



WARNING
0 1/2 1
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(858)712-8400 FAX (858)712-8333

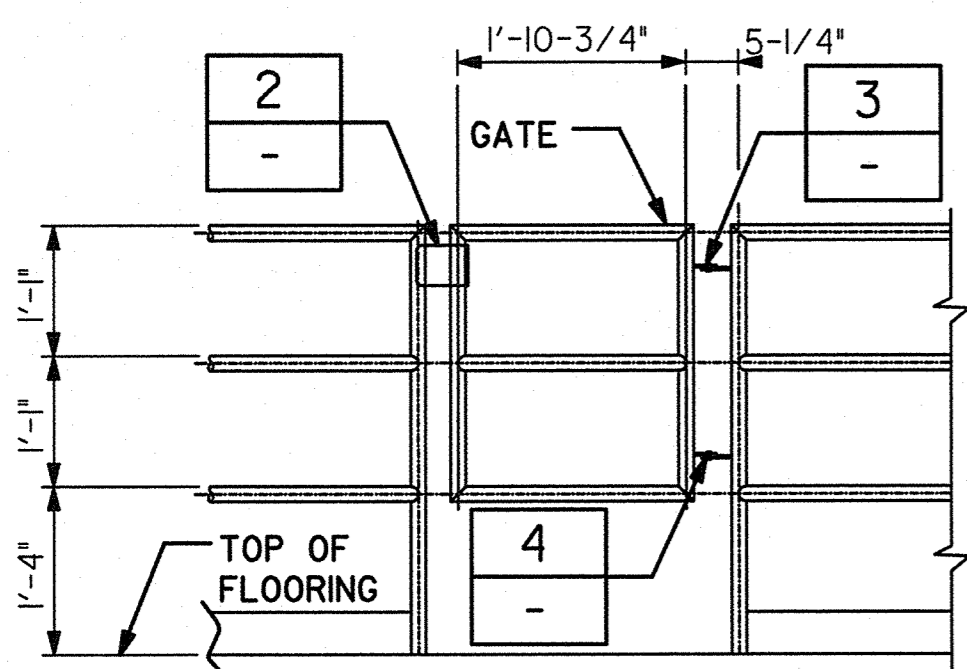
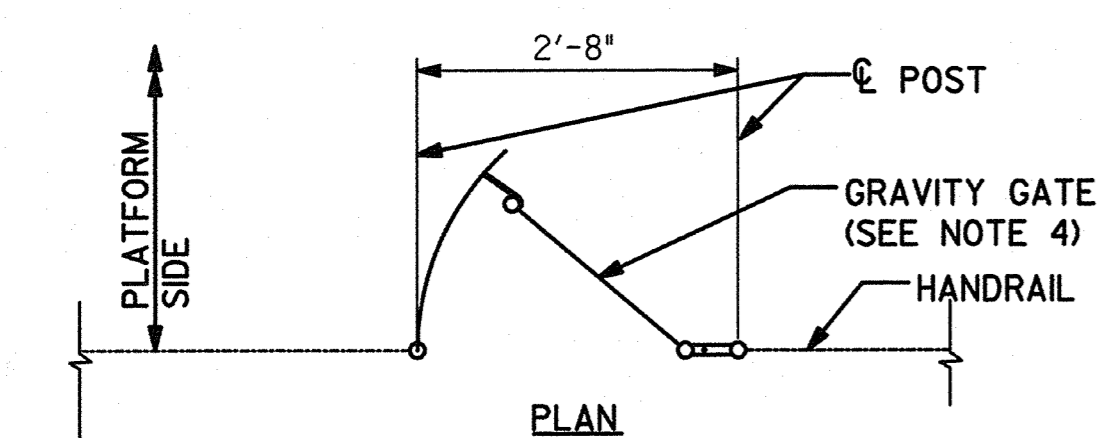
SCALE
HORIZONTAL 3/8" = 1'-0"
VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



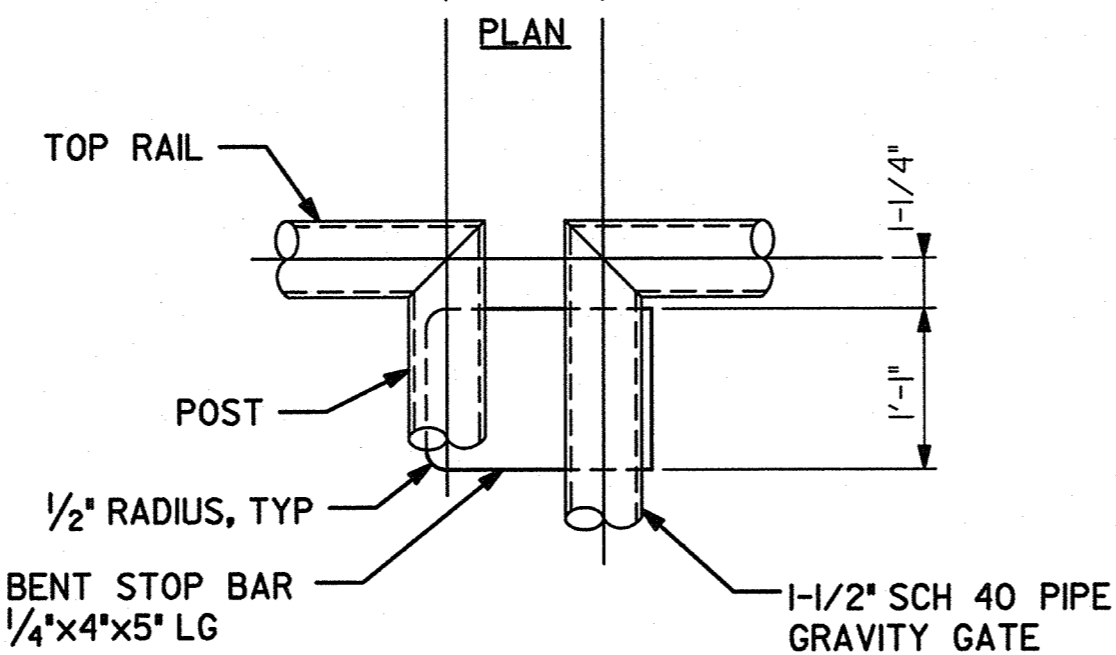
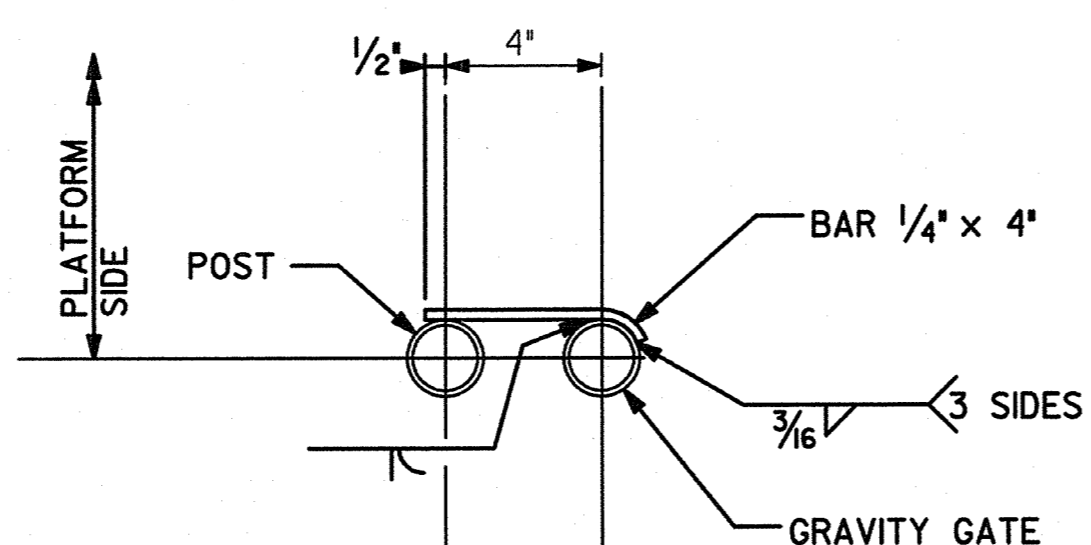
DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/9		BLDG PERMIT	DG	SB	AB			

36196-43-D



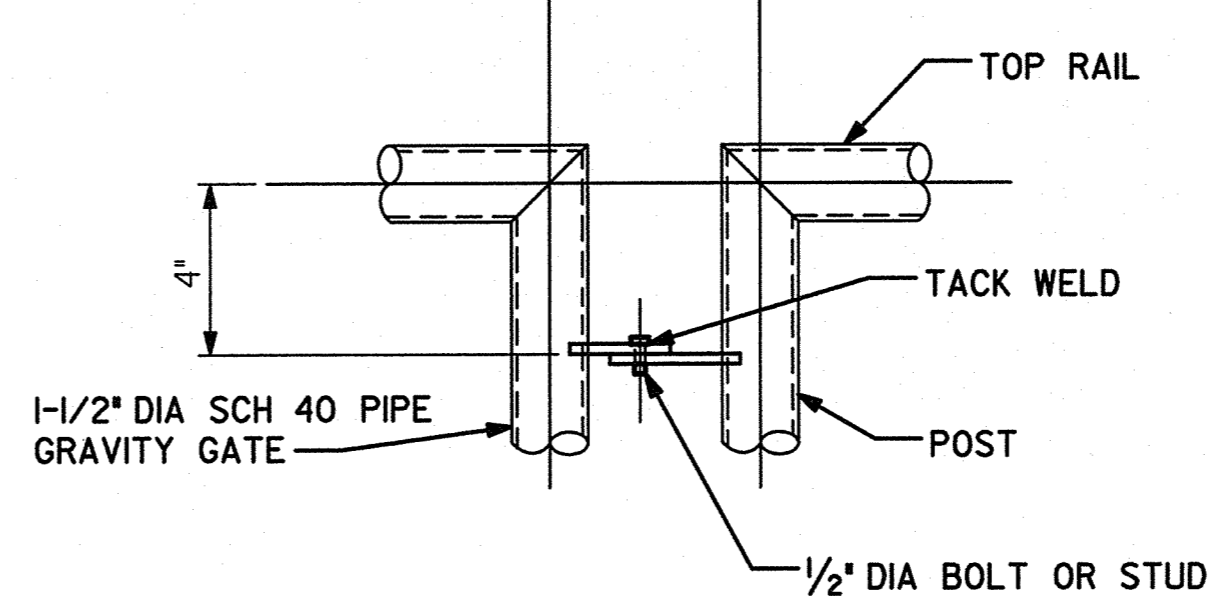
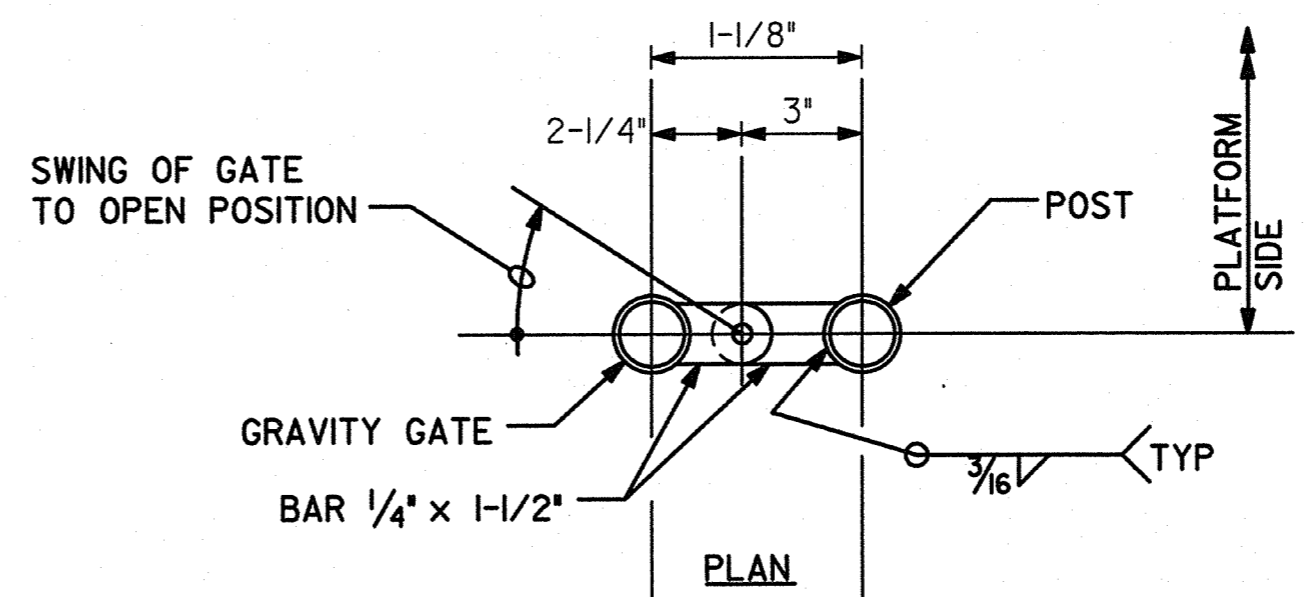
ELEVATION

RAIL GRAVITY GATE DETAIL 1
NTS



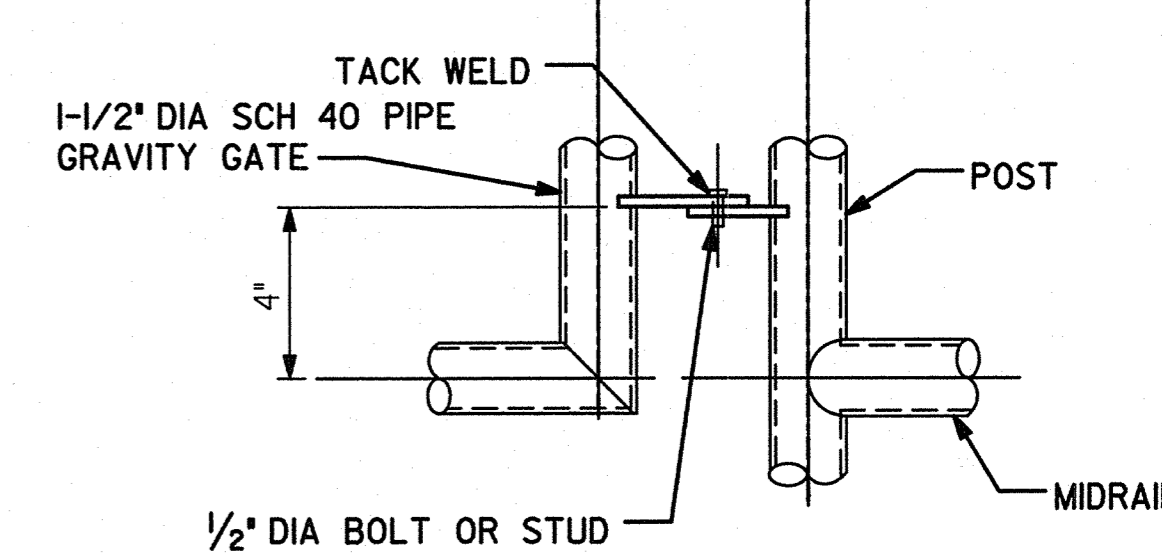
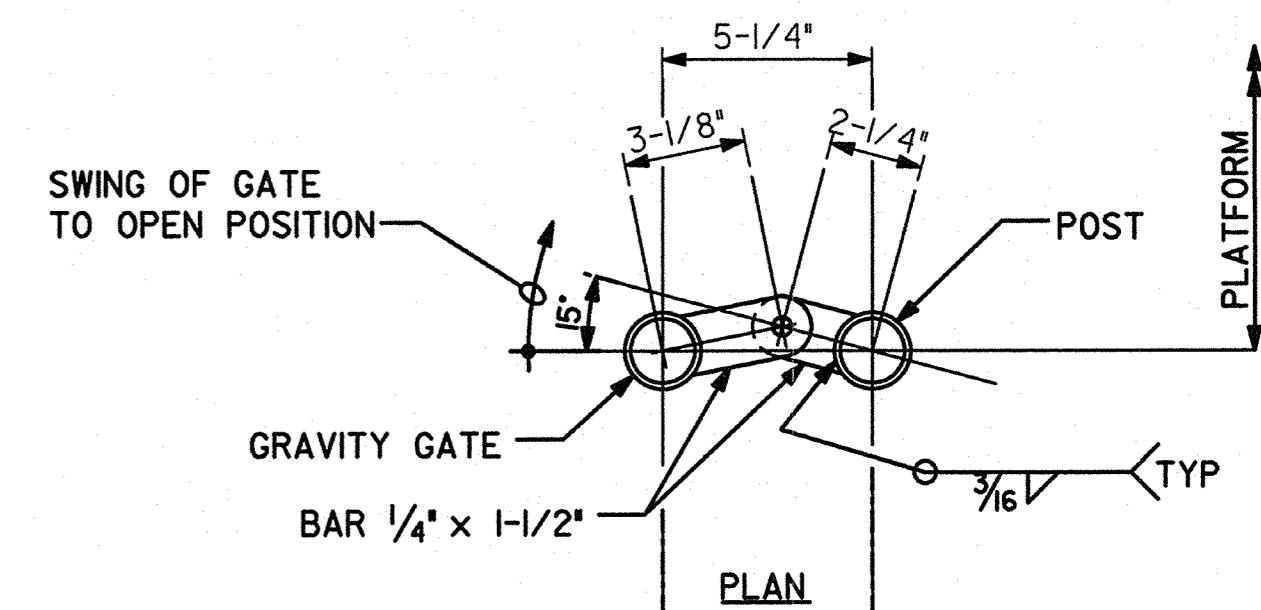
ELEVATION

DETAIL 2
NTS



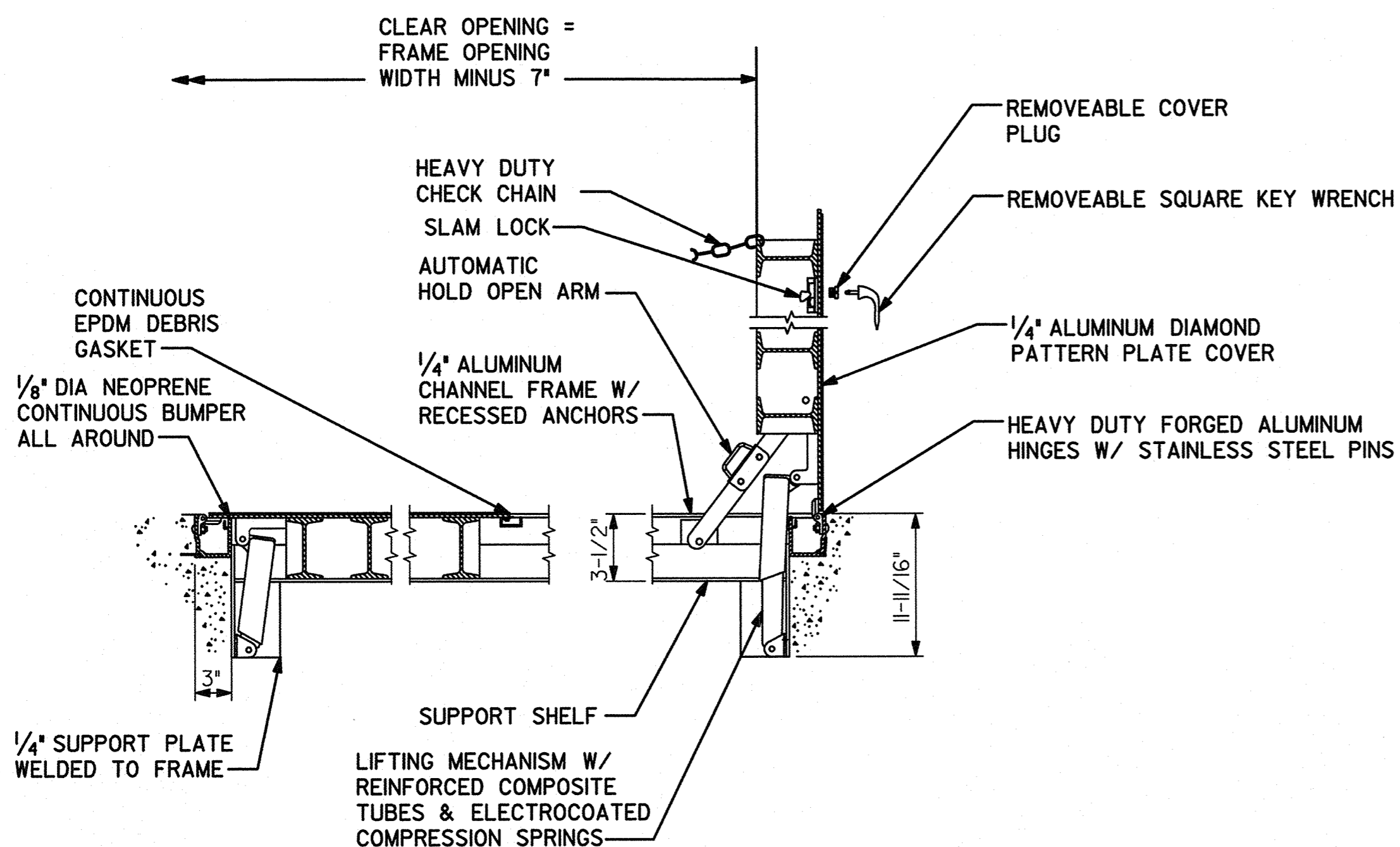
ELEVATION

DETAIL 3
NTS

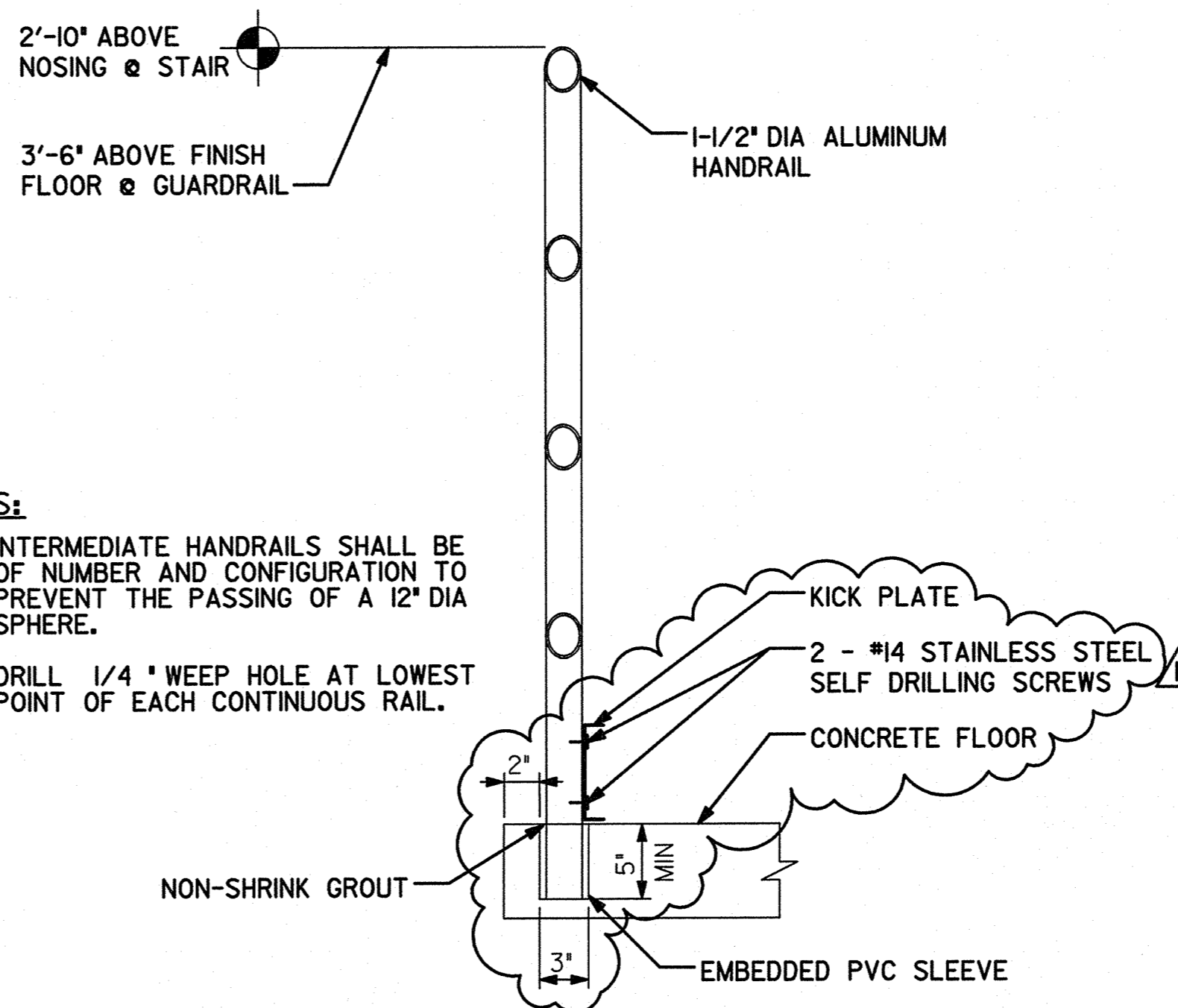


ELEVATION

DETAIL 4
NTS



DOUBLE LEAF HATCH DETAIL 5
NTS



GUARD/HANDRAIL SECTION EMBEDDED 6
NTS

- NOTES:
- INTERMEDIATE HANDRAILS SHALL BE OF NUMBER AND CONFIGURATION TO PREVENT THE PASSING OF A 12" DIA SPHERE.
 - DRILL 1/4" WEEP HOLE AT LOWEST POINT OF EACH CONTINUOUS RAIL.

NOTES:

- GRIND SMOOTH AND ROUND ALL CORNERS AND EDGES OF METAL WORK.
- FOR GRAVITY GATE LOCATION, SEE DESIGN DRAWINGS.
- ALL GRAVITY GATES SHALL BE 1/2" SCH 40 PIPE.
- ALL GUARDRAIL MATERIAL SHALL BE ALUMINUM, UNO.
- GRAVITY GATES SHALL BE FABRICATED USING WELDED CONSTRUCTION.

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SPS84-A-106.DGN

DRAWING NO. 84-A-106	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 46	ARCHITECTURAL DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 46 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	<p>Hogg-Arora 10-25-11 FOR CITY ENGINEER</p> <p>DATE</p>	<p>302-1737 LAMBERT COORDINATES</p>
CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED	36196-46-D



WARNING
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SCALE HORIZONTAL
VERTICAL

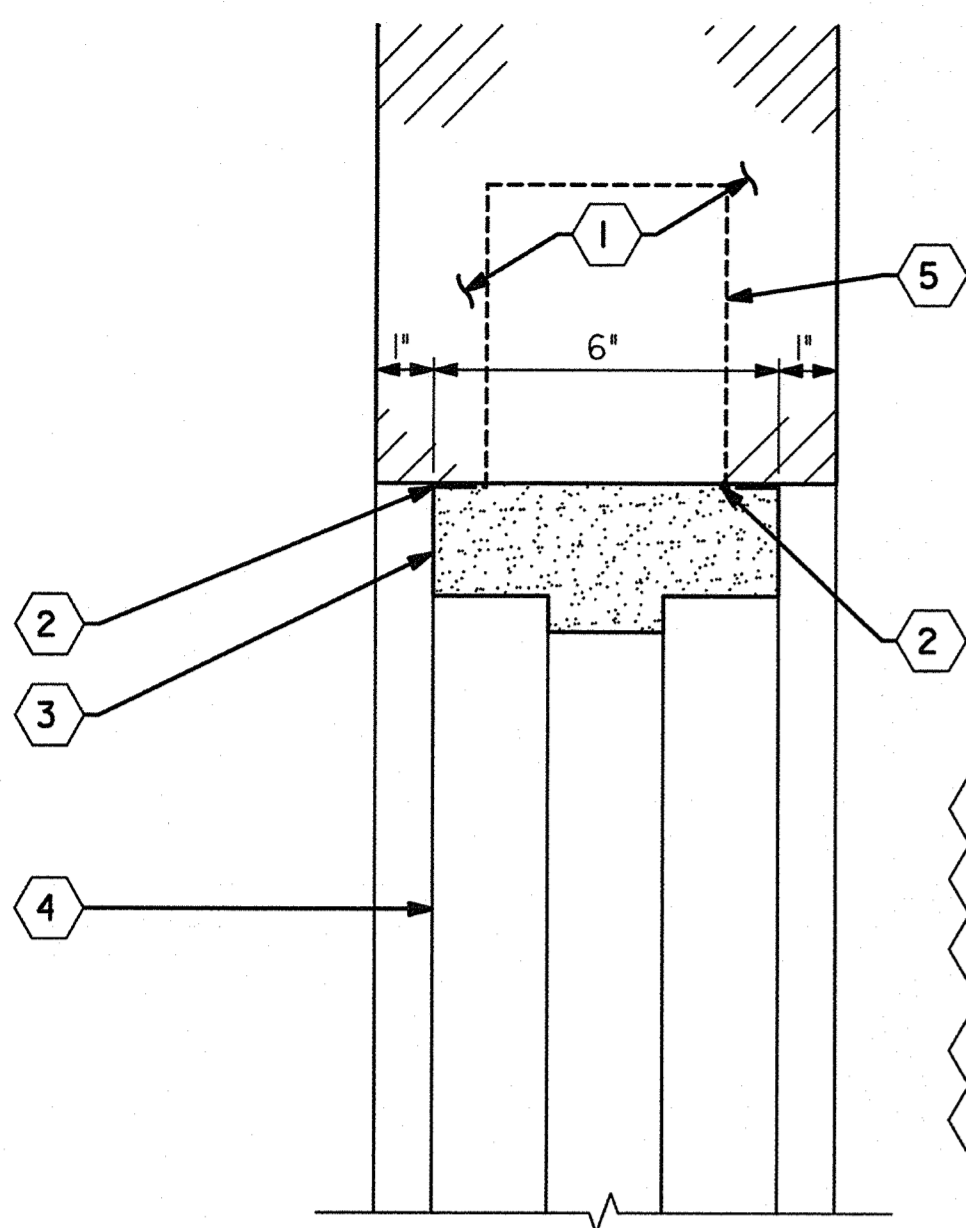
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS									
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1	10/11		BLDG PERMIT	DG	SB	AB			

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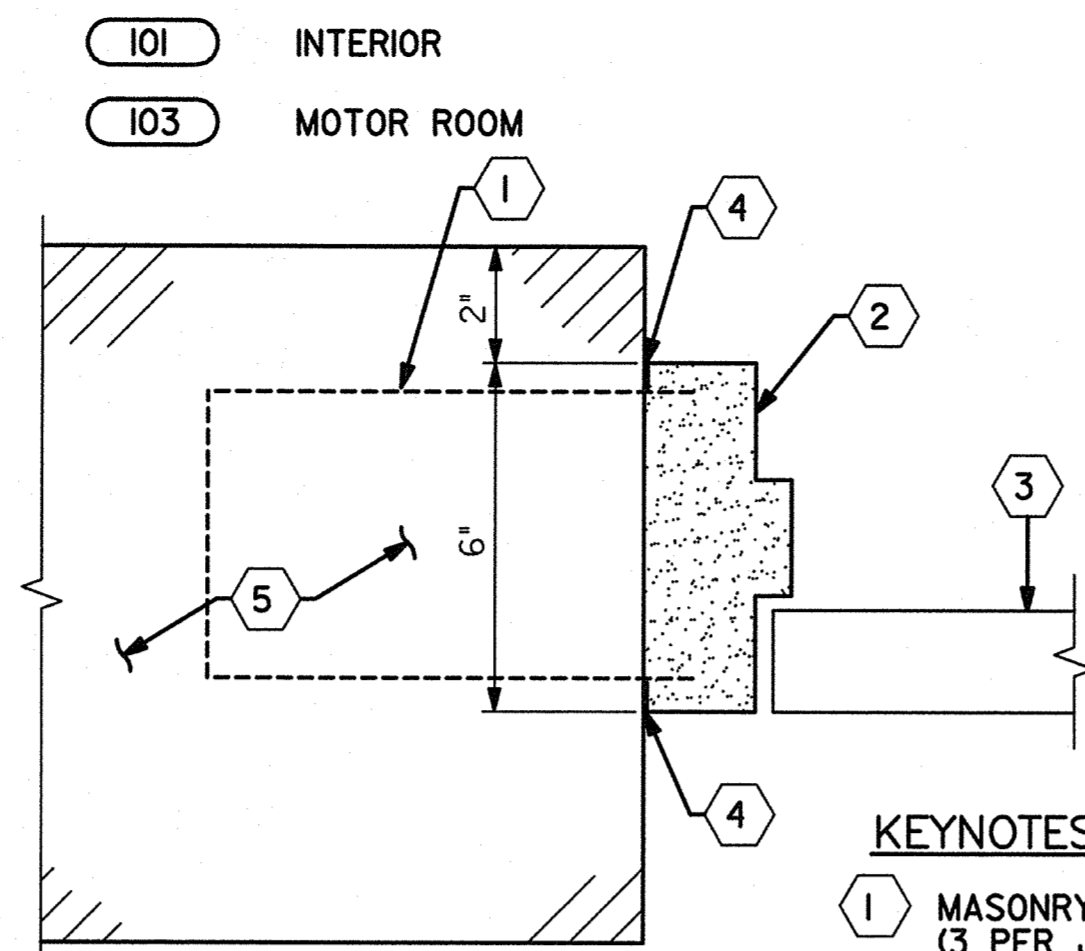
SPS84-A-107.DGN



- KEYNOTES:**
- 1 CMU WALL.
 - 2 SEALANT.
 - 3 GROUT FILLED HOLLOW METAL FRAME.
 - 4 HOLLOW METAL DOOR.
 - 5 MASONRY ANCHOR (3 PER HEAD).

HEAD
NTS

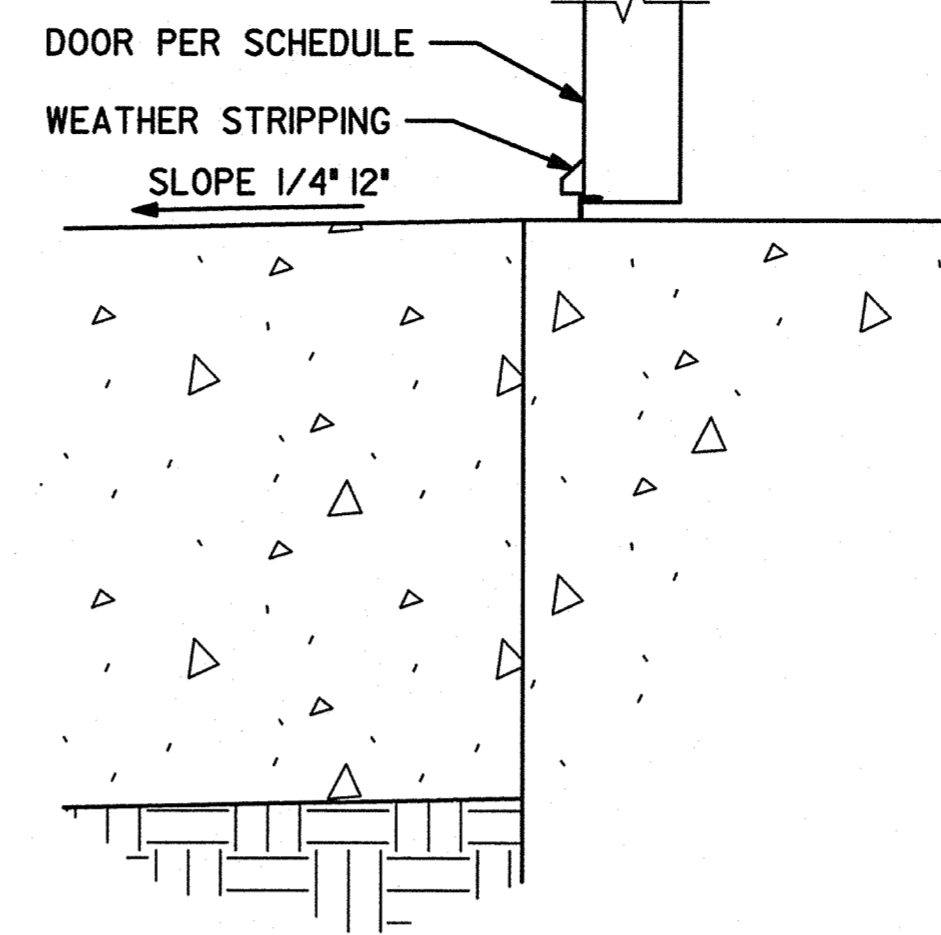
1	-
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- KEYNOTES:**
- 1 MASONRY ANCHOR (3 PER JAMB).
 - 2 GROUTED HOLLOW METAL FRAME.
 - 3 HOLLOW METAL DOOR.
 - 4 SEALANT.
 - 5 CMU WALL.

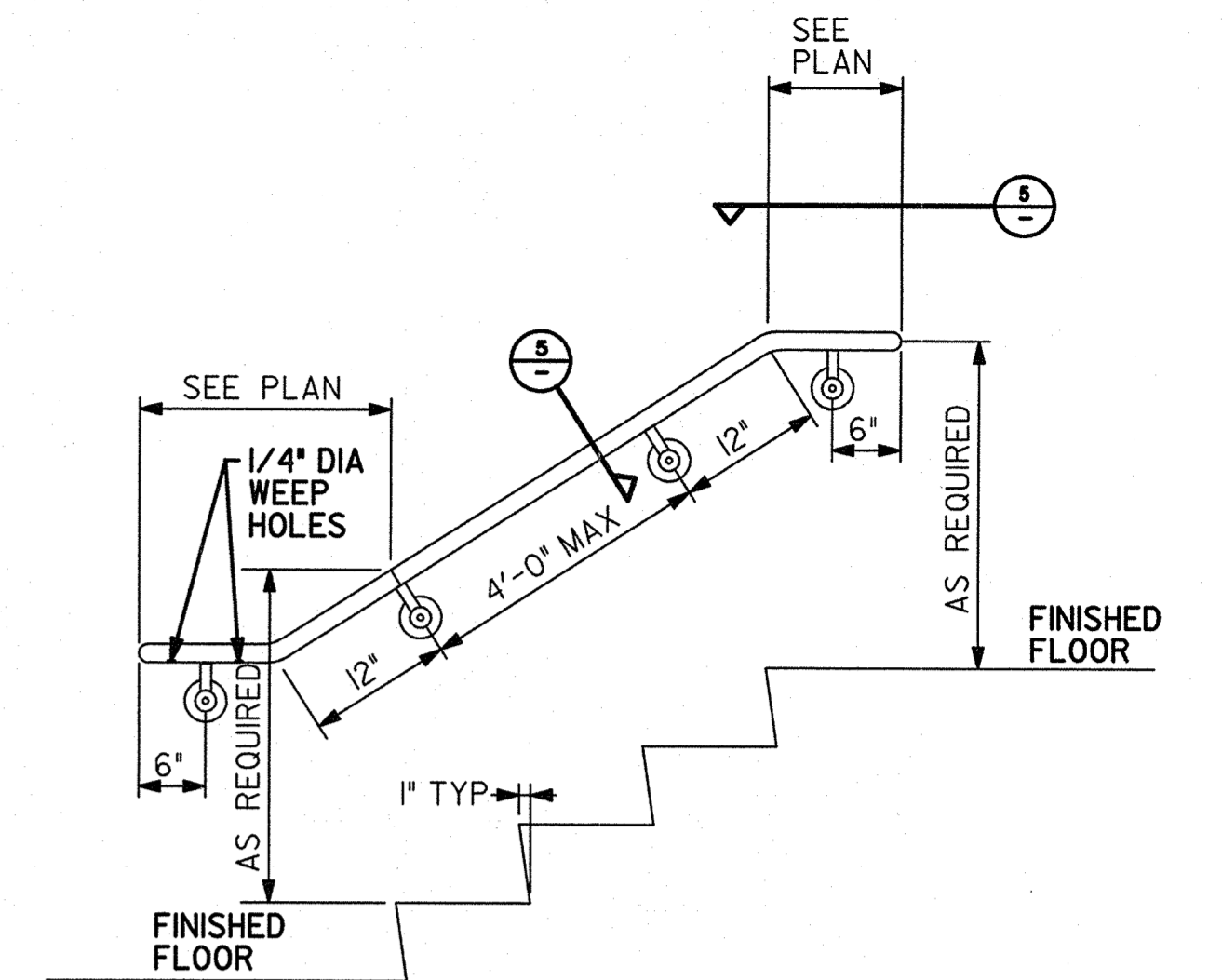
JAMB
NTS

2	-
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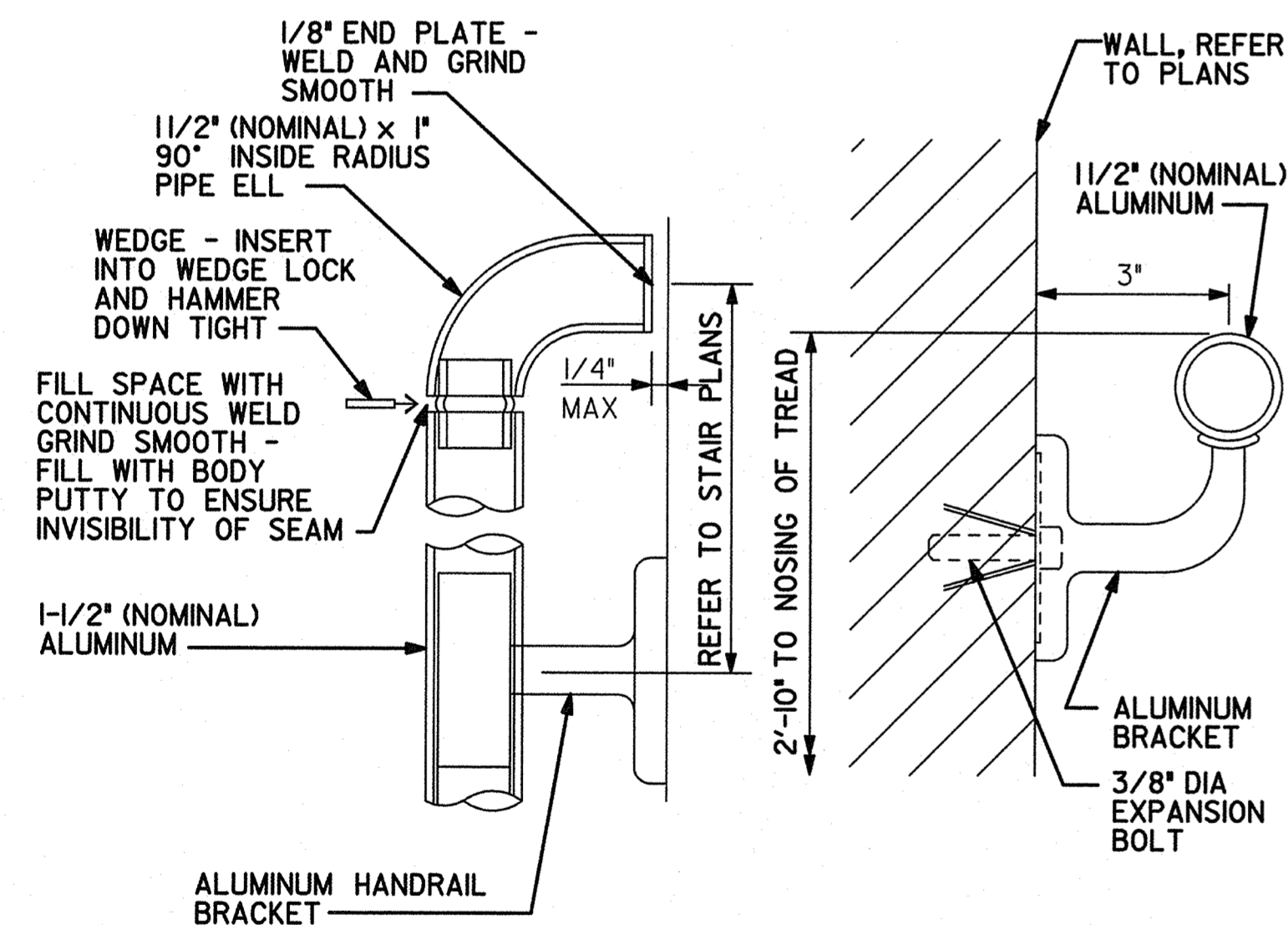
DOOR THRESHOLD
AT EXTERIOR
NTS

3	-
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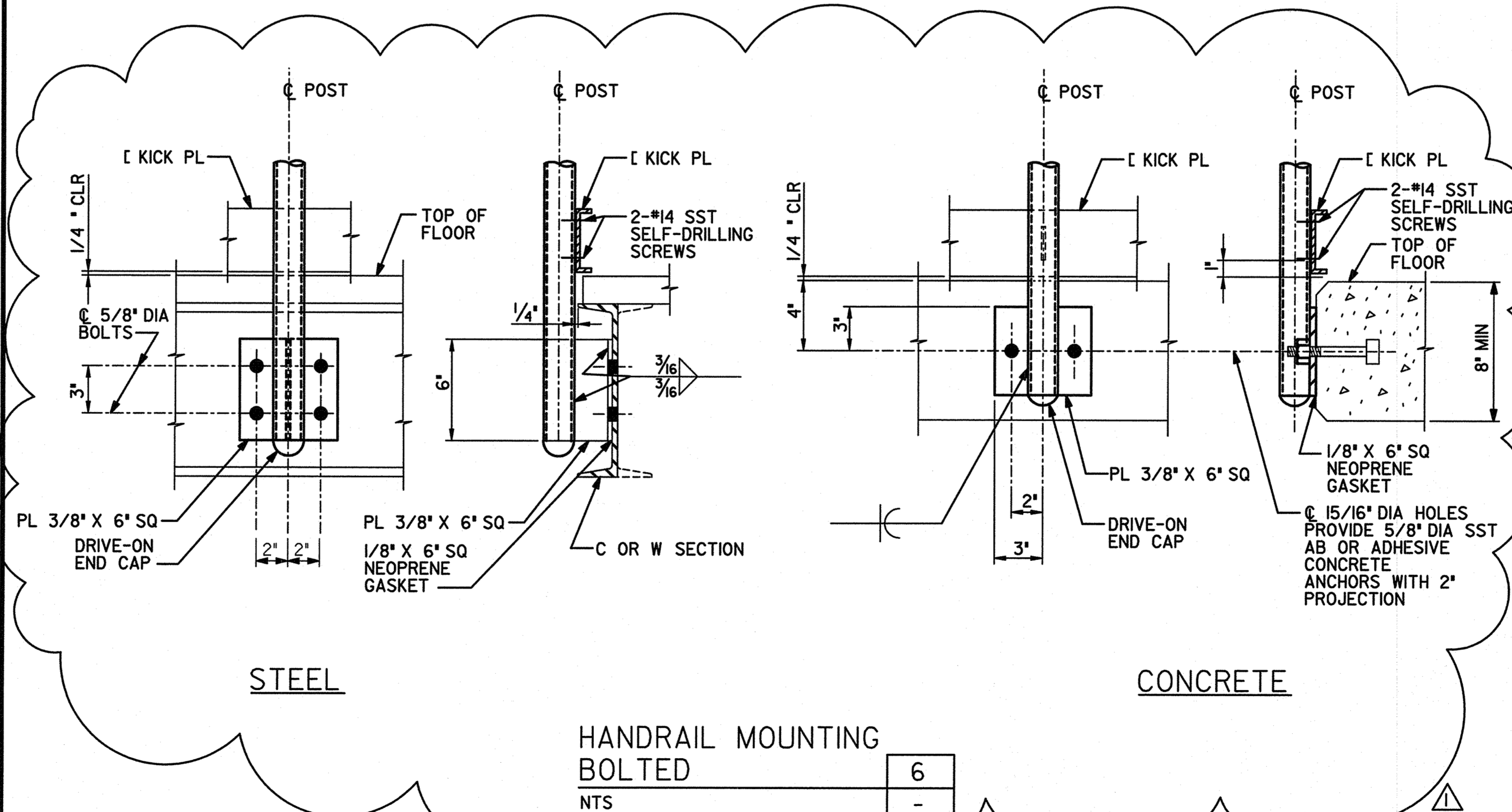
TYPICAL WALL-MOUNTED
HANDRAIL
NTS

4	-
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HANDRAIL
CONNECTION
NTS

5	-
---	---

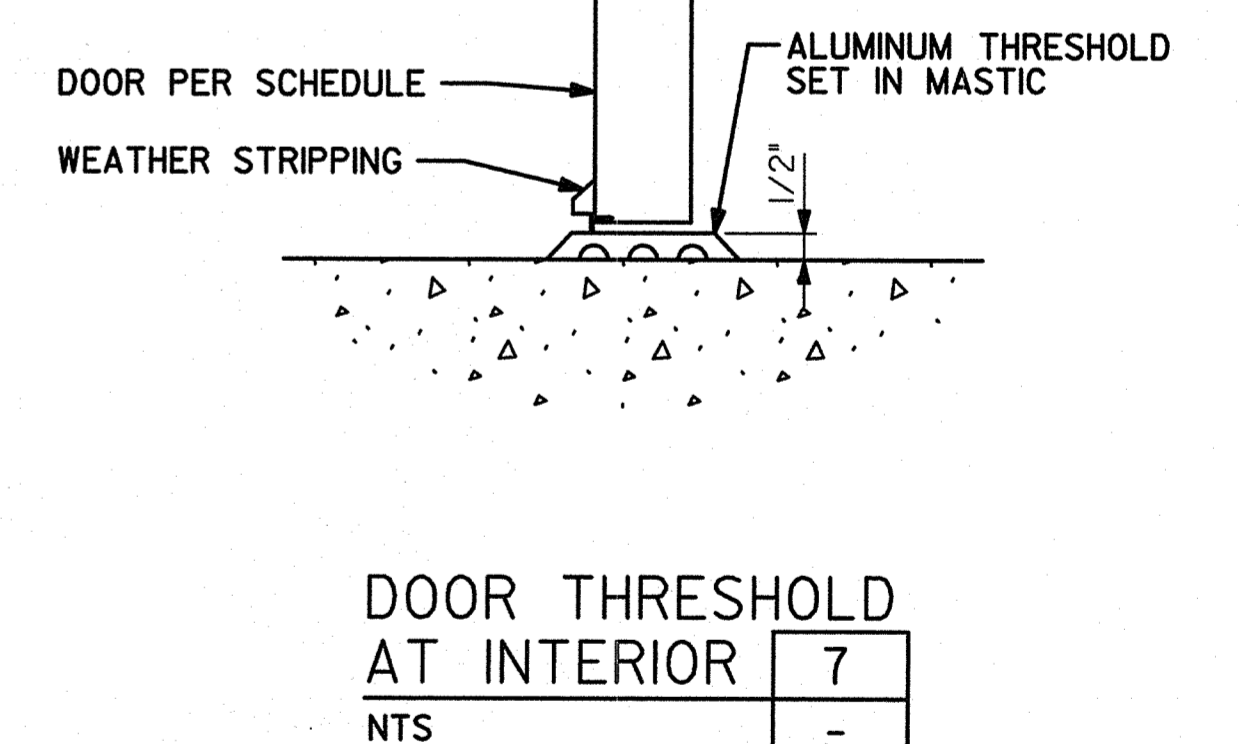


STEEL

CONCRETE

HANDRAIL MOUNTING
BOLTED
NTS

6	-
---	---



DOOR THRESHOLD
AT INTERIOR
NTS

7	-
---	---

DRAWING NO.
84-A-107

SHEET NO.
47

SPECIFICATION NO.
5525

CITY WIDE PUMP STATION UPGRADES
SPS 84 UPGRADE/SPS 62 ABANDONMENT

ARCHITECTURAL DETAILS

CITY OF SAN DIEGO, CALIFORNIA
SHEET 47 OF 118 SHEETS

WATER
WBS
SEWER
WBS S-00308

APPROVED BY:	Hosea Ayon 10-25-11				
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED	DATE	FILMED
CHECKED BY:					
CONSTRUCTION ENGINEER					
CHECKED BY:					
INSPECTOR					
INSPECTOR	CONTRACTOR	DATE STARTED	DATE COMPLETED		



WARNING
0 1/2 1
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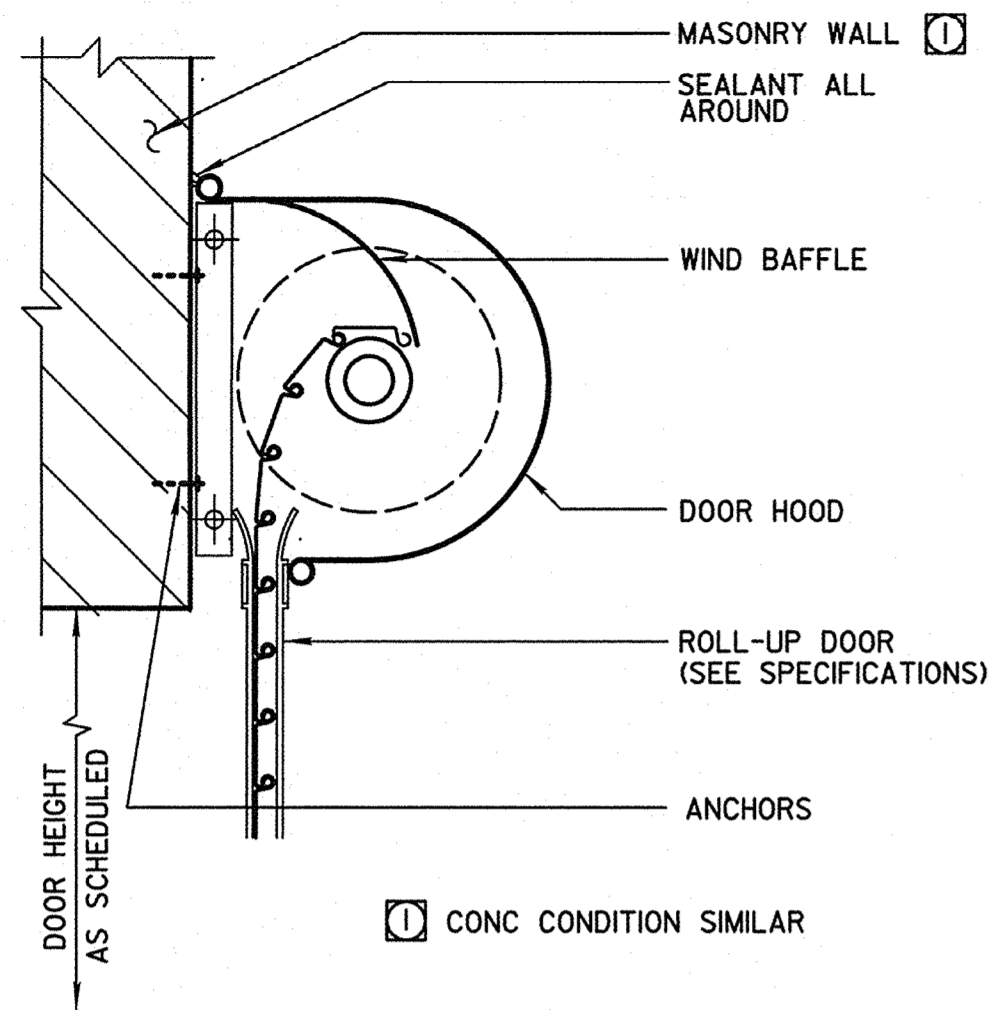
SCALE
HORIZONTAL
VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

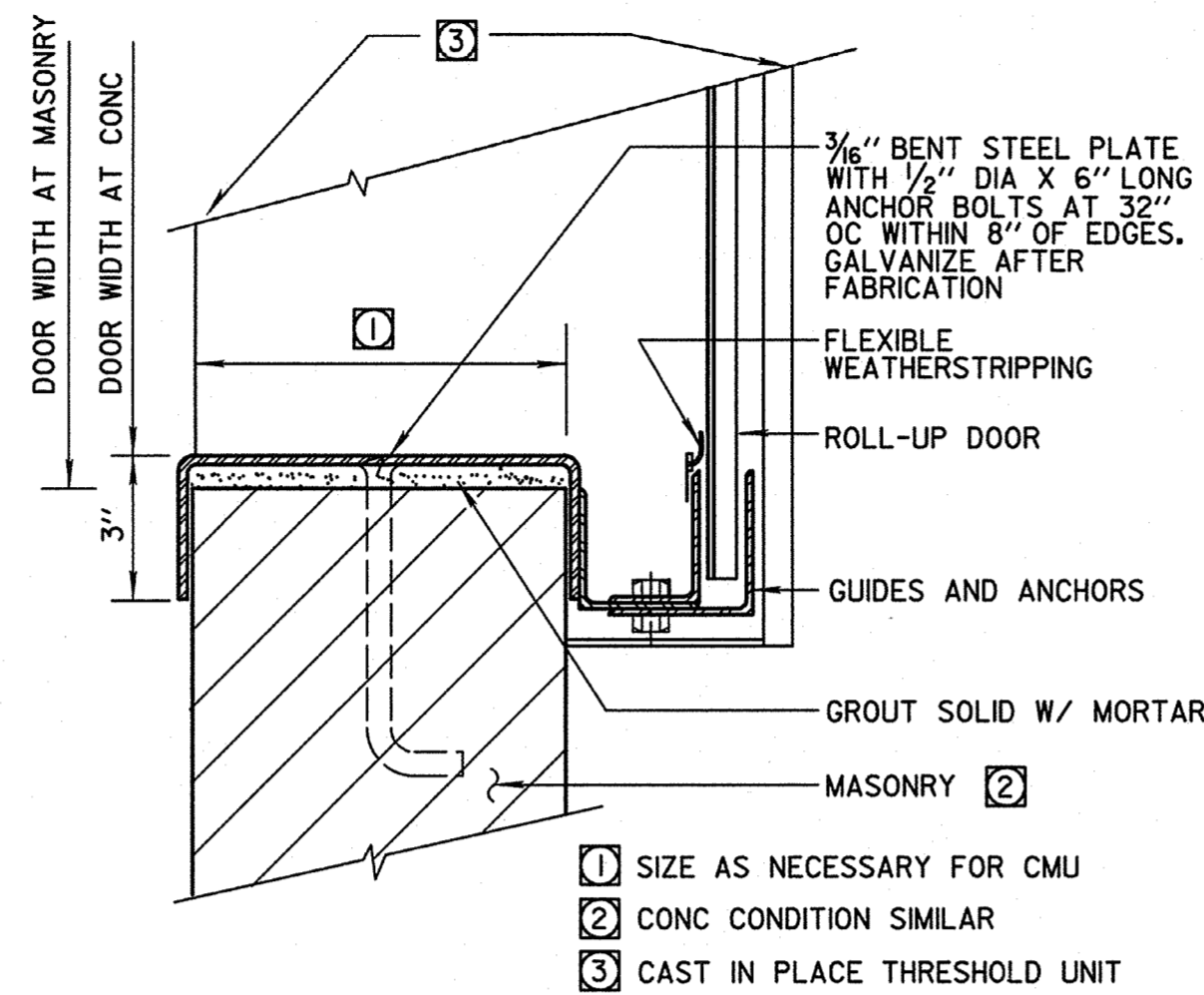


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

CONTROL CERTIFICATION
302-1737
LAMBERT COORDINATES
36196- 47 -D

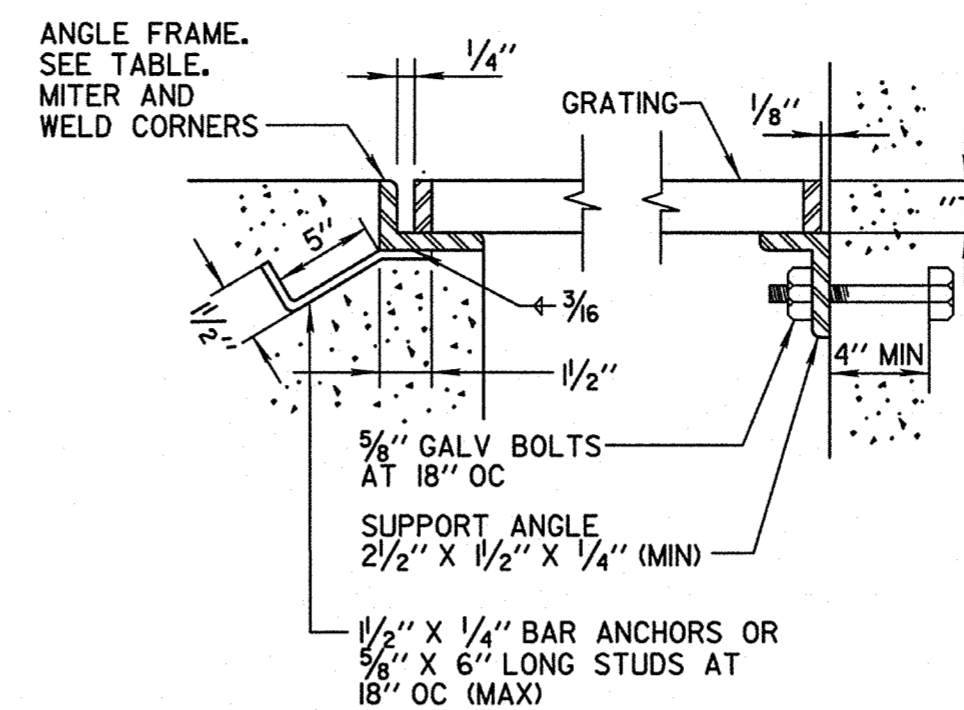


HEAD AT ROLL-UP DOOR A-322
NTS CWP



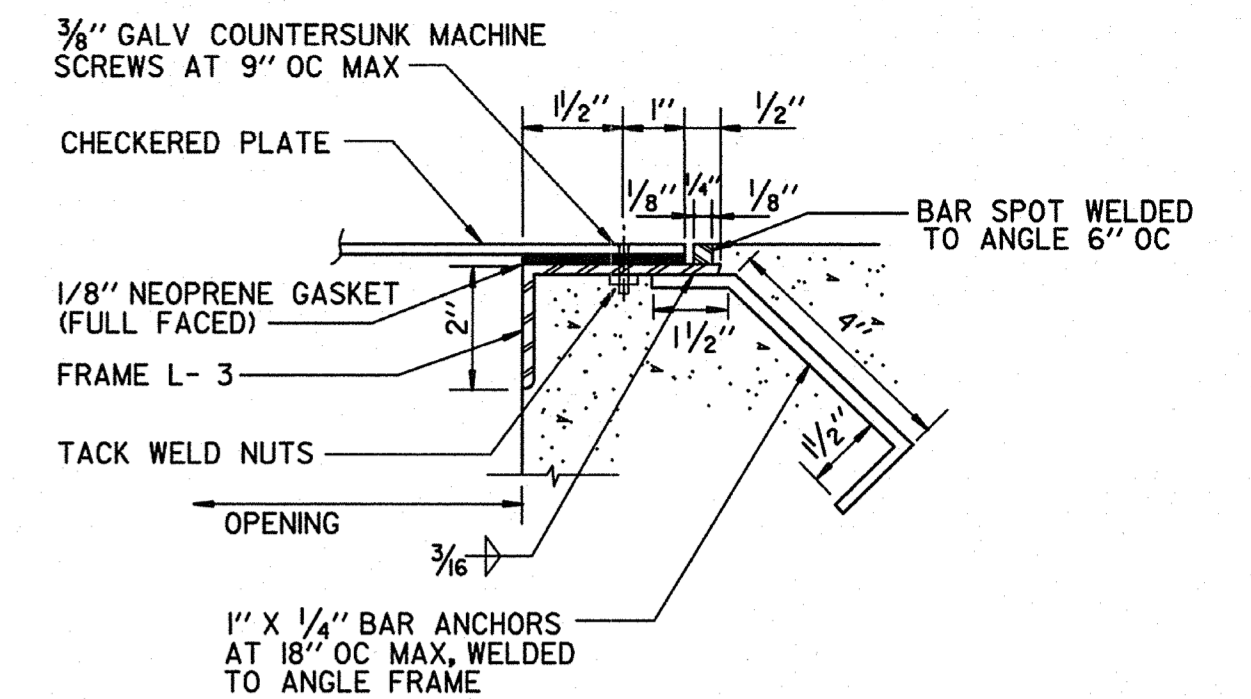
JAMB AT ROLL-UP DOOR A-323
NTS CWP

GRATING FRAME TABLE					
TYPE	GRATING DEPTH "T"	ANGLE FRAME	TYPE	GRATING DEPTH "T"	ANGLE FRAME
1	1"	1 3/4" X 1 1/4" X 1/4"	5	2"	2 1/2" X 2 1/2" X 1/2"
2	1 1/4"	2 X 1 1/2" X 1/4"	6	2 1/4"	2 1/2" X 2 1/2" X 1/4"
3	1 1/2"	1 3/4" X 1 3/4" X 1/4"	7	2 1/2"	3 X 2 1/2" X 1/2"
4	1 3/4"	2 X 2 X 1/4"			



- NOTES:
1. BEARING BARS: "T" X 3/16" AT 1 3/16" OC
CROSS BARS: SAME SIZE AT 4" OC
 2. ANGLE FRAME, SUPPORT ANGLE, BOLTS AND NUT TO BE OF SAME MATERIAL AS GRATING
 3. FOR GRATING DEPTH "T" SEE DRAWINGS
 4. ALL ENDS AND OPENINGS OF GRATING SHALL BE BANDED
 5. SEE DETAIL S-406 FOR GRATING ANCHORS
 6. WEIGHT OF GRATING SECTION SHALL NOT EXCEED 80 LBS

GRATING DETAILS - ALUM., GALV. STEEL & STAINLESS STEEL S-403
NTS CWP

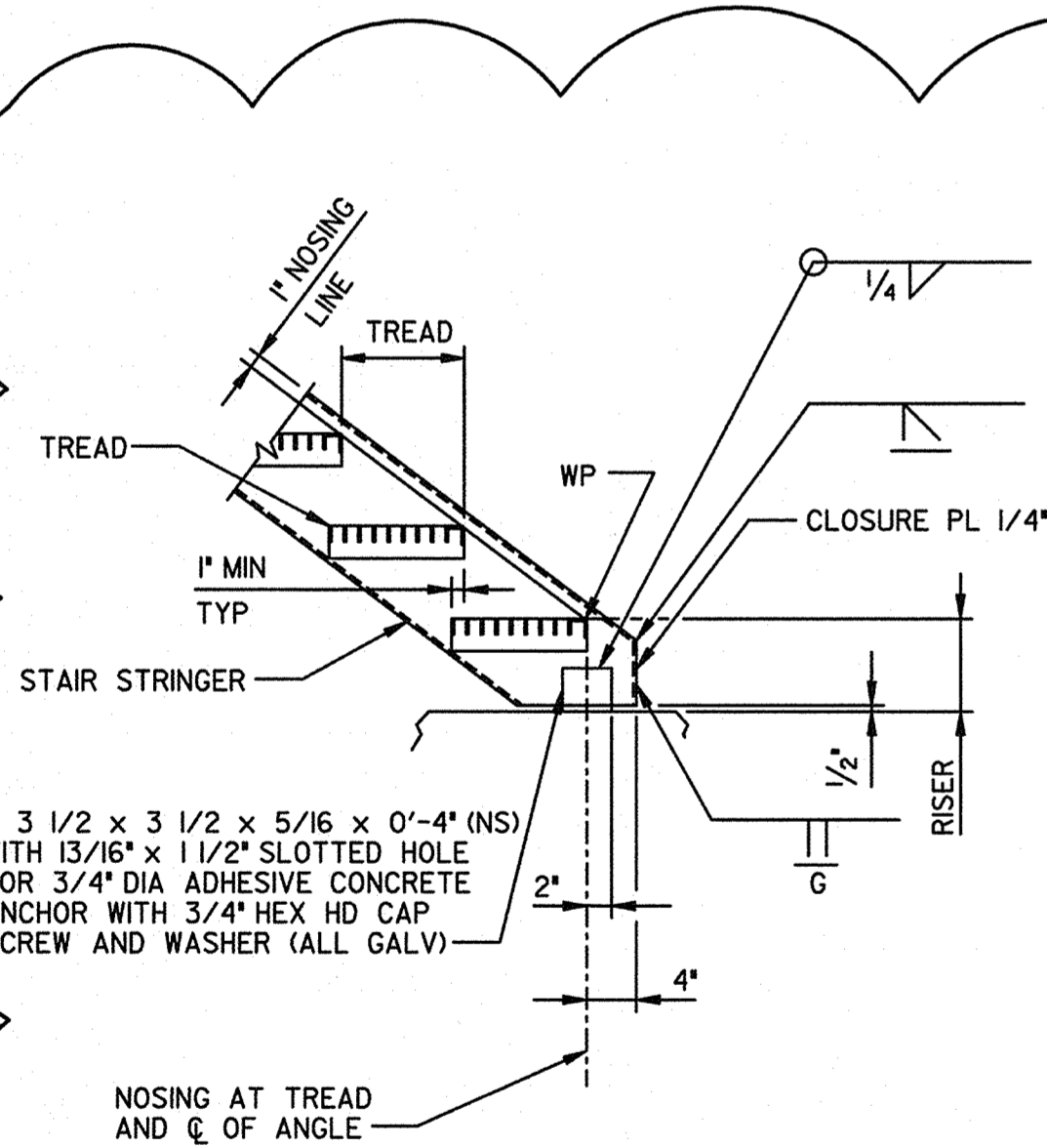


- NOTES:
1. GALVANIZE FRAME AFTER FABRICATION
 2. FOR ALUMINUM OR STAINLESS STEEL PLATES USE MATCHING MATERIAL FOR FRAME AND FASTENERS

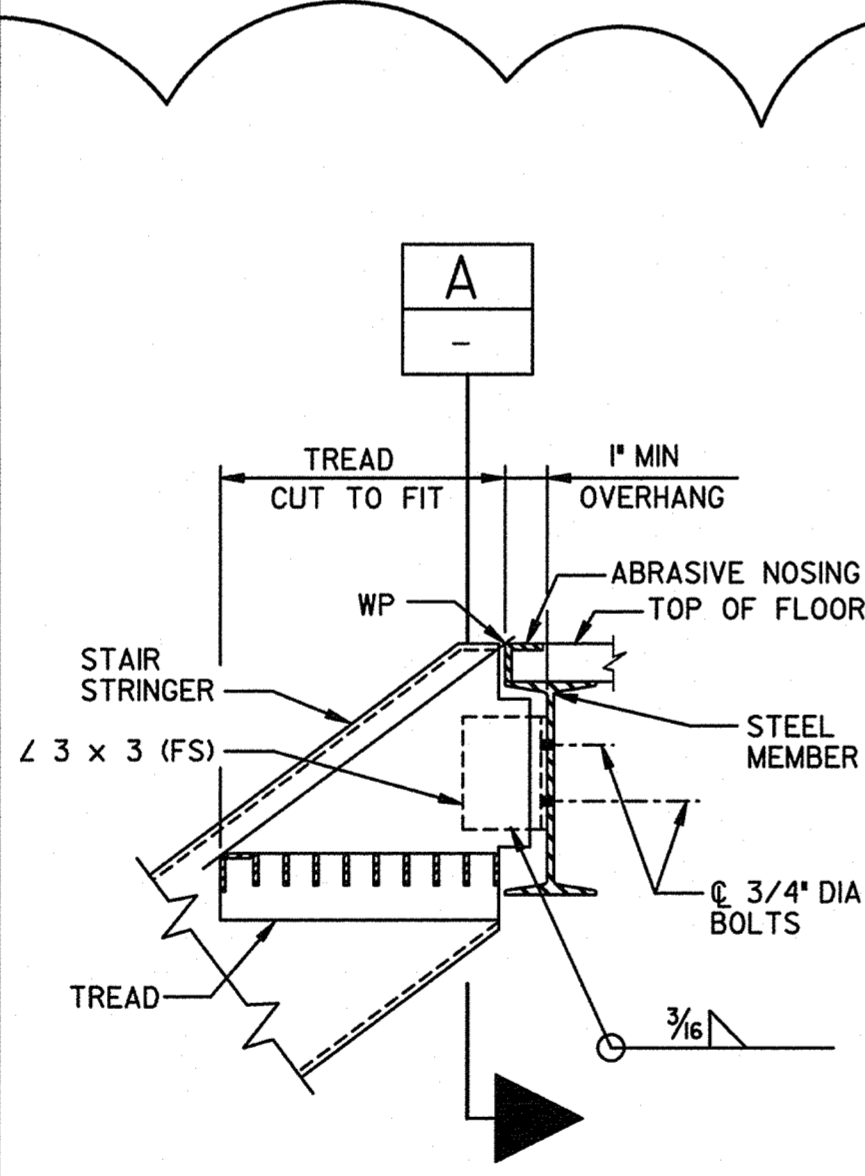
NOTE TO DESIGN CONSULTANT:

IF A PVC LINER IS USED ON THE CONCRETE SURFACE, THE LINER SHALL BE CONTINUED AT LEAST ONE INCH BEHIND THE EDGE OF THE FRAME ANGLE

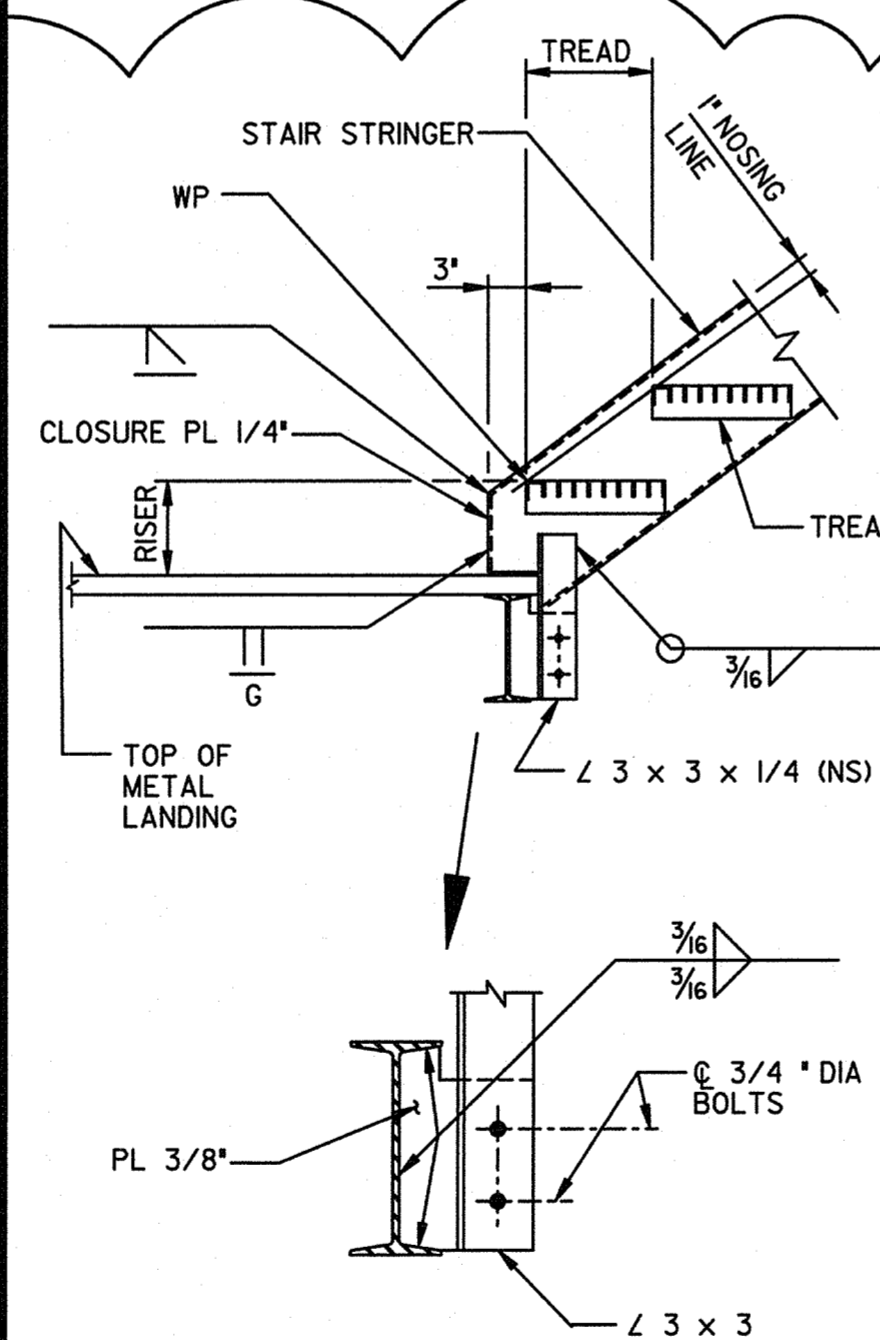
TYPICAL PLATE-COVERED OPENING S-407
NTS CWP



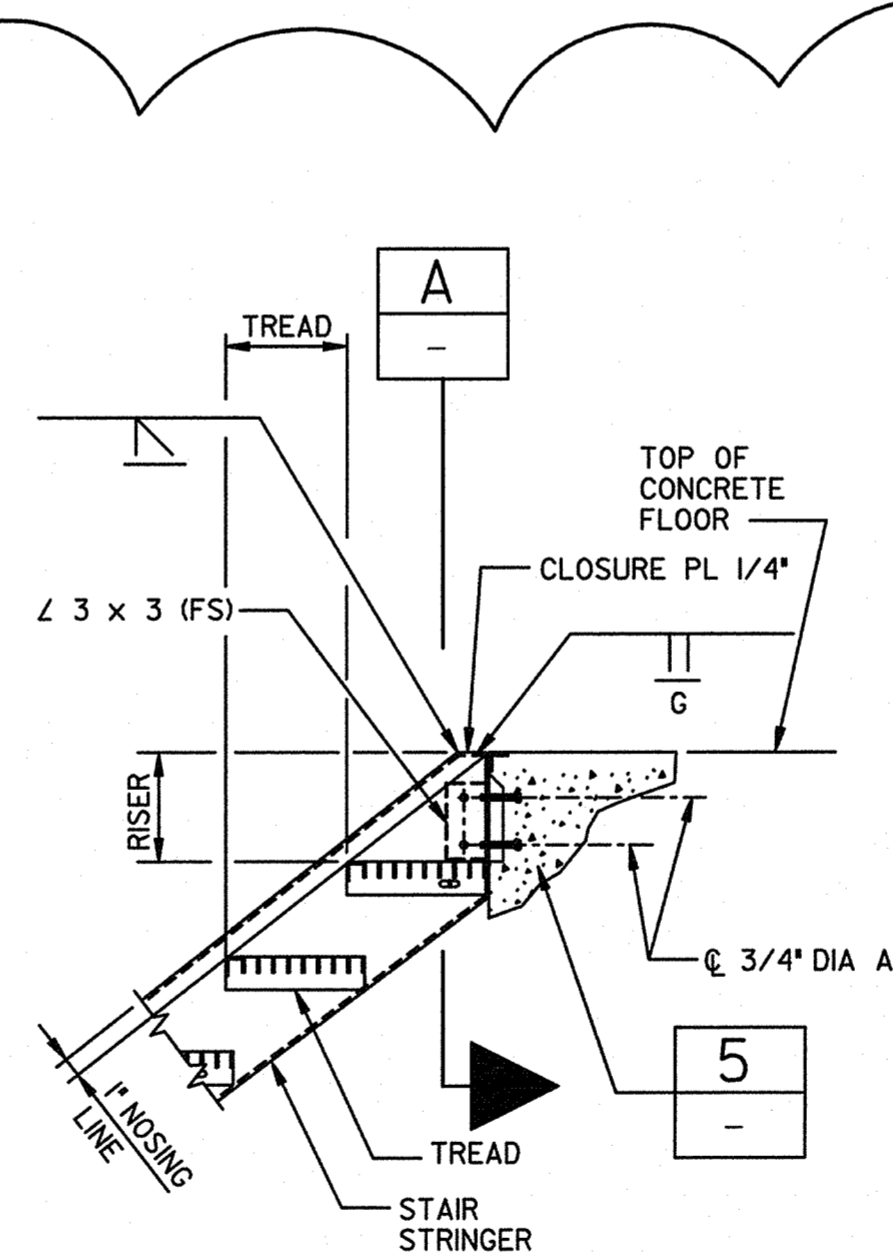
DETAIL 1
NTS



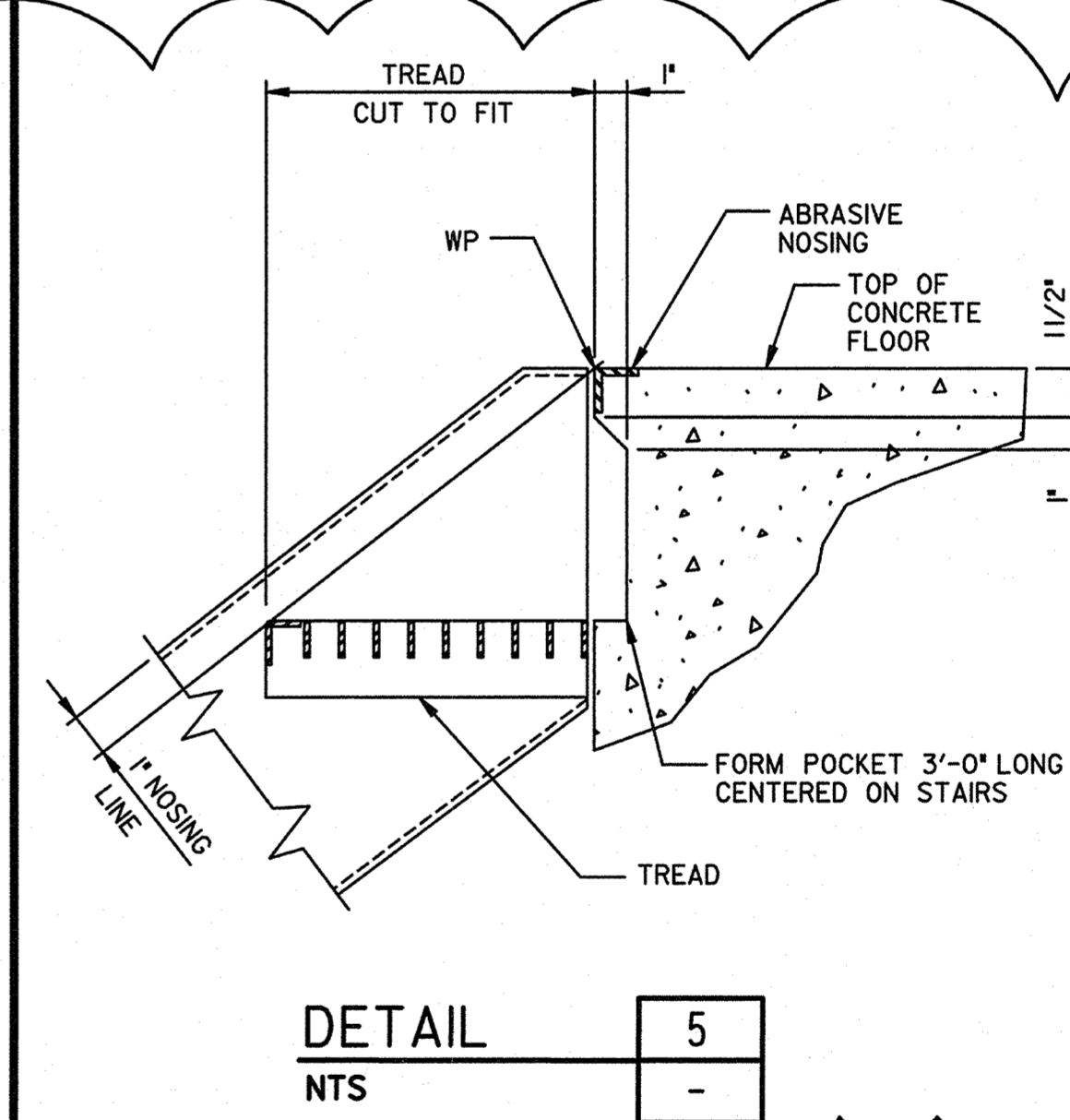
DETAIL 2
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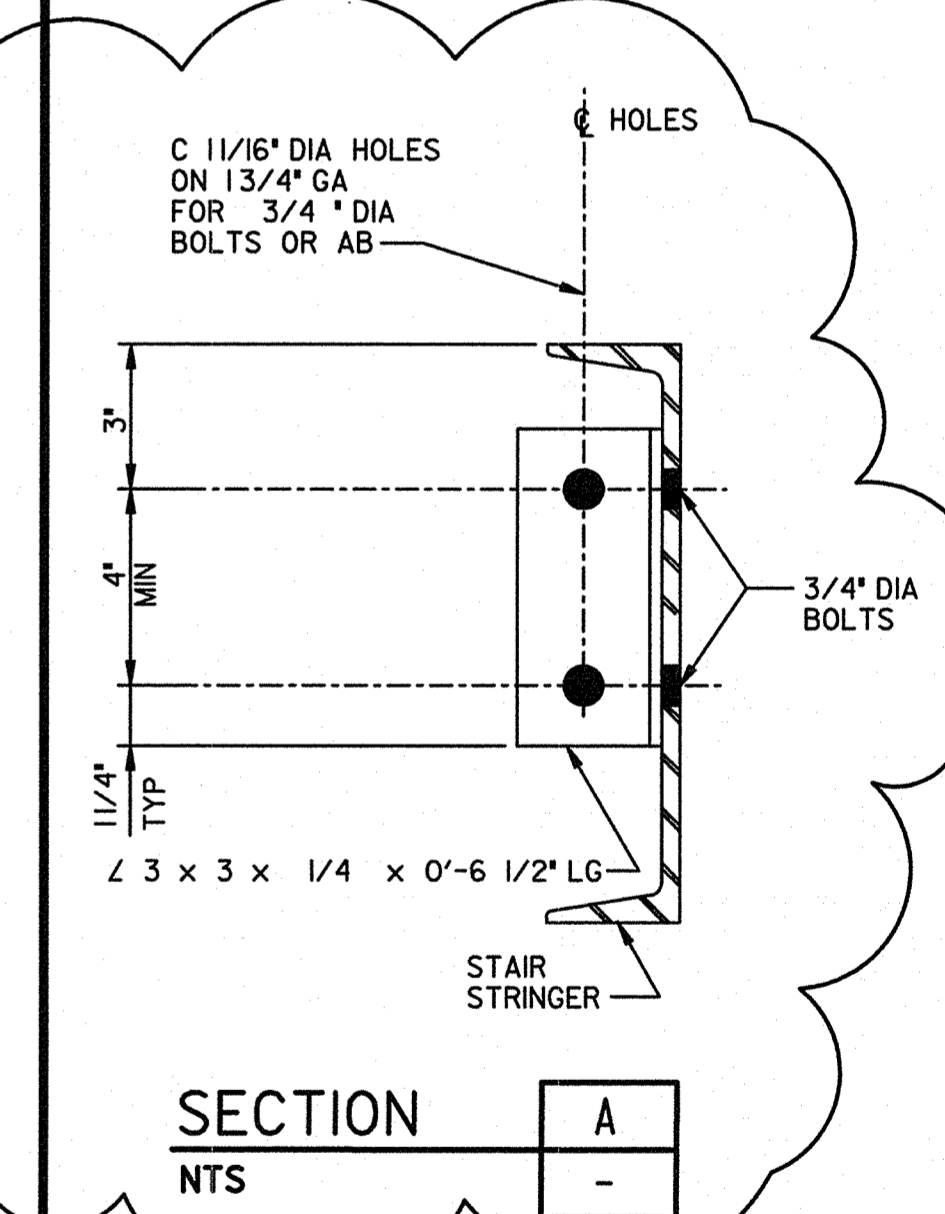
DETAIL 3
NTS



DETAIL 4
NTS



DETAIL 5
NTS



SECTION A
NTS

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SPS84-A-108.DGN

DRAWING NO. 84-A-108	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 48	ARCHITECTURAL DETAILS 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 48 OF 118 SHEETS		WATER SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hosco Acar 10-25-11		PROJECT MANAGER Paul H. Lee
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED
CHECKED BY: INSPECTOR			
	DATE STARTED	DATE COMPLETED	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196- 48 -D



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SCALE
HORIZONTAL
VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

FOUNDATION:

- 1. ATTACH ONE COPY OF SOILS REPORT TO THE APPROVED SET OF CONSTRUCTION DOCUMENTS. SOILS REPORT SHALL BE PART OF THESE NOTES. PRIOR TO THE POURING OF CONCRETE AND PRIOR TO THE CONTRACTOR REQUESTING A BUILDING DEPARTMENT FOUNDATION INSPECTION, THE GEOTECHNICAL ENGINEER SHALL INSPECT AND APPROVE THE FOOTING EXCAVATIONS. HE SHALL POST NOTICE ON THE JOB SITE AND ADVISE THE BUILDING INSPECTOR IN WRITING THAT THE WORK SO INSPECTED MEETS THE CONDITIONS OF THE REPORT. A WRITTEN CERTIFICATION TO VERIFY THAT:
A. THE BUILDING PAD WAS PREPARED IN ACCORDANCE WITH THE SOILS REPORT.
B. THE UTILITY TRENCHES HAVE BEEN PROPERLY BACKFILLED AND COMPACTED, AND
C. THE FOUNDATION EXCAVATIONS COMPLY WITH THE INTENT OF THE SOILS REPORT.
2. SOILS REPORT PREPARED BY: NINYO & MOORE GEOTECHNICAL & ENVIRONMENTAL SCIENCES CONSULTANTS GEOTECHNICAL EVALUATION, CITY OF SAN DIEGO SEWER PUMP STATION UPGRADE PROJECT PUMP STATION NO. 84 SAN DIEGO, CALIFORNIA. JULY 21, 2010.
3. SOIL REMOVAL AND RECOMPACTION SHALL BE DONE PER SOILS REPORT RECOMMENDATIONS UNDER GEOTECHNICAL ENGINEER'S SUPERVISION AND INSPECTION.
4. TYPE OF FOOTING:
A. SHALLOW FOOTING SYSTEM -MINIMUM EMBEDMENT 24" BELOW LOWEST ADJACENT GRADE.
DESIGN SOIL PRESSURE:
FOOTING TYPE STATIC BEARING PRESSURE
SPREAD FOOTING 2,500 P.S.F.
CONTINUOUS FOOTING 2,500 P.S.F.
EMERGENCY STORAGE TANK FOOTING 5,000 P.S.F.
LOWER LEVEL OF PUMP ROOM 5,000 P.S.F.
5. SLAB BASE AND COMPACTION TO BE IN ACCORDANCE WITH SOILS REPORT.
6. NO PIPES OR DUCTS SHALL BE PLACED IN SLABS OR WALLS UNLESS SPECIFICALLY DETAILED OR APPROVED BY THE ENGINEER.
7. FOR ALL DIMENSIONS, CURBS, SLAB DEPRESSIONS, STEPS, FLOOR DRAINS, FLOOR SINKS, TRENCHES, UNDER FLOOR DUCTS AND CONDUITS, SEE ARCHITECTURAL, MECHANICAL, REFRIGERATION, AIR CONDITIONING, PLUMBING, ELECTRICAL, AND FOOD SERVICE DRAWINGS, TRENCH BACK FILL AS PER SOILS REPORT REQUIREMENTS.
8. ALL WALLS RETAINING EARTH SHALL DRAIN TO DAYLIGHT OR OTHER DRAINAGE.
9. ALL ABANDONED FOOTINGS, UTILITIES, ETC., THAT INTERFERE WITH NEW CONSTRUCTION SHALL BE REMOVED.
10. THE CONTRACTOR SHALL DETERMINE THE LOCATION OF UTILITY SERVICES IN AREAS TO BE EXCAVATED BEFORE BEGINNING EXCAVATION. EXERCISE EXTREME CAUTION IN EXCAVATING AND TRENCHING. DAMAGE CAUSED AS A RESULT OF FAILING TO EXACTLY LOCATE AND PRESERVE ALL EXISTING UNDERGROUND UTILITIES ARE THE RESPONSIBILITY OF THE CONTRACTOR.
11. THE CONTRACTOR SHALL PROVIDE FOR THE DESIGN, APPROVALS, PERMITS, INSTALLATION AND MONITORING OF ALL CRIBBING, SHEATHING AND SHORING REQUIRED TO SAFELY RETAIN TEMPORARY EXCAVATIONS.
12. ALL PLANTERS IN CLOSE PROXIMITY TO THE STRUCTURE SHALL HAVE ADEQUATE DRAINAGE OF SURFACE WATER TO PREVENT SATURATION OF SOIL UNDER FOUNDATION.

STRUCTURAL OBSERVATION:

- 1. PER C.B.C. CHAPTER 17 SECTION 1709, THE OWNER SHALL EMPLOY A LICENSED ENGINEER OR ARCHITECT RESPONSIBLE FOR THE STRUCTURAL DESIGN, OR HIS DESIGNATED ENGINEER OR ARCHITECT TO MAKE SITE VISITS TO OBSERVE GENERAL COMPLIANCE WITH THE APPROVED STRUCTURAL PLANS, SPECIFICATIONS AND CHANGE ORDERS. THE ENGINEER OR ARCHITECT SHALL SUBMIT A STATEMENT IN WRITING TO THE BUILDING OFFICIAL STATING THAT THE SITE VISIT HAS BEEN MADE AND THAT ANY DEFICIENCIES NOTED HAVE BEEN CORRECTED. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE INSPECTIONS REQUIRED BY SECTIONS 109, 1704 OR OTHER SECTIONS OF THE CODE.

GENERAL NOTES:

- 1. THE PROJECT SPECIFICATIONS SHALL BE PART OF THE CONTRACT DOCUMENTS.
2. THE STRUCTURAL DRAWINGS ARE TO BE USED IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
3. THE CONTRACTOR SHALL REVIEW EXISTING CONDITIONS ON THE SITE DURING THE BIDDING. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING WORK. THE ARCHITECT AND ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES PRIOR TO PROCEEDING.
4. UNLESS NOTED OR SHOWN OTHERWISE, ALL PHASES OF WORK ARE TO CONFORM TO THE MINIMUM STANDARDS OF THE CALIFORNIA BUILDING CODE (2010 EDITION), AND ANY A.S.T.M. SPECIFICATIONS ON WHICH THESE STANDARDS ARE BASED. WHERE CONFLICT BETWEEN BUILDING CODES AND SPECIFICATIONS OCCUR, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
5. ALL A.S.T.M. DESIGNATIONS REFERRED TO ON THESE DRAWINGS SHALL BE THE LATEST ADOPTED OR REVISED SPECIFICATION, AS OF THE DATE OF THESE DRAWINGS.
6. ALL DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALE SHOWN ON PLANS, SECTIONS AND DETAILS. DRAWINGS SHALL NOT BE SCALED FOR CONSTRUCTION PURPOSES.
7. NOTES AND DETAILS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
8. THE STRUCTURAL DRAWINGS SHOW ONLY THE BASIC STRUCTURAL REQUIREMENTS. REFER TO CIVIL, ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR NON-STRUCTURAL ITEMS, SUCH AS:
A. SIZE AND LOCATION OF ALL OPENINGS.
B. SIZE AND LOCATION OF ALL NON-BEARING WALLS.
C. SIZE AND LOCATION OF ALL CONCRETE CURBS, WALKS, ROOF AND FLOOR DRAINS, SLOPES, DEPRESSED SLAB AREAS, ETC.
D. FLOOR, ROOF AND WALL FINISHES.
E. DIMENSIONS WHICH ARE NOT SHOWN ON STRUCTURAL DRAWINGS.
9. THE STRUCTURAL CONTRACT DOCUMENTS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. UNLESS NOTED OTHERWISE, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION.
10. NEITHER THE OWNER NOR THE ARCHITECT/STRUCTURAL ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS. SITE OBSERVATION VISITS BY THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE SAFETY ITEMS.
11. SATISFACTORY EXECUTION OF CONSTRUCTION IS DEPENDENT UPON CONFORMANCE WITH THE INTENT OF THESE DRAWINGS. THE OWNER OR CONTRACTOR SHALL RETAIN A CALIFORNIA LICENSED CIVIL OR STRUCTURAL ENGINEER DURING CONSTRUCTION TO OBSERVE THE CONSTRUCTION AND STATE THAT THE STRUCTURE HAS BEEN BUILT IN GENERAL CONFORMANCE WITH THE INTENT OF THESE DRAWINGS.
12. CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON FRAMED FLOORS OR ROOF. LOAD SHALL NOT EXCEED DESIGN LIVE LOAD FOR EACH PARTICULAR LEVEL. WHEN WEIGHT OF MATERIALS OR EQUIPMENT MAY EXCEED DESIGN LOAD, STRUCTURAL SYSTEMS SHALL BE SHORED.
13. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF THE WORK. THE DETAILS SHALL BE THE SAME AS FOR OTHER SIMILAR WORK.

WELDING:

- 1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF THE AMERICAN WELDING SOCIETY CODE D11. (LATEST EDITION).
2. ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS.
3. ALL WELDS SHALL HAVE A WELD CONTROLLED SEQUENCE AND TECHNIQUE IN ORDER TO MINIMIZE SHRINKAGE, STRESSES AND DISTORTION.
4. ALL ELECTRODES FILLER MATERIAL SHALL BE A MINIMUM OF E70XX.
5. WELDING OF REINFORCING BARS TO BE IN ACCORDANCE WITH A.W.S. D1.4. REINFORCING STEEL TO BE WELDED SHALL HAVE A CARBON EQUIVALENT (CE) OF 0.75. SPECIAL INSPECTION IS REQUIRED.
6. WELDING OF SHEET METAL SHALL BE IN ACCORDANCE WITH A.W.S. D1.3.
7. SPECIAL INSPECTION IS REQUIRED FOR ALL FIELD WELDING.
8. ALL SHOP AND FIELD WELDING OF MOMENT CONNECTIONS OR MOMENT RESISTING FRAMES, AND ALL COLUMN SPLICE WELDS, SHALL BE TESTED AS PER C.B.C.

CONCRETE:

- 1. ALL CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF A.C.I. 318-LATEST EDITION 'BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND ACI 350-LATEST EDITION, CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURE', EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS CONTAINED HEREIN OR SHOWN ON THE DRAWINGS.
2. ALL CONCRETE SHALL BE 150 P.C.F. HARDROCK, MIXED PER A.S.T.M. C-94, AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 P.S.I. AT 28 DAYS AND A WATER-CEMENT RATIO NO HIGHER THAN 0.45 BY WEIGHT.
3. THE MAXIMUM SIZE AGGREGATE IN FOUNDATION AND MASS CONCRETE WORK SHALL BE 1 INCH. THE MAXIMUM SIZE AGGREGATE IN SLABS ON GRADE, WALLS, AND ALL OTHER CONCRETE SHALL BE 3/4 INCH.
4. CEMENT SHALL CONFORM TO A.S.T.M. C-150, TYPE V, LOW ALKALI. AGGREGATES FOR NORMAL WEIGHT SHALL CONFORM TO A.S.T.M. C-33.
5. ADMIXTURES AND COLORS (EXCEPT AS NOTED HEREIN) SHALL NOT BE USED UNLESS SUBSTANTIATING DATA IS SUBMITTED TO AND REVIEWED BY THE ENGINEER AND ARCHITECT OF RECORD.
6. CONCRETE MIXES SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY. THE MIX DESIGNS SHALL CONFORM TO C.B.C. SEC. 1905 UNLESS OTHERWISE NOTED.
7. NON-STRUCTURAL STEEL EMBEDDED IN CONCRETE SHALL BE GALVANIZED OR PAINTED. ALL DAMAGED GALVANIZED AREAS SHALL BE REPAIRED PRIOR TO EMBEDMENT.
8. PROVIDE 2- #5 DIAGONAL BARS AT CORNERS OF WALL, FLOOR, AND ROOF OPENINGS AND INSIDE CORNERS OF FLOORS.
9. PROVIDE WATERSTOPS IN ALL BELOW GRADE FOUNDATION WALL CONSTRUCTION JOINTS.
10. READY MIXED CONCRETE SHALL CONFORM TO (A.S.T.M. C-94).
11. PLACEMENT OF CONCRETE SHALL CONFORM TO A.C.I. 304. CLEAN AND ROUGHEN TO 1/4" AMPLITUDE FOR ALL CONCRETE SURFACES AGAINST WHICH CONCRETE IS TO BE PLACED.
12. ALL EXPOSED CONCRETE SHALL HAVE A SMOOTH FORM FINISH USING B-B PLYFORM, CLASS I, EXT-A.P.A. PLYWOOD.
13. ALL SLABS SHALL HAVE A TROWELED FINISH EXCEPT AS NOTED ON THE DRAWINGS.
14. ALL REINFORCING STEEL, ANCHOR BOLTS, DOWELS AND INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
15. IF THE CONTRACTOR DESIRES TO MAKE ANY CONSTRUCTION JOINTS OTHER THAN THOSE SHOWN ON THESE DRAWINGS, HE SHALL SUBMIT DETAILS OF CHANGES TO THE ENGINEER OF RECORD FOR REVIEW BEFORE STARTING WORK.
16. NO BRICK OR POROUS MATERIAL SHALL BE USED TO SUPPORT FOUNDATION STEEL OFF THE GROUND.
17. PROVIDE 3/4 INCH CHAMFER ON ALL EXPOSED CONCRETE CORNERS, U.O.N.
18. SLEEVE PLUMBING OPENINGS IN SLABS WITH NON-CORROSIVE SLEEVE BEFORE PLACING CONCRETE AND BEND REINFORCING AROUND SLEEVES.
19. ALL REINFORCING BARS SHALL BE PROVIDED WITH THE FOLLOWING CONCRETE MINIMUM COVER:
FOOTINGS CAST AGAINST EARTH 3"
FORMED CONCRETE EXPOSED TO EARTH, WEATHER OR LIQUID 2"
BEAMS AND GIRDER 2"
WALLS 2"
COLUMN TIES 2"
SLABS (#11 AND SMALLER) 2"
20. CONCRETE CURING: TYPICALLY REQUIRED A MINIMUM OF 10 DAYS.

DESIGN BASIS:

CODE: 2010 C.B.C. (CALIFORNIA BUILDING CODE) CCR, TITLE 24, PART 2.

GRAVITY LOADS:

- 1. FLAT ROOF LIVE LOAD 20 P.S.F. (REDUCIBLE)
2. OPERATING/EQUIPMENT FLOOR 150 P.S.F.
3. EMERGENCY STORAGE TANK ROOF
A. 150 P.S.F. UNIFORM
B. H2O CONCENTRATED TRUCK LOADING (16 K/WHEEL)
4. MEZZANINE 100 P.S.F.
5. ALL OTHER AREAS 100 P.S.F.

LATERAL LOADS:

1. SEISMIC LOAD

SEISMIC DESIGN CATEGORY = D
SITE CLASS = C
Ss = 1.016
S1 = 0.431
F0 = 1.0
Fv = 1.43
Sms = 1.016
Smi = 0.677
Sds = 1.016
Sdi = 0.352
I = 1.25 (OCCUPANCY CATEGORY III)
R = 5.0 (SPECIALLY REINFORCED MASONRY SHEAR WALLS)
Ro = 2.5

SEISMIC BASE SHEAR:

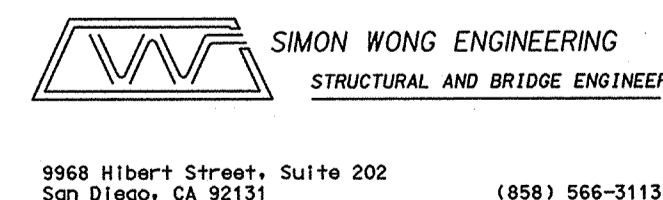
V = 0.169W (ULTIMATE DESIGN)
V = 0.18W (ALLOWABLE DESIGN)

2. WIND LOAD:

BASIC WIND SPEED = 85 MPH
EXPOSURE C
Iw = 1.15

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Project information block including: DRAWING NO. S-01, SHEET NO. 49, CITY OF SAN DIEGO, CALIFORNIA, SHEET 49 OF 118 SHEETS, WATER WBS SEWER WBS S-00308, APPROVED BY: [Signature], CHECKED BY: [Signature], CONSTRUCTION ENGINEER, INSPECTOR, DATE STARTED, DATE COMPLETED, 36196-49-D

Professional Engineer seal for HDR, No. S 35837, State of California, expires 03/31/13. Includes a warning: IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR logo and address: 8690 BALBOA AVENUE, SUITE 200 SAN DIEGO, CA 92123-1502 (858) 712-8400 FAX (858) 712-8333. SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE.

CITY OF SAN DIEGO PUBLIC WORKS PROJECT



DRAWING STATUS table with columns: NO., DATE, REQ., REVISION DESCRIPTION, DRAWN, CKD, APD, PE, EM, QA/QC.

LUMBER:

- STRUCTURAL LUMBER SHALL BE STRESS-MARKED DOUGLAS FIR-LARCH S4S IN ACCORDANCE WITH GRADING AND DRESSING RULE NO. 16 OF THE WEST COAST LUMBER INSPECTION BUREAU (LATEST EDITION).
- LUMBER SHALL NOT BE BORED OR NOTCHED, EXCEPT WHERE DETAILED.
- SILLS, LEDGERS, AND PLATES IN CONTACT WITH CONCRETE OR MASONRY SHALL BE PRESSURE TREATED DOUGLAS FIR-LARCH.
- PROVIDE 2x FIRE BLOCKING AT MID-HEIGHT OF STUD PARTITIONS OVER 8'-6" IN HEIGHT.
- PROVIDE 2x SOLID BLOCKING AT ALL SUPPORTS FOR RAFTERS, CEILING JOISTS AND FLOOR JOIST EXCEPT WHERE RAFTERS OR JOISTS ARE SUPPORTED BY JOIST HANGERS.
- ROOF SHEATHING INSPECTIONS SHALL BE MADE PRIOR TO COVERING. ALL STRUCTURAL CONNECTIONS SHALL BE COMPLETED PRIOR TO INSPECTION.
- SEE DRAWINGS FOR SHEAR WALL SCHEDULE, HOLDOWN DETAILS, PANEL LOCATIONS, ETC. SHEAR PANEL NAILING SHALL BE SPACED AT LEAST 3/8 INCH FROM ALL EDGES.
- METAL CONNECTORS SHALL BE "SIMPSON STRONG-TIE" OR EQUAL, EXCEPT AS SHOWN. FILL ALL HOLES OF THE PREFABRICATED CONNECTORS AS SPECIFIED BY MANUFACTURER.
- LUMBER MINIMUM GRADE:
 - HORIZONTAL MEMBERS:

JOISTS AND RAFTERS	NO. 1 AND BETTER
PURLINS	NO. 1
SUBPURLINS:	NO. 1
2x4	NO. 1
2x6 OR LARGER	NO. 1
6x BEAMS AND LARGER	NO. 1
4x BEAMS AND SMALLER	NO. 1 AND BETTER
LEDGERS AND NAILERS	NO. 1 AND BETTER
HEADERS	NO. 1 AND BETTER
TOP PLATES	MATCH VERTICAL MEMBERS
 - VERTICAL MEMBERS:

2x4 STUDS, 8'-0" MAX.	NO. 1
2x4 STUDS, 8'-1" TO 14'-0"	NO. 1
2x6 STUDS AND LARGER	NO. 1
POSTS	NO. 1 AND BETTER
- ALL BOLTS AND LAG SCREWS SHALL HAVE STANDARD CUT WASHERS BETWEEN THE WOOD AND THE NUTS. SEE DRAWINGS FOR LOCATIONS OF PLATE WASHERS AS REQUIRED.

BOLTS	ASTM A-307
LAG SCREWS	ANSI B-18
NUTS	ASTM A-563
WASHERS	ASTM F-844
- LEAD HOLES FOR LAG SCREWS SHALL HAVE THE SAME DIAMETER OF THE SHANK FOR THE UNTHREADED PORTION OF THE SHANK, AND 70% OF THE SHANK DIAMETER FOR THE THREADED PORTION. ALL LAG SCREWS SHALL BE INSERTED BY TURNING WITH A WRENCH AND NOT BY DRIVING WITH A HAMMER.
- TOP PLATES OF ALL WOOD STUD WALLS SHALL BE TWO PIECES AND THE SAME SIZE AS STUDS, EXCEPT AS NOTED OTHERWISE. LAP 4 FEET MINIMUM WITH NO LESS THAN (2) 16d AND NO MORE THAN 6 INCHES BETWEEN NAILS AT EACH LAP.
- STRUCTURAL PLYWOOD SHEATHING SHALL BE DOUGLAS FIR-LARCH, STRUCTURAL I, EXTERIOR GRADE, 4 PLY MINIMUM FOR FLOORS, ROOF AND WALLS IN ADDITION TO BEING A.P.A. RATED AS INDICATED ON THE DRAWINGS IN ACCORDANCE WITH U.S. PRODUCT STANDARD PS I-07.
- DOUBLE JOISTS SHALL BE PROVIDED UNDER ALL PARALLEL PARTITIONS.
- ALL BOLTS, LAG SCREWS, AND WOOD SCREWS SHALL BE RETIGHTENED PRIOR TO THE APPLICATION OF DRYWALL, PLYWOOD, PLASTER, ETC.
- JOISTS MORE THAN 8 INCHES IN DEPTH SHALL BE CONTINUOUSLY BRIDGED BY SOLID BLOCKING, 2 INCHES THICK AND THE FULL DEPTH OF THE JOIST, SPACED AT 8'-0" ON CENTER.
- ALL NAILING SHALL CONFORM TO TABLE NO. 2304.9, NAILING SCHEDULE, USING COMMON WIRE NAILS. PREDRILL ALL NAILS 20d AND LARGER AND WHERE REQUIRED TO PREVENT SPLITTING.
- THE MOISTURE CONTENT OF WOOD MEMBERS SHALL NOT EXCEED 19 PERCENT, BEFORE INSTALLATION. IT WILL BE THE RESPONSIBILITY OF THE INSPECTOR OF RECORD TO VERIFY THAT THE CONTRACTOR HAS SUPPLIED LUMBER OF THE PROPER MOISTURE CONTENT BEFORE INSTALLATION. THE USE OF A HAND HELD MOISTURE CONTENT METER IS ACCEPTABLE.

NAILING SCHEDULE

CONNECTION	NAILING
JOIST to sill or girder, toenail	3-8d
BRIDGING to joist, toenail each end	2-8d
1" X 6" (25 mm X 152 mm) SUBFLOOR or less to each joist, face nail	2-8d
WIDER than 1" X 6" (25 mm X 152 mm) SUBFLOOR to each joist, face nail	3-8d
2" (51mm) SUBFLOOR to joist or girder, blind and face nail	2-16d
SOLE PLATE to joist or blocking, typical face nail	16d at 16" (406 mm) o.c.
SOLE PLATE to joist or blocking, at braced wall panels	3-16d per 16" (610 mm)
TOP PLATE to stud, end nail	2-16d
STUD to sole plate 4-10d toenail or 2-20d box end nail for 3x Sill, or 2-16d end nail at 2x Sill	
DOUBLE STUD, face nail	16d at 24" (610 mm) o.c.
DOUBLE TOP PLATES, typical face nail	16d at 16" (406 mm) o.c.
DOUBLE TOP PLATE, lap splice	8-16d
BLOCKING between joists or rafters to top plate, toenail	3-8d
RIM JOIST to top plate, toenail	8d at 6" (152 mm) o.c.
TOP PLATES, laps and intersections, face nail	2-16d
CONTINUOUS HEADER, two pieces	16d at 16" (406 mm) o.c. along each edge
CEILING JOISTS to plate, toenail	3-8d
CONTINUOUS HEADER to stud, toenail	4-8d
CEILING JOISTS, laps over partitions, face nail	3-16d
CEILING JOISTS to parallel rafters, face nail	3-16d
RAFTERS to plate, toenail	3-8d
1" (25 MM) BRACE to each stud and plate, face nail	2-8d
1" X 8" (25 mm X 203 mm) SHEATHING or less to each bearing, face nail	2-8d
WIDER than 1" X 8" (25 mm X 203 mm) SHEATHING to each bearing, face nail	3-8d
BUILT-UP CORNER studs	16d at 24" (610 mm) o.c.
BUILT-UP GIRDERS and BEAMS	20d at 32" (813 mm) o.c. at top and bottom and staggered 2-20d at ends and at each splice
2" (51mm) PLANKS	2-16d at each bearing
WOOD STRUCTURAL PANELS AND PARTICLEBOARD: ² SUBFLOOR and WALL SHEATHING (to framing): 1/2" (12.7 mm) and less 19/32" - 3/4" (15mm - 19 mm) 7/8" - 1" (22 mm - 25 mm) 1 1/8" - 1 1/4" (29 mm - 32 mm)	6d ³ 8d ³ 6d ⁵ 8d ⁵ 10d ⁴ or 8d ⁵
COMBINATION SUBFLOOR-UNDERLAYMENT (to framing): 3/4" (19 mm) and less 7/8" - 1" (22 mm - 25 mm) 1 1/8" - 1 1/4" (29 mm - 32 mm)	6d ⁵ 8d ⁵ 10d ⁴ or 8d ⁵
PANEL SIDING (to framing): ² 1/2" (12.7 mm) or less 5/8" (16 mm)	6d ⁶ 8d ⁶
FIBERBOARD SHEATHING: ⁷ 1/2" (12.7 mm)	No. 11 ga ⁸ 6d ⁹ No. 16 ga ⁸ No. 11 ga ⁸ 6d ⁹ No. 16 ga
25/32" (20 mm)	
INTERIOR PANELING 1/4" (6.4 mm) 3/8" (9.5 mm)	4d ¹⁰ 6d

- NAILS SHALL BE COMMON WIRE ONLY UNLESS OTHERWISE NOTED.
- NAILS SPACED AT 6 INCHES (152 mm) ON CENTER AT EDGES, 12 INCHES (305 mm) AT INTERMEDIATE SUPPORTS EXCEPT 6 INCHES (152 mm) AT ALL SUPPORTS WHERE SPANS ARE 48 INCHES (1219 mm) OR MORE. FOR NAILING OF WOOD STRUCTURAL PANEL AND PARTICLEBOARD DIAPHRAGMS AND SHEARWALLS, REFER TO SECTIONS 2315.3.3 AND 2315.4. NAILS FOR WALL SHEATHING MAY BE COMMON, BOX OR CASING.
- COMMON OR DEFORMED SHANK
- COMMON
- DEFORMED SHANK
- CORROSION-RESISTANT SIDING OR CASING NAILS CONFORMING TO THE REQUIREMENTS OF SECTION 2304.3.
- FASTENERS SPACE 3 INCHES (76 mm) ON CENTER AT EXTERIOR EDGES AND 6 INCHES (152 mm) ON CENTER AT INTERMEDIATE SUPPORTS.
- CORROSION-RESISTANT ROOFING NAILS WITH 7/16-INCH-DIAMETER (11mm) HEAD AND 1 1/2-INCH (38 mm) LENGTH FOR 1/2-INCH (12.7 mm) SHEATHING AND 1 3/4-INCH (44 mm) LENGTH FOR 25/32-INCH (20 mm) SHEATHING CONFORMING TO THE REQUIREMENTS OF SECTION 2304.3.
- CORROSION-RESISTANT STAPLES WITH NOMINAL 7/16-INCH (11mm) CROWN AND 1 1/8-INCH (29 mm) LENGTH FOR 1/2-INCH (12.7 mm) SHEATHING AND 1 1/2-INCH (38 mm) LENGTH FOR 25/32-INCH (20 mm) SHEATHING CONFORMING TO THE REQUIREMENTS OF SECTION 2304.3
- PANEL SUPPORTS AT 16 INCHES (406 mm) [20 INCHES (508 mm) IF STRENGTH AXIS IN THE LONG DIRECTION OF THE PANEL, UNLESS OTHERWISE MARKED]. CASING OR FINISH NAILS SPACED 6 INCHES (152 mm) ON PANEL EDGES, 12 INCHES (305 mm) AT INTERMEDIATE SUPPORTS.
- PANEL SUPPORTS AT 24 INCHES (610 mm). CASING OR FINISH NAILS SPACED 6 INCHES (152 mm) ON PANEL EDGES, 12 INCHES (305 mm) AT INTERMEDIATE SUPPORTS.

MASONRY:

- ALL MASONRY SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF f'm = 2,000 P.S.I.
- MASONRY UNITS SHALL BE MEDIUM WEIGHT BLOCK IN ACCORDANCE WITH A.S.T.M. SPECIFICATION C-90 WITH A MINIMUM NET AREA COMPRESSIVE STRENGTH OF 2,800 P.S.I. USE OPEN END UNITS AT VERTICAL REINFORCING.
- MORTAR SHALL BE TYPE S PER CALIFORNIA BUILDING CODE TABLE 2105.2.2.1.2.
- GROUT SHALL CONFORM TO ARTICLE 2.2 OF TMS 602/ACI 530.1/ASCE 6 OR ASTM C476. A MIXTURE OF CEMENT, SAND, PEA GRAVEL AND WATER WHICH WILL COMPLETELY FILL ALL VOIDS IN THE WALL AND DEVELOP A 28 DAY COMPRESSIVE STRENGTH OF 2,500 P.S.I.
- REINFORCING STEEL A.S.T.M. A-615, GRADE 60. SPLICE IN REINFORCEMENT SHALL BE LAPPED 48 DIAMETERS MINIMUM.
- ALL VERTICAL CELLS SHALL BE GROUTED SOLID IN LIFTS NOT EXCEEDING 8'-0" IN HEIGHT.
- VERTICAL BARS IN MASONRY UNITS SHALL BE TIED OR OTHERWISE FIXED IN POSITION AT INTERVALS OF NOT LESS THAN 4'-0" AND AT TOP AND BOTTOM.
- PROVIDE INSPECTION AND CLEANOUT HOLES AT BASE OF VERTICAL CELL GROUT LIFTS WHICH ARE MORE THAN 4'-0" IN HEIGHT.
- WHEN GROUTING IS STOPPED FOR ONE HOUR OR LONGER HORIZONTAL CONSTRUCTION JOINTS SHALL BE FORMED BY STOPPING THE POUR OF GROUT 1 1/2" BELOW THE TOP OF THE UPPERMOST MASONRY UNITS.
- REINFORCEMENT WELDING SHALL COMPLY WITH A.W.S. D1.4 (LATEST EDITION). NO FIELD WELDING OF REINFORCING BARS, U.O.N.
- ALL HEAD JOINTS SHALL BE FULL BUTTERED OR OPEN END MASONRY UNITS SHALL BE USED.
- ALL VERTICAL WALL REINFORCEMENT SHALL BE DOWELED TO THE FOUNDATION WITH THE SAME SIZE AND NUMBER OF BARS AS SHOWN IN THE WALLS.
- PROVIDE ONE INCH MINIMUM GROUT COVER ON ALL BOLTS AND PLATES.
- HORIZONTAL REINFORCING SHALL BE PLACED IN BOND BEAM UNITS.
- NO PIPES OR DUCTS SHALL BE PLACED IN MASONRY WALLS UNLESS SPECIFICALLY NOTED OR DETAILED.

SIMON WONG ENGINEERING
STRUCTURAL AND BRIDGE ENGINEERS
9968 Hibernia Street, Suite 202
San Diego, CA 92131 (858) 566-3113

DRAWING NO. S-02	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 50	STRUCTURAL NOTES		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 50 OF 118 SHEETS	WATER WBS _____	SEWER WBS S-00308
APPROVED BY: <i>Hege-Har</i>	DATE 7-26-11	FOR CITY ENGINEER	
CHECKED BY:	DESCRIPTION	BY	APPROVED DATE FILMED
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR	DATE STARTED	PROJECT MANAGER <i>Paul A. Joo</i>	
INSPECTOR	DATE COMPLETED	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196-50-D	

DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE EM QA/QC

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858) 712-8400 FAX (858) 712-8333

SCALE	HORIZONTAL NO SCALE
	VERTICAL NO SCALE

WARNING

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ABBREVIATIONS:

&	AND	KIPS	KILOPOUNDS (1,000 POUNDS)
@	AT	KO	KNOCK OUT
CL	CENTER LINE	LB	POUND
PL	PLATE, PROPERTY LINE	LB	LAG BOLT
AB	ANCHOR BOLT	LF	LINEAR FOOT
ADJ	ADJACENT	LG	LONG
AFF	ABOVE FINISH FLOOR	LL	LIVE LOAD
ARCH	ARCHITECTURAL	LLH	LONG LEG HORIZONTAL
BD	BOARD	LLV	LONG LEG VERTICAL
BLDG	BUILDING	LS	LAG SCREW
BLK	BLOCK	LT	LIGHT
BLKG	BLOCKING	MAS	MASONRY
BLW	BELOW	MAT	MATERIAL
BM	BEAM	MAX	MAXIMUM
BN	BOUNDARY NAIL	MB	MACHINE BOLT
(B) OR BOT	BOTTOM	MECH	MECHANICAL
BRG	BEARING	MEZZ	MEZZANINE
BS	BOTH SIDES	MIN	MINIMUM
BTWN	BETWEEN	MH	MANHOLE
CB	CARRIAGE BOLT	MANUF	MANUFACTURER
CF	CUBIC FOOT	MTL	METAL
CHAM	CHAMFER	NS	NEAR SIDE
CI	CAST-IRON	NIC	NOT IN CONTRACT
CIP	CAST-IN-PLACE	NOM	NOMINAL
CJ	CONSTRUCTION JOINT	NTS	NOT TO SCALE
CJP	COMPLETE JOINT PENETRATION	OC	ON CENTER
CLG	CEILING	OD	OUTSIDE DIAMETER
CLK	CAULK	OH	OPPOSITE HAND
CLKG	CAULKING	OPNG	OPENING
CLR	CLEAR	OPP	OPPOSITE
CMU	CONCRETE MASONRY UNIT	OWJ	OPEN WEB JOIST
CNTR	CENTER	PC	PRECAST
COL	COLUMN	PERP	PERPENDICULAR
CONC	CONCRETE	PLYWD	PLYWOOD
CONN	CONNECTION	PNL	PANEL
CONT	CONTINUOUS	PREFAB	PREFABRICATED
CSK	COUNTERSINK	PSF	POUNDS PER SQUARE FOOT
d	PENNY	PSI	POUNDS PER SQUARE INCHES
DBL	DOUBLE	PT.	POINT
DEP	DEPRESSED	PT	PRESSURE TREATED
DET	DETAIL	PVC	POLYVINYL CHLORIDE
DF	DOUGLAS FIR	RAD	RADIUS
DFL	DOUGLAS FIR/LARCH	RD	ROOF DRAIN
DIA	DIAMETER	REF	REFERENCE
DIAG	DIAGONAL	REINF	REINFORCED / REINFORCING
DIM	DIMENSION	REQD	REQUIRED
DL	DEAD LOAD	REV	REVISION
DN	DOWN	RF	RAFTER
DIV	DIVISION	RFTR	RAFTER
DR	DOOR	RH	ROOF HATCH
DWG	DRAWING	RM	ROOM
DWL	DOWEL	RO	ROUGH OPENING
EA	EACH	RS	ROUGH SAWN
EF	EACH FACE	SCHED	SCHEDULE
EJ	EXPANSION JOINT	SECT	SECTION
EL	ELEVATION	SF	SQUARE FOOT
ELEV	ELEVATOR	SHT	SHEET
EMBED	EMBEDMENT	SHTG	SHEATHING
EN	EDGE NAIL	SIM	SIMILAR
EQ	EQUAL	SMS	SHEET METAL SCREW
EQUIP	EQUIPMENT	SPEC	SPECIFICATION
EIS	EACH SIDE	SQ	SQUARE
EW	EACH WAY	SS	STAINLESS STEEL
(E)	EXISTING	STGR	STAGGERED
EXP	EXPANSION	STD	STANDARD
EXT	EXTERIOR	STIFF	STIFFENER
FD	FLOOR DRAIN	STL	STEEL
FDN	FOUNDATION	STRUCT	STRUCTURAL
FF	FINISH FLOOR	STS	SELF TAPPING SCREW
FIN	FINISH	SYM	SYMMETRICAL
FLR	FLOOR	SYS	SYSTEM
FN	FIELD NAIL	T&B	TOP AND BOTTOM
FO	FACE OF	T&G	TONGUE AND GROOVE
FRMG	FRAMING	TEMP	TEMPORARY
FS	FAR SIDE	THK	THICK
FT	FEET / FOOT	THKN	THICKENED
FTG	FOOTING	THRU	THROUGH
GA	GAUGE	TL	TOTAL LOAD
GALV	GALVANIZED	T.O.	TOP OF
GI	GALVANIZED IRON	TSG	TAPERED STEEL GIRDER
GLB	GLU-LAMINATED BEAM	TYP	TYPICAL
GRD	GRADE	UON	UNLESS OTHERWISE NOTED
GYP	GYP SUM	VERT OR (V)	VERTICAL
HD	HOLD DOWN	W/	WITH
HDR	HEADER	W/O	WITHOUT
HGR	HANGER	WCJ	WALL CONTROL JOINT
HORIZ	HORIZONTAL	WD	WOOD
HRD	HARD	WIN	WINDOW
HSB	HIGH STRENGTH BOLT	WP	WATERPROOF / WORK POINT
HT	HEIGHT	WPJ	WEAKENED PLANE JOINT
HVAC	HEATING, VENTILATION, & AIR CONDITIONING	WT	WEIGHT
		WWF	WELDED WIRE FABRIC
		WWM	WELDED WIRE MESH

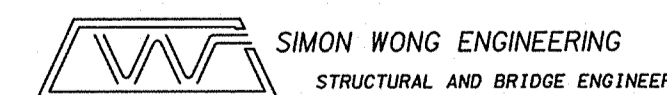
STRUCTURAL STEEL

- FABRICATION AND ERECTION TO CONFORM TO A.I.S.C. LATEST EDITION "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL BUILDINGS" AND "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" EXCEPT AS OTHERWISE SHOWN OR SPECIFIED.
- A.W.S. CERTIFIED WELDERS SHALL BE USED FOR ALL WELDING. WELDING TO BE PERFORMED IN AISC CERTIFIED FABRICATOR SHOP OR EQUAL. ALL WELDING TO CONFORM TO THE LATEST EDITION OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE A.W.S. D1.1.
- MATERIALS:

ROLLED SHAPES	
WIDE FLANGES	ASTM A992 GRADE 50
CHANNELS, ANGLES & OTHER	ASTM A36
PLATES	
BEAM COVER/SIDE PLATES	ASTM A572 GRADE 50
COLUMN CONTINUITY PLATES	ASTM A572 GRADE 50
COLUMN BASE PLATES	ASTM A572 GRADE 50
OTHER UON	ASTM A36
STEEL PIPES	ASTM A53 GRADE B
STEEL TUBING	ASTM A500, GRADE B (Fy=46 KSI)
HIGH STRENGTH BOLTS	ASTM A325
MACHINE BOLTS	ASTM A307
ANCHOR BOLTS	ASTM F1554, GRADE 36 UON
THREADED AND HANGER ROD	ASTM A307
WELDED SHEAR CONNECTORS	ASTM A108 GRADE 1015 THRU 1020
GALVANIZING	ASTM A123
RUST-INHIBITING PRIMER	TT-P-645 ASTM
- HOT-DIPPED GALVANIZE PER ASTM A123, A153, A385 AFTER FABRICATION OF ALL STRUCTURAL STEEL AND CONNECTORS EXPOSED TO WEATHER. REPAIR PER ASTM A780.
- CONNECTED MEMBERS SHALL BEAR ONLY UPON UNTHREADED PORTIONS OF BOLTS.
- BURNING OF HOLES IS NOT ALLOWED.
- INSPECTION OF WELDING SHALL CONFORM TO C.B.C. REQUIREMENTS (CHAPTER 17).
- THE STRUCTURAL STEEL FABRICATOR SHALL SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.
- BOLT HOLES SHALL BE 1/16" LARGER IN DIAMETER THAN NOMINAL SIZE OF BOLT USED, UNLESS NOTED OTHERWISE.
- ALL STRUCTURAL STEEL SURFACES TO RECEIVE SPRAY-APPLIED FIREPROOFING OR TO BE ENCASED IN CONCRETE OR MASONRY SHALL BE LEFT UNPAINTED.
- STRUCTURAL STEEL SHALL BE DELIVERED TO THE JOB SITE FREE OF EXCESSIVE RUST, MILL SCALE, GREASE, ETC.
- OPENING SHALL NOT BE PLACED IN STEEL MEMBERS UNLESS SPECIFICALLY DETAILED.

CONCRETE REINFORCING:

- ALL REINFORCING STEEL SHALL BE PLACED IN CONFORMANCE WITH THE C.B.C., AND THE "MANUAL OF STANDARD PRACTICE" BY THE C.R.S.I. OR AS MODIFIED BY THE CONSTRUCTION DOCUMENTS.
- REINFORCING BARS SHALL CONFORM TO A.S.T.M. A-615, DEFORMED GRADE 60, EXCEPT #3 BARS MAY BE GRADE 40. REINFORCING BARS THAT ARE TO BE WELDED SHALL CONFORM TO A.S.T.M. A-706, DEFORMED GRADE 60.
- WELDING OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH A.S.T.M. A-706 WITH LOW HYDROGEN ELECTRODES AND STRUCTURAL WELDING CODE REINFORCING STEEL SHALL CONFORM TO A.N.S.I. / A.W.S. D1.4. MINIMUM TENSILE STRENGTH OF WELD METAL SHALL BE 90 K.S.I. ALL WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS.
- ALL REINFORCING BAR BENDS SHALL BE MADE COLD, UNLESS OTHERWISE PERMITTED BY THE BUILDING OFFICIAL.
- WELDED WIRE FABRIC SHALL CONFORM TO A.S.T.M. A-185, AND SHALL BE LAPPED 1 SPACE AND 12" MINIMUM.
- DOWELS BETWEEN FOOTINGS AND WALLS OR COLUMNS SHALL BE LAPPED WITH THE SAME GRADE, SIZE, SPACING AND NUMBER AS THE VERTICAL REINFORCEMENT.
- REINFORCING SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS.
- ALL VERTICAL REINFORCING SHALL BE CONTINUOUS BETWEEN TWO LEVELS, UNLESS OTHERWISE NOTED.
- SLAB ON GRADE REINFORCING SHALL BE POSITIONED AT MID-DEPTH, UNLESS OTHERWISE NOTED.
- PROVIDE #3 SPACER TIES AT 2'-6" ON CENTER IN ALL BEAMS AND FOOTINGS TO SECURE REINFORCING BARS IN PLACE, UNLESS OTHERWISE NOTED.
- PIPING AND CONDUIT SHALL BE SO FABRICATED AND INSTALLED THAT CUTTING, BENDING, OR DISPLACEMENT OF REINFORCEMENT FROM ITS PROPER LOCATION WILL NOT BE REQUIRED. A.C.I. #6.3.12



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DRAWING NO. S-03	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 51	STRUCTURAL NOTES		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 51 OF 118 SHEETS	WATER WBS	SEWER WBS
APPROVED BY: <i>Hogel</i>	DATE 7-26-11	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196-51-D	
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY:			
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
INSPECTOR	DATE STARTED	DATE COMPLETED	

DRAWING STATUS

NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE	HORIZONTAL NO SCALE
	VERTICAL NO SCALE

WARNING
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SUMMARY OF SPECIAL INSPECTION

REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION		
VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. INSPECTION OF REINFORCING STEEL AND PLACEMENT.	-	X
2. INSPECT BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE WHERE ALLOWABLE LOADS HAVE BEEN INCREASED.	X	-
3. VERIFYING USE OF REQUIRED DESIGN MIX.	-	X
4. AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	-
5. INSPECTION OF CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	-
6. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	-	X
7. VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	-	X
8. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	X
9. EXPANSION ANCHORS PER ICC-ESR#1917	-	X
10. ADHESIVE ANCHORS PER ICC ESR-2232	-	X

SPECIAL INSPECTION NOTES - APPLIES TO ALL TABLES

- A. THE SPECIAL INSTRUCTIONS LISTED ARE IN ADDITION TO THE CALLED INSPECTIONS REQUIRED BY APPENDIX CHAPTER I SECTION 109 OF THE C.B.C., AS AMENDED. SPECIAL INSPECTION IS NOT A SUBSTITUTE FOR INSPECTION BY A CITY INSPECTOR.
- B. THE SPECIAL INSPECTORS MUST BE CERTIFIED BY THE CITY OF SAN DIEGO DEVELOPMENT SERVICES, TO PERFORM THE TYPE OF INSPECTION SPECIFIED.
EXCEPTIONS:
1. SOILS INSPECTIONS BY THE SOILS ENGINEER OF RECORD.
2. SMOKE CONTROL SYSTEM, BY THE MECHANICAL ENGINEER OF RECORD.
3. WHEN WAIVED BY THE BUILDING OFFICIAL.
- C. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE SPECIAL INSPECTOR OR INSPECTION AGENCY AT LEAST ONE WORKING DAY PRIOR TO PERFORMING ANY WORK THAT REQUIRES SPECIAL INSPECTION.
- D. SPECIALLY INSPECTED WORK THAT IS INSTALLED OR COVERED WITHOUT THE APPROVAL OF THE CITY INSPECTOR IS SUBJECT TO REMOVAL OR EXPOSURE.
- E. THE CONSTRUCTION MATERIALS TESTING LABORATORY MUST BE APPROVED BY THE CITY OF SAN DIEGO DEVELOPMENT SERVICES, FOR TESTING OF MATERIALS, SYSTEMS, COMPONENTS AND EQUIPMENTS.
- F. A PROPERTY OWNER'S FINAL REPORT OF WORK REQUIRING SPECIAL INSPECTION MUST BE COMPLETED BY THE PROPERTY OWNER, PROPERTY OWNER'S AGENT OF RECORD, ARCHITECT OF RECORD, OR ENGINEER OF RECORD AND SUBMITTED TO THE INSPECTION SERVICES DIVISION.
- G. AN APPLICATION TO PERFORM OFF-SITE FABRICATION MUST BE SUBMITTED TO THE INSPECTION SERVICES DIVISION FOR APPROVAL PRIOR TO FABRICATION.
- H. A CERTIFICATE OF COMPLIANCE OF OFF-SITE FABRICATION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION PRIOR TO ERECTION OF PREFABRICATED COMPONENTS.
- I. FABRICATOR MUST BE REGISTERED AND APPROVED BY THE CITY OF SAN DIEGO, DEVELOPMENT SERVICES FOR THE FABRICATION OF MEMBERS AND ASSEMBLIES ON THE PREMISES OF THE FABRICATOR'S SHOP.

SUMMARY OF SPECIAL INSPECTION

LEVEL I SPECIAL INSPECTION OF MASONRY		
VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. AS MASONRY CONSTRUCTION BEGINS, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE: a. PROPORTIONS OF SITE-PREPARED MORTAR. b. CONSTRUCTION OF MORTAR JOINTS. c. LOCATION OF REINFORCEMENT, CONNECTORS, PRESTRESSING TENDONS AND ANCHORAGES. d. PRESTRESSING TECHNIQUE. e. GRADE AND SIZE OF PRESTRESSING TENDONS AND ANCHORAGES.	- - - - -	X X X X X
2. THE INSPECTION PROGRAM SHALL VERIFY: a. SIZE AND LOCATION OF STRUCTURAL ELEMENTS. b. TYPE, SIZE AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES OR OTHER CONSTRUCTION. c. SPECIFIED SIZE, GRADE AND TYPE OF REINFORCEMENT. d. WELDING OF REINFORCING BARS. e. PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40 ³ / ₄ F) OR HOT WEATHER (TEMPERATURE ABOVE 90 ³ / ₄ F) f. APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE.	- - - X - -	X X X - X X
3. PRIOR TO GROUTING, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE: a. GROUT IS CLEAN. b. PLACEMENT OF REINFORCEMENT AND CONNECTORS AND PRESTRESSING TENDONS AND ANCHORAGES. c. PROPORTIONS OF SITE-PREPARED GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS. d. CONSTRUCTION OF MORTAR JOINTS.	- - - -	X X X X
4. GROUT PLACEMENT SHALL BE VERIFIED TO ENSURE COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENT PROVISIONS. a. GROUTING OF PRESTRESSING BONDED TENDONS.	X X	- -
5. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS SHALL BE OBSERVED.	X	-
6. COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	-	X
7. EXPANSION ANCHORS PER ICC ESR-1385	-	X
8. ADHESIVE ANCHORS PER ICC ESR-1967	-	X

SUMMARY OF SPECIAL INSPECTION

REQUIRED VERIFICATION AND INSPECTION OF SOILS		
VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	-	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIALS.	-	X
3. PERFORM CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS.	-	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF CONTROLLED FILL.	X	-
5. PRIOR TO PLACEMENT OF CONTROLLED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	-	X

SUMMARY OF SPECIAL INSPECTION

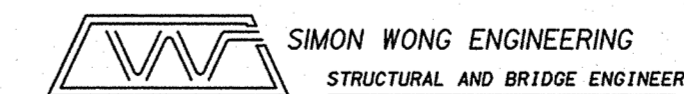
REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION		
VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS: a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS. b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	- -	X X
2. INSPECTION OF HIGH-STRENGTH BOLTING: a. BEARING-TYPE CONNECTIONS.	-	X
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL: a. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS. b. MANUFACTURERS' CERTIFIED MILL TEST REPORTS.	- -	- -
4. MATERIAL VERIFICATION OF WELD FILLER MATERIALS: a. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS. b. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	- -	- -
5. INSPECTION OF WELDING: a. STRUCTURAL STEEL: 1) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS. 2) MULTIPASS FILLET WELDS. 3) SINGLE-PASS FILLET WELDS > 5/16" 4) SINGLE-PASS FILLET WELDS < 5/16" 5) FLOOR AND ROOF DECK WELDS.	X X X - -	- - - X X
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS: a. DETAILS SUCH AS BRACING AND STIFFENING. b. MEMBER LOCATIONS. c. APPLICATION OF JOINT DETAILS AT EACH CONNECTION.	- - -	- - X

STRUCTURAL OBSERVATION:

- 1. PER C.B.C. CHAPTER 17 SECTION 1710, THE OWNER SHALL EMPLOY A LICENSED ENGINEER OR ARCHITECT RESPONSIBLE FOR THE STRUCTURAL DESIGN, OR HIS DESIGNATED ENGINEER OR ARCHITECT TO MAKE SITE VISITS TO OBSERVE GENERAL COMPLIANCE WITH THE APPROVED STRUCTURAL PLANS, SPECIFICATIONS AND CHANGE ORDERS. THE ENGINEER OR ARCHITECT SHALL SUBMIT A STATEMENT IN WRITING TO THE BUILDING OFFICIAL STATING THAT THE SITE VISIT HAS BEEN MADE AND THAT ANY DEFICIENCIES NOTED HAVE BEEN CORRECTED. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE INSPECTIONS REQUIRED BY SECTIONS 109, 1704 OR OTHER SECTIONS OF THE CODE.
- 2. PRECONSTRUCTION MEETING: THE OWNER OR HIS REPRESENTATIVE, THE AGENCY REPRESENTATIVES, THE CIVIL ENGINEER, STRUCTURAL ENGINEER, GEOTECHNICAL ENGINEER, AND CONTRACTOR(S) SHOULD BE IN ATTENDANCE TO DISCUSS THE PLANS, THE PROJECT, AND THE PROPOSED CONSTRUCTION SCHEDULE.

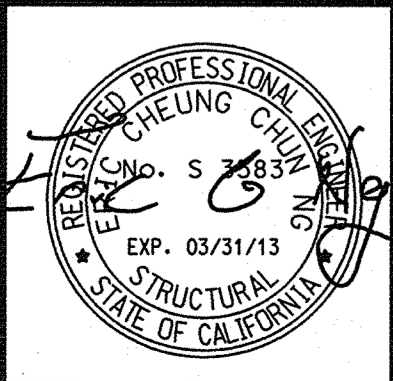
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DRAWING NO. S-04	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 52	STRUCTURAL NOTES	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 52 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hoggin Ascar 10-25-11 FOR CITY ENGINEER	DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY APPROVED DATE FILMED
CHECKED BY: INSPECTOR		
CONTRACTOR	DATE STARTED	
INSPECTOR	DATE COMPLETED	
		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196- 52 -D



WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE.

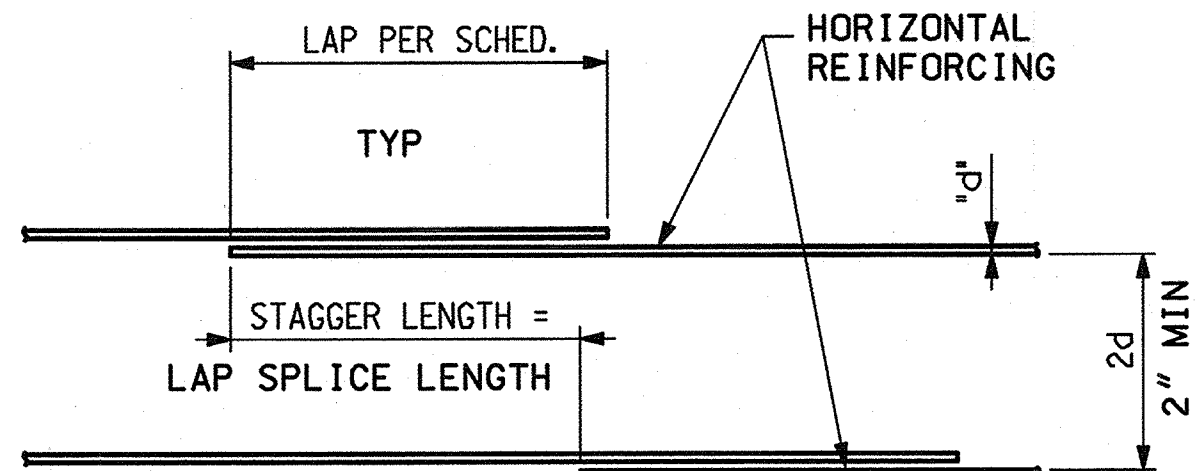
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SCALE
HORIZONTAL NO SCALE
VERTICAL NO SCALE

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



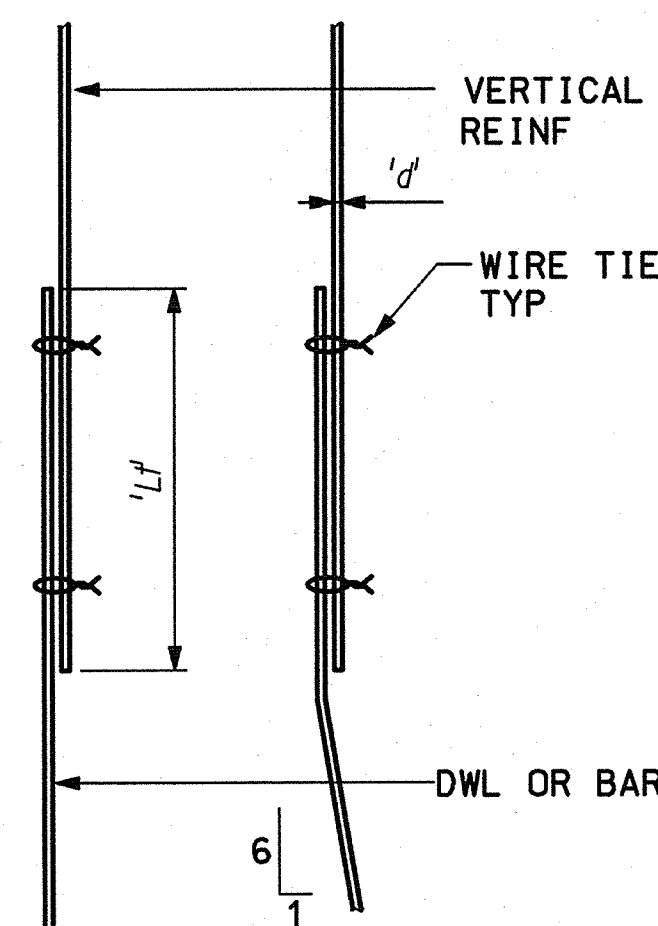
DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			



- NOTES:
- SPLICE LENGTH SHALL BE DETERMINED FROM THE SIZE OF THE SMALLER BAR SPLICED.
 - MINIMUM COVER 1.5", MINIMUM BAR CLEAR SPACING 2 BAR DIAMETERS.
 - TOP BARS ARE DEFINED AS BARS WITH 12" OR MORE OF FRESH CONCRETE PLACED BELOW THEM.
 - CONCRETE MASONRY UNITS LAP 48d MIN HORIZ & VERT REINF.
 - L_T VALUES IN SCHEDULE SHALL BE MULTIPLIED BY 1.3 FOR LIGHT

BAR SIZE	TENSION LAP "L _T " (IN.)					
	F'c=3,000 P.S.I.		F'c=4,000 P.S.I.		F'c=5,000 P.S.I.	
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#3	29	23	25	20	22	17
#4	38	30	33	26	29	23
#5	47	37	41	32	36	28
#6	56	44	49	38	44	34
#7	82	64	71	55	63	49
#8	94	73	81	63	72	56
#9	106	82	91	70	81	63
#10	119	92	103	80	91	70
#11	131	101	113	87	101	78

HARDROCK CONCRETE
F'y = 60,000 PSI (CLASS "B")



BAR SIZE	TENSION LAP 'L _T ' (IN.)			HOOK EMBED (IN.)
	F'c=3,000 PSI	F'c=4,000 PSI	F'c=5,000 PSI	
#3	22	19	17	8
#4	29	25	23	11
#5	36	31	28	14
#6	43	37	34	16
#7	63	54	49	19
#8	72	62	56	22
#9	81	70	63	25
#10	91	79	70	28
#11	101	87	78	31

F'y = 60 KSI

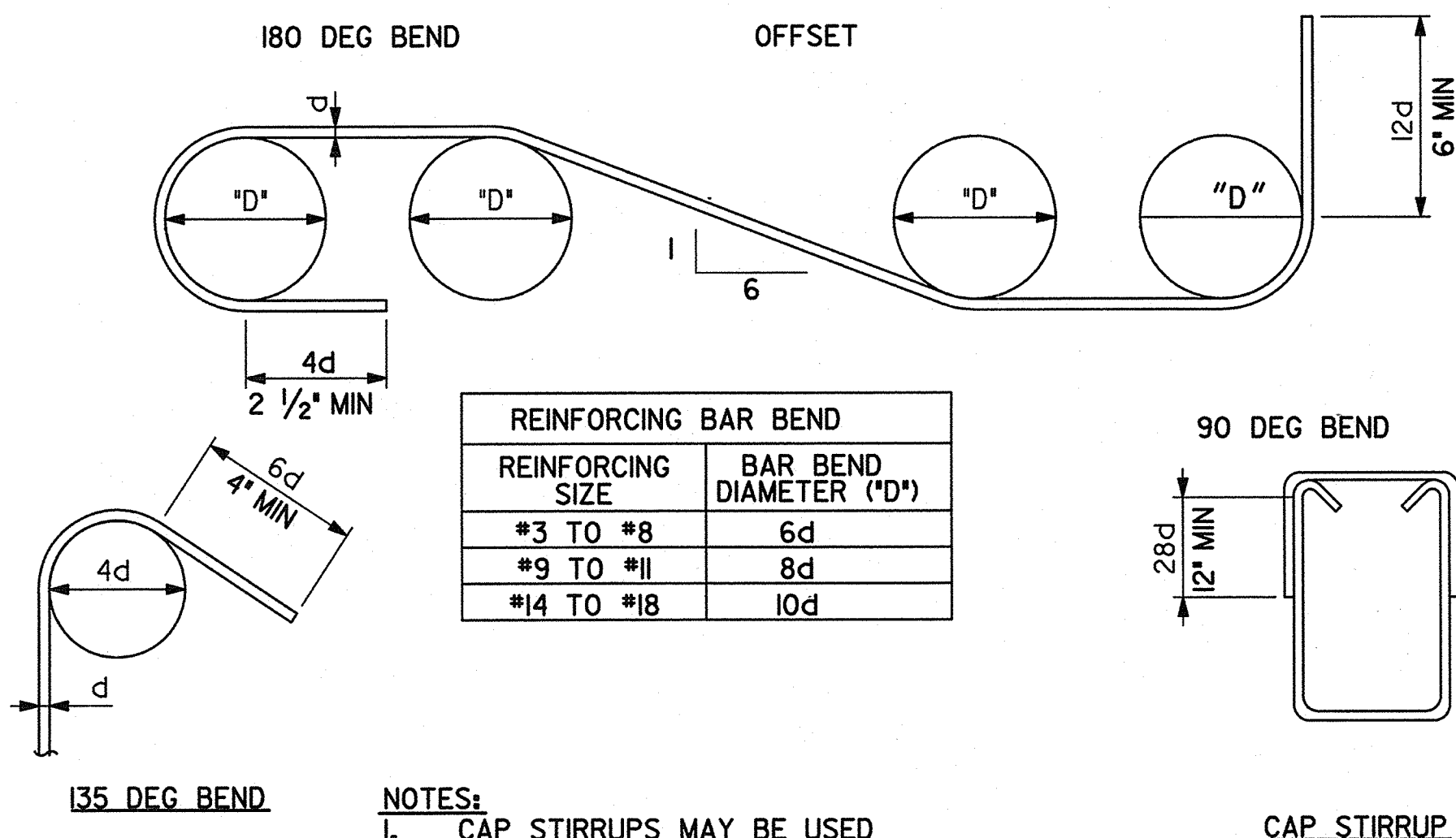
- NOTES:
- ALL VERTICAL REINFORCING FOR COLUMN, PIERS AND WALLS SHALL BE DOWELED AS SHOWN UON.
 - MINIMUM CLEAR SPACING 2d, MINIMUM COVER 1.5".
 - DOWELS SHALL BE THE SAME GRADE, SIZE, QUANTITY AND/OR SPACING AS VERTICAL REINFORCING.

HORIZONTAL REINFORCING LAP SPLICE

1
VAR

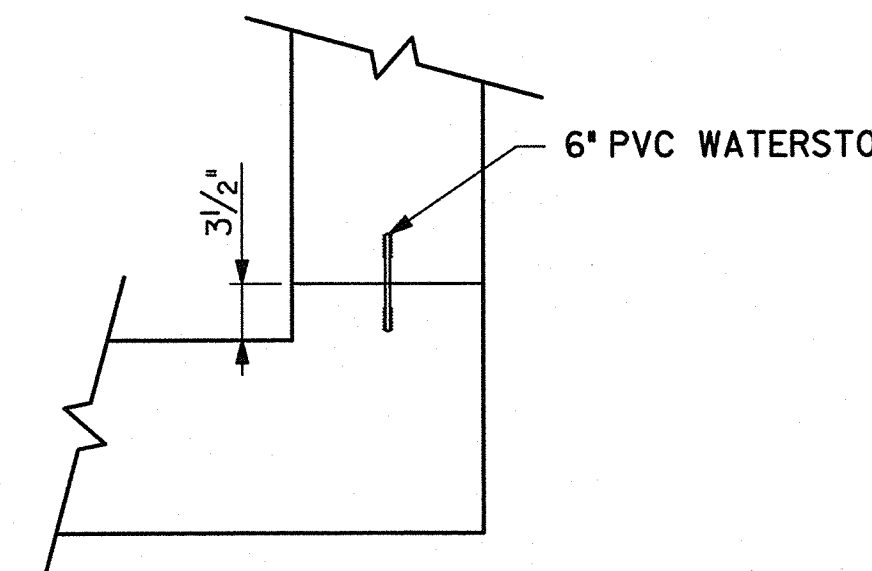
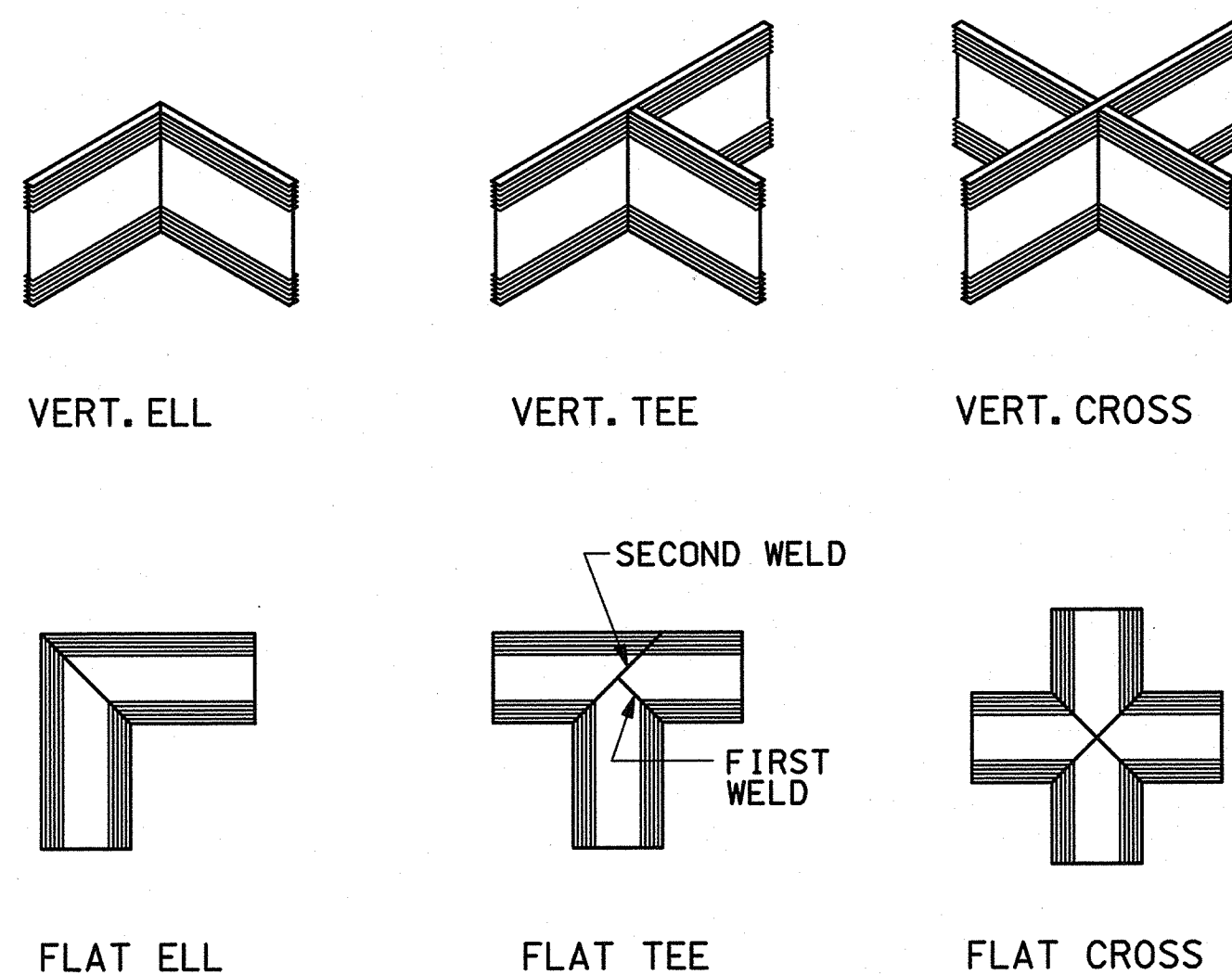
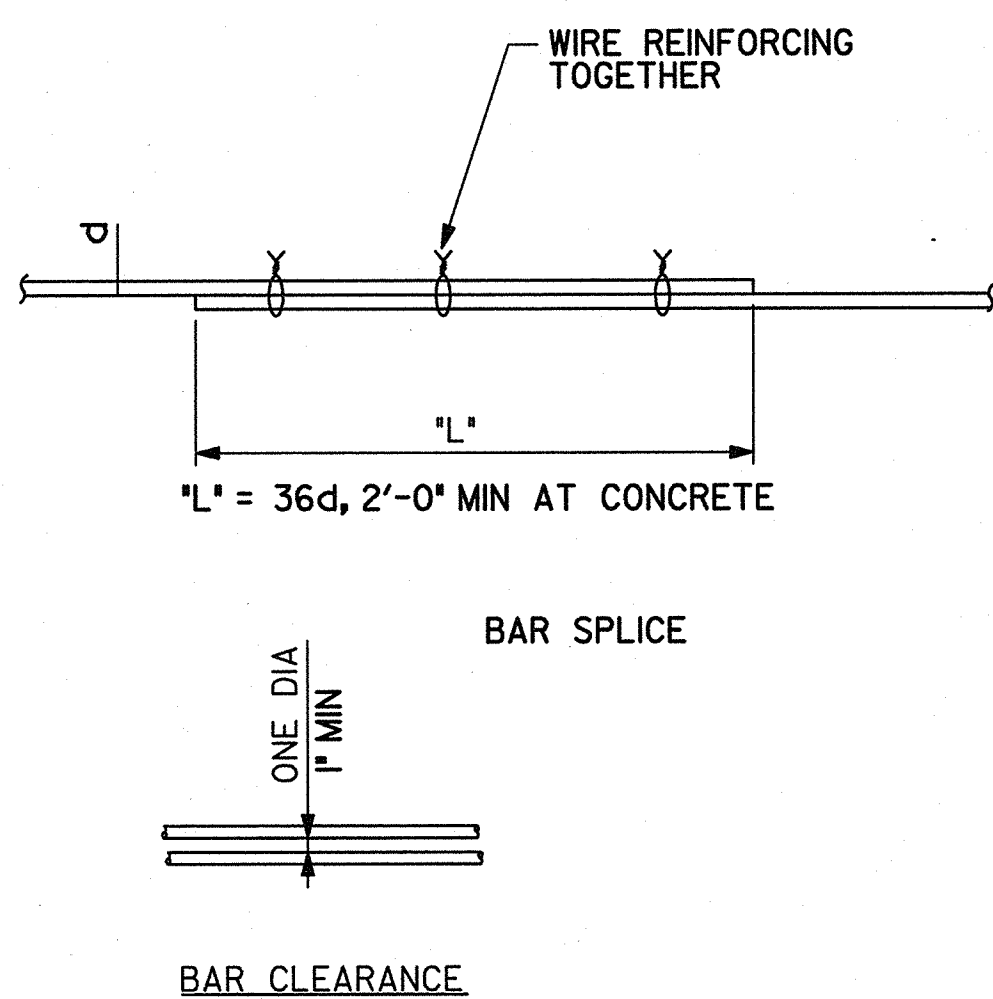
VERT REINF - TENSION LAP SPLICE

2
VAR



REINFORCING BAR BEND	
REINFORCING SIZE	BAR BEND DIAMETER ("D")
#3 TO #8	6d
#9 TO #11	8d
#14 TO #18	10d

- NOTES:
- CAP STIRRUPS MAY BE USED WHENEVER 135° CLOSED STIRRUPS ARE SHOWN IN GRADE BEAM ONLY
 - ALL BENDS SHALL BE MADE COLD.



TYPICAL BAR BENDS

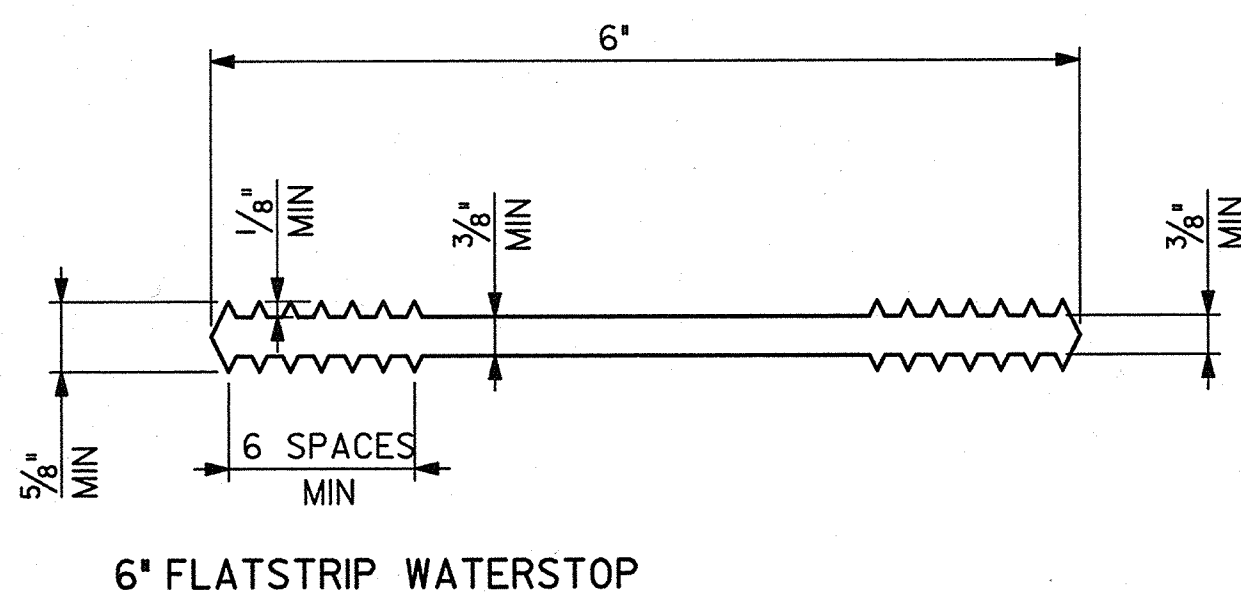
3
VAR

WATER STOP BENDS

4
VAR

KEY DETAIL

5
VAR



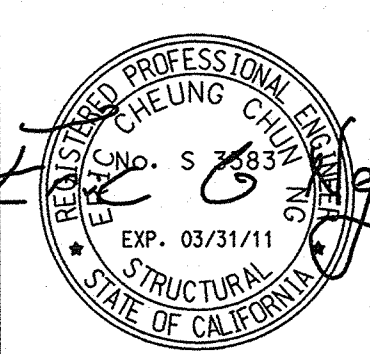
WATER STOP

6
VAR

SIMON WONG ENGINEERING
STRUCTURAL AND BRIDGE ENGINEERS
9968 Hibert Street, Suite 202
San Diego, CA 92131 (619) 566-3113

DRAWING NO. S-05	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 53	STRUCTURAL DETAILS		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 53 OF 118 SHEETS	WATER WBS SEWER WBS S-00308	
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	DATE	FILED
CHECKED BY: CONSTRUCTION ENGINEER			
INSPECTOR			
CONTRACTOR	DATE STARTED	DATE COMPLETED	
302-1737 LAMBERT COORDINATES			36196-53-D

DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE



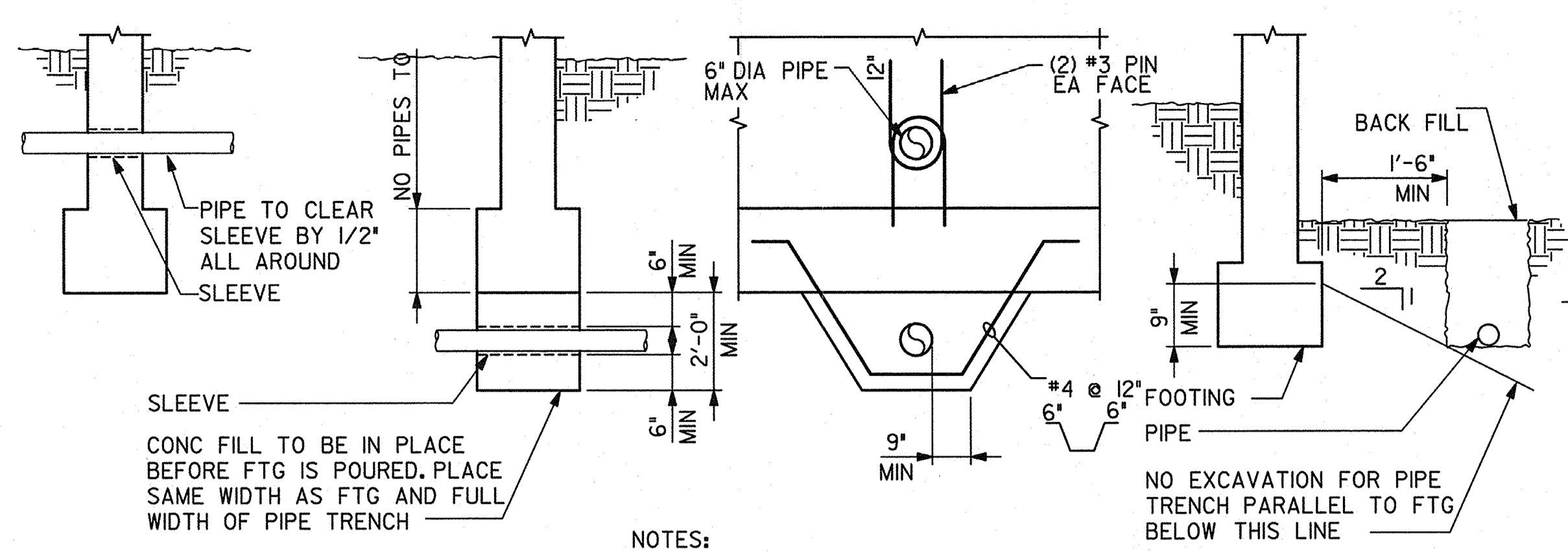
WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE.

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8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858) 712-8400 FAX (858) 712-8333

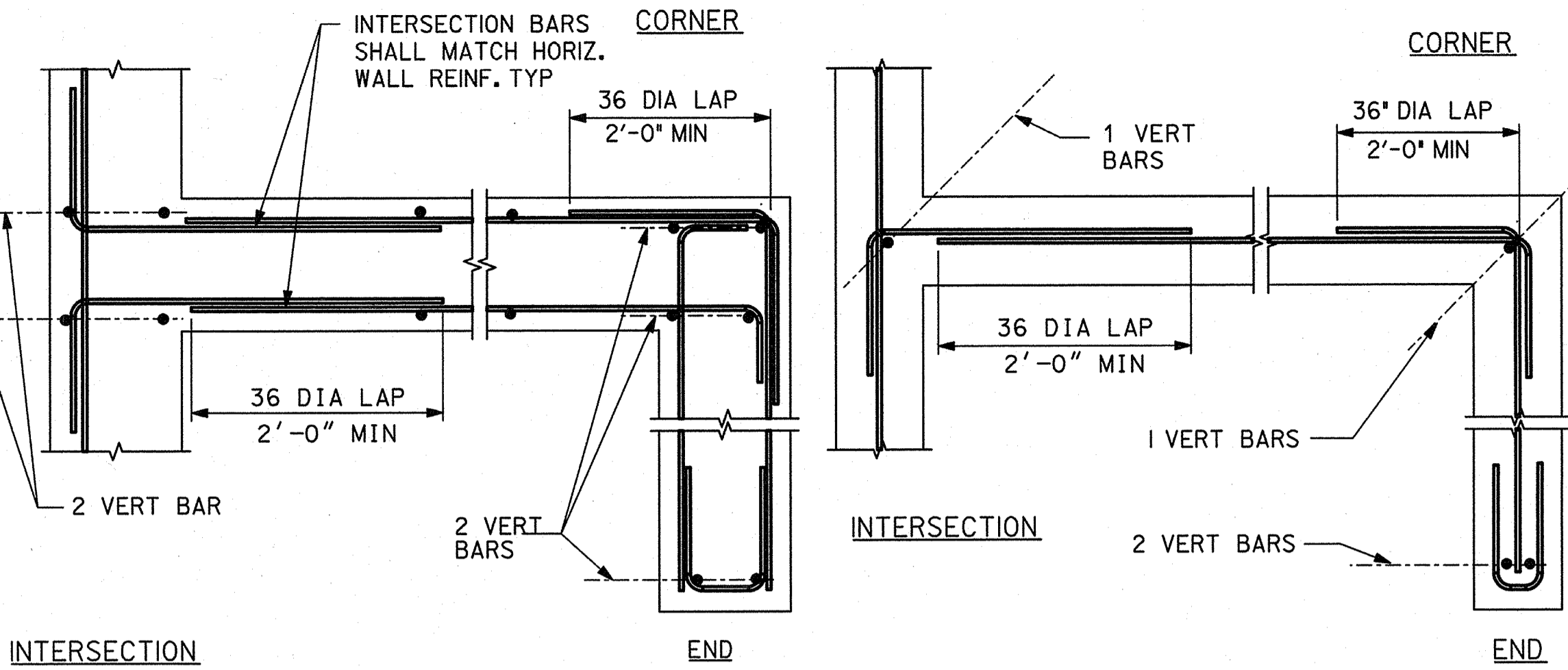
SCALE: HORIZONTAL AS SHOWN, VERTICAL AS SHOWN

CITY OF SAN DIEGO
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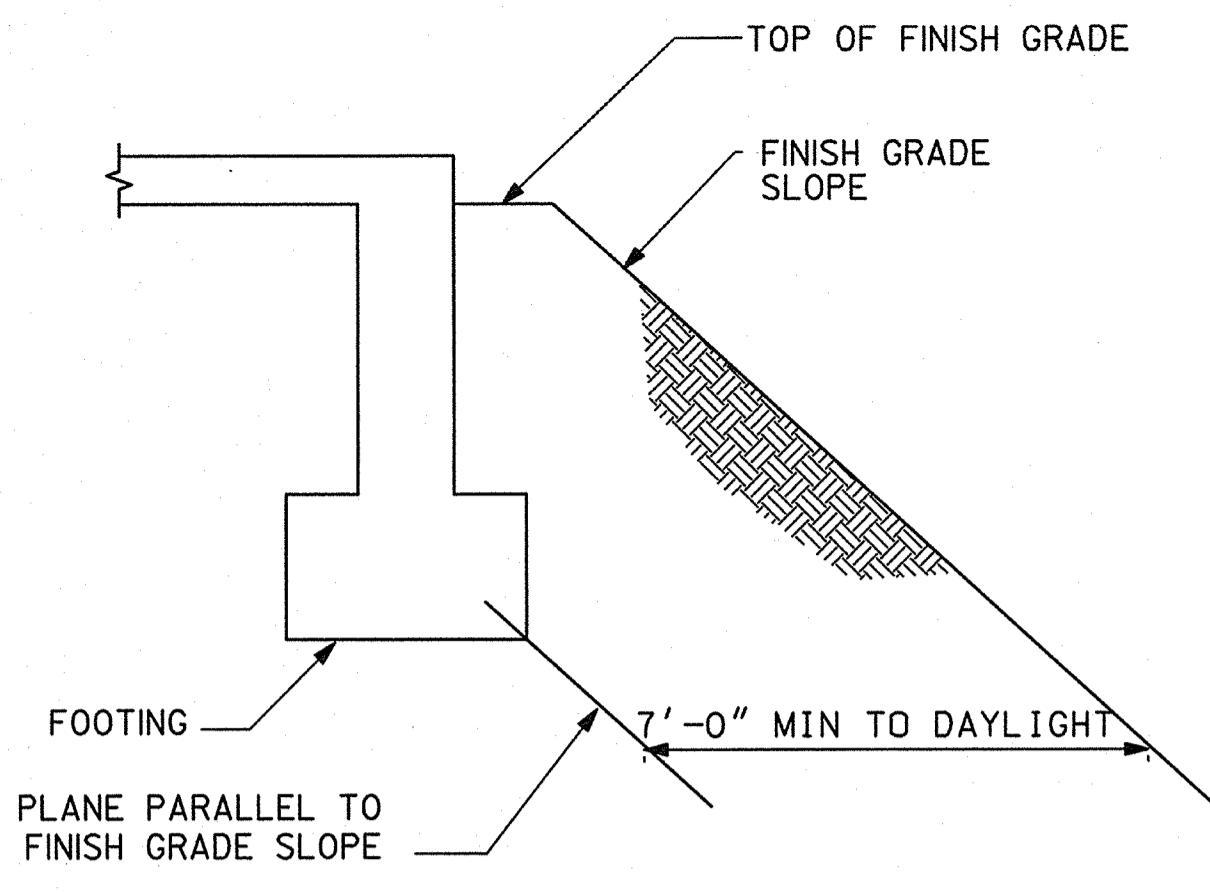


- NOTES:
- INSIDE DIAMETER OF SLEEVE TO BE 1" LARGER THAN OUTSIDE DIAMETER OF PIPE.
 - SLEEVES SHALL BE NON-CORROSIVE, FILL VOID W/ OAKUM AT EA END.
 - IF PIPE IS IN PLACE PRIOR TO POURING CONC, WRAP PIPE WITH 1" GLASS WOOL INSULATION BEFORE POURING CONC IN LIEU OF SLEEVE.



TYPICAL CONCRETE FOOTING REBAR - PLAN VIEW
 NTS

2
VAR



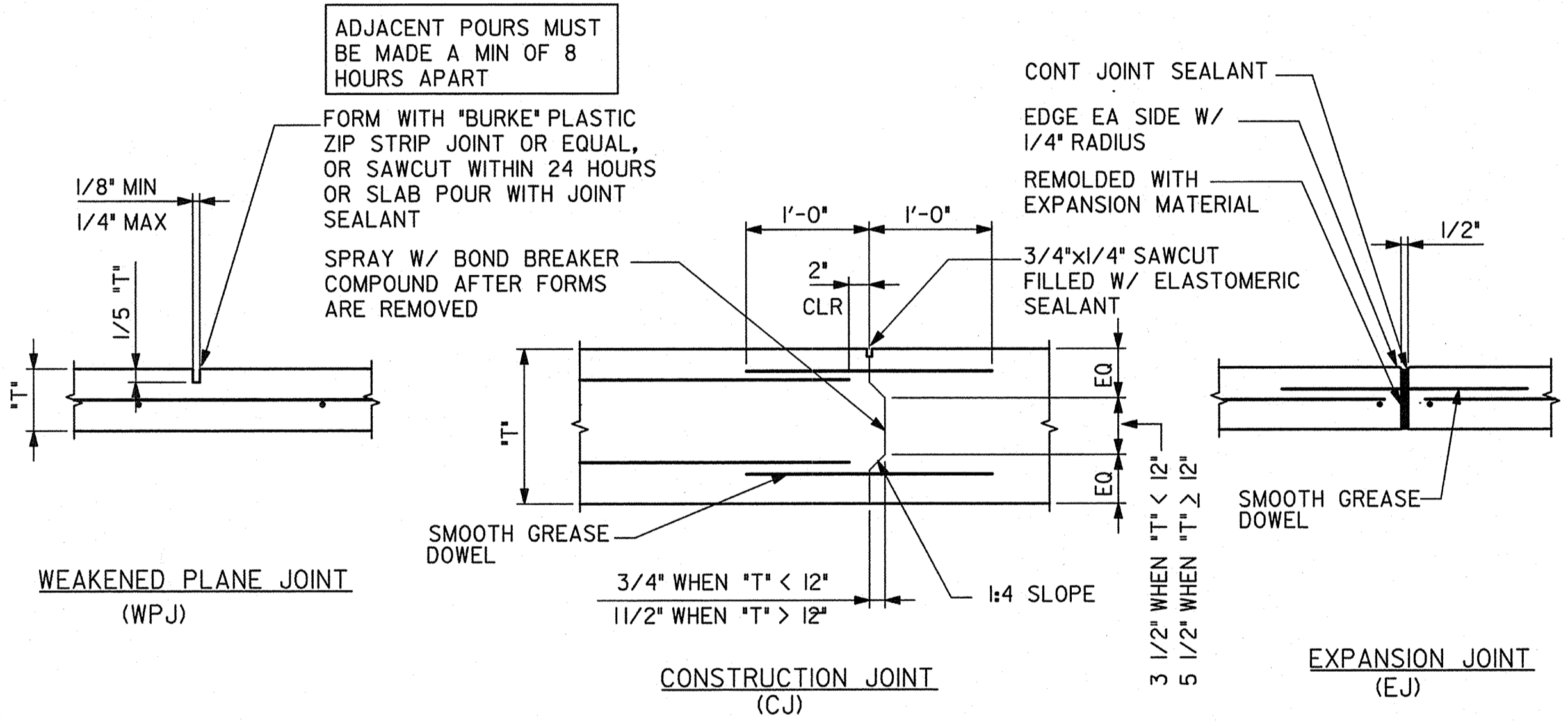
TYP FOOTING-TO-SLOPE
 NTS

3
VAR

PIPE AT FOUNDATION WALL
 (PIPE IS MORE THAN 2'-6" BELOW FINISH GRADE AND PASSES THRU FOUNDATION WALL.)

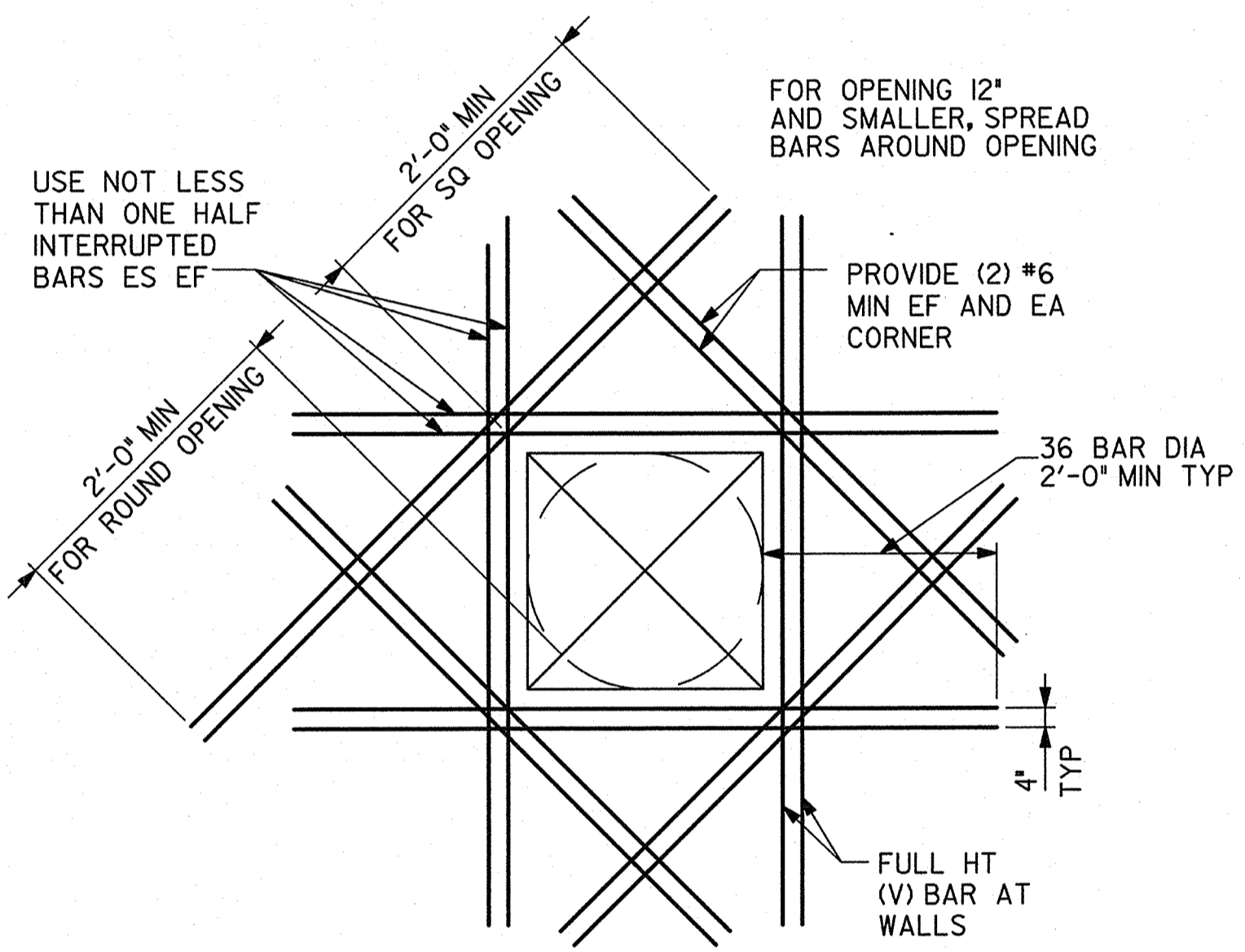
TYP PIPE THRU FOOTING
 NTS

1
VAR



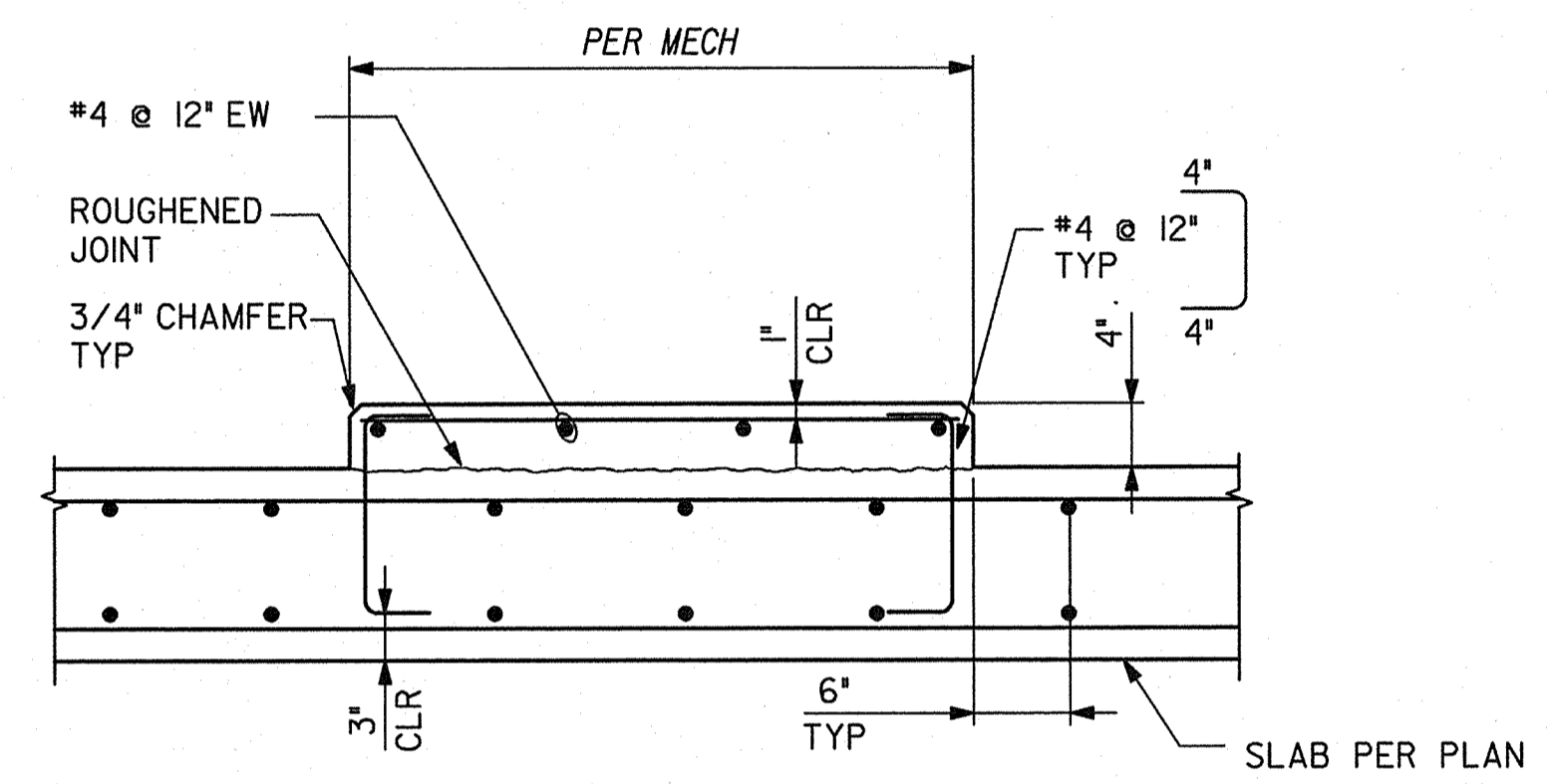
TYPICAL SLAB JOINTS
 NTS

4
VAR



TYPICAL REINF AT LARGE OPNG
 NTS

5
VAR



- NOTES:
- CONTRACTOR SHALL POUR PADS SEPARATELY FROM FLOOR SLAB AT PADS ON STRUCTURAL FLOOR.
 - EQUIPMENT ANCHORAGE EMBEDMENTS ARE UNIQUE TO EACH PIECE OF EQUIPMENT, AND ARE NOT SHOWN.

TYPICAL PAD ON SLAB
 NTS

6
VAR

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s-06.dgn

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DRAWING NO. S-06	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 54	STRUCTURAL DETAILS		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 54 OF 118 SHEETS	WATER WBS	SEWER WBS S-00308
APPROVED BY: <i>Hog C. Acar</i>	DATE 7-26-11	PROJECT MANAGER <i>Paul J. Lee</i>	
CHECKED BY:	DESCRIPTION	BY	APPROVED
CONSTRUCTION ENGINEER			
INSPECTOR			
CONTRACTOR	DATE STARTED	DATE COMPLETED	
INSPECTOR			

WARNING
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

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SCALE
 HORIZONTAL AS SHOWN
 VERTICAL AS SHOWN

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

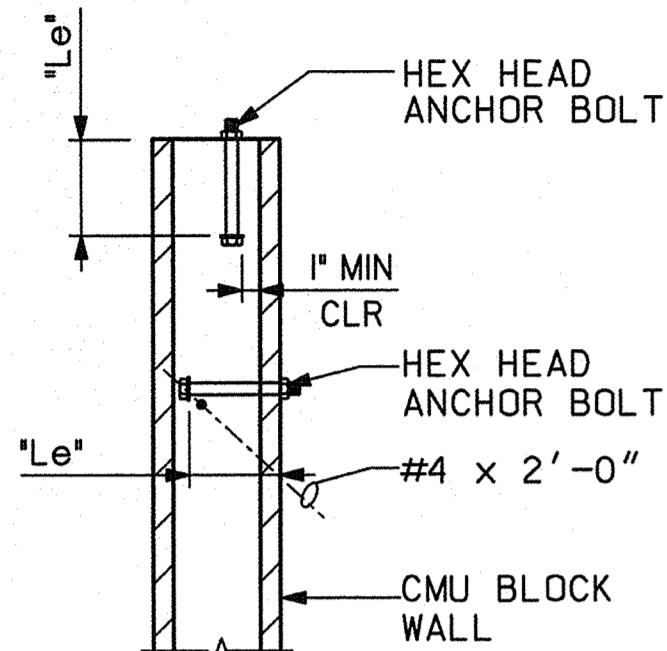


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NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	KCD	APD

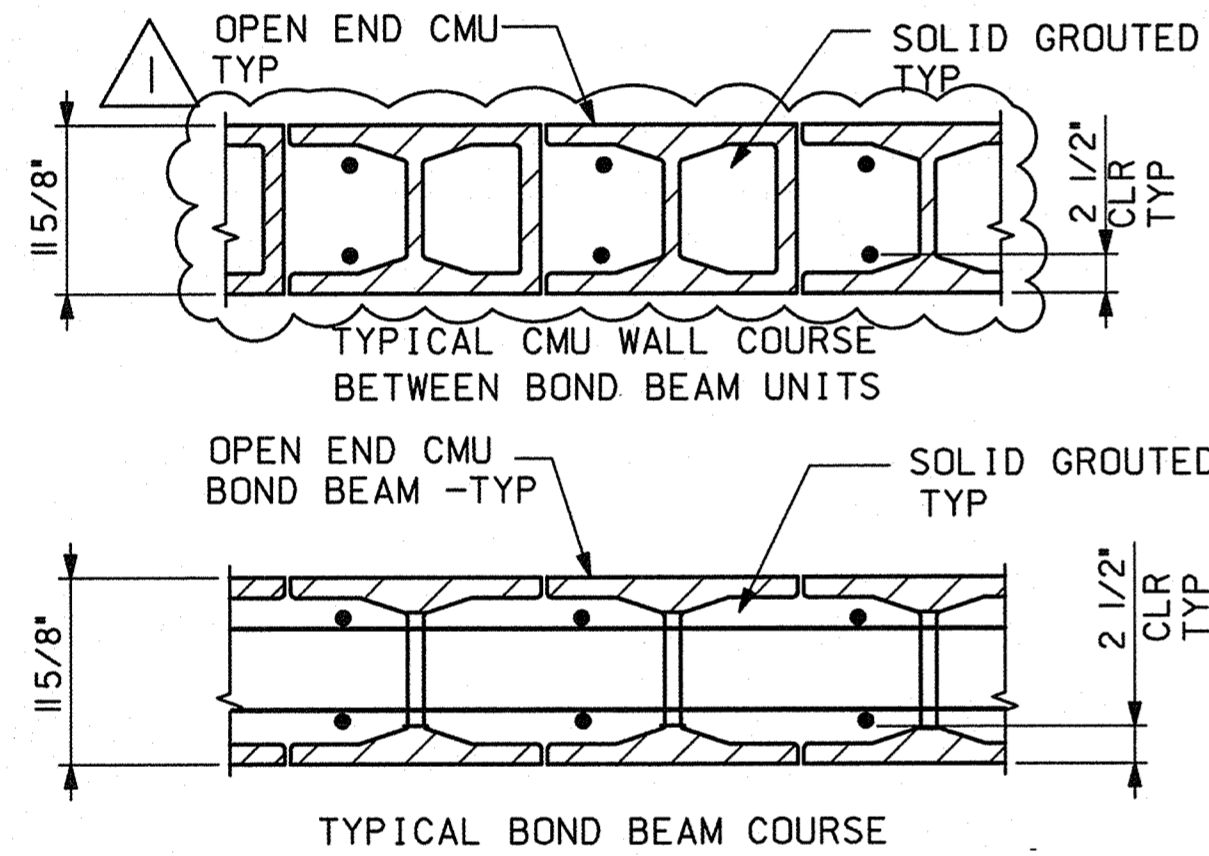
36196-54-D

NOTE:
ALL BOLTS SHALL BE GROUTED IN PLACE WITH AT LEAST INCH OF GROUT BETWEEN THE BOLT & THE CMU & SHALL BE ACCURATELY SET WITH TEMPLATES.

MINIMUM EMBEDMENT				
ANCHOR SIZE	1/2"	5/8"	3/4"	7/8"
"Le"	5"	5"	6"	7"

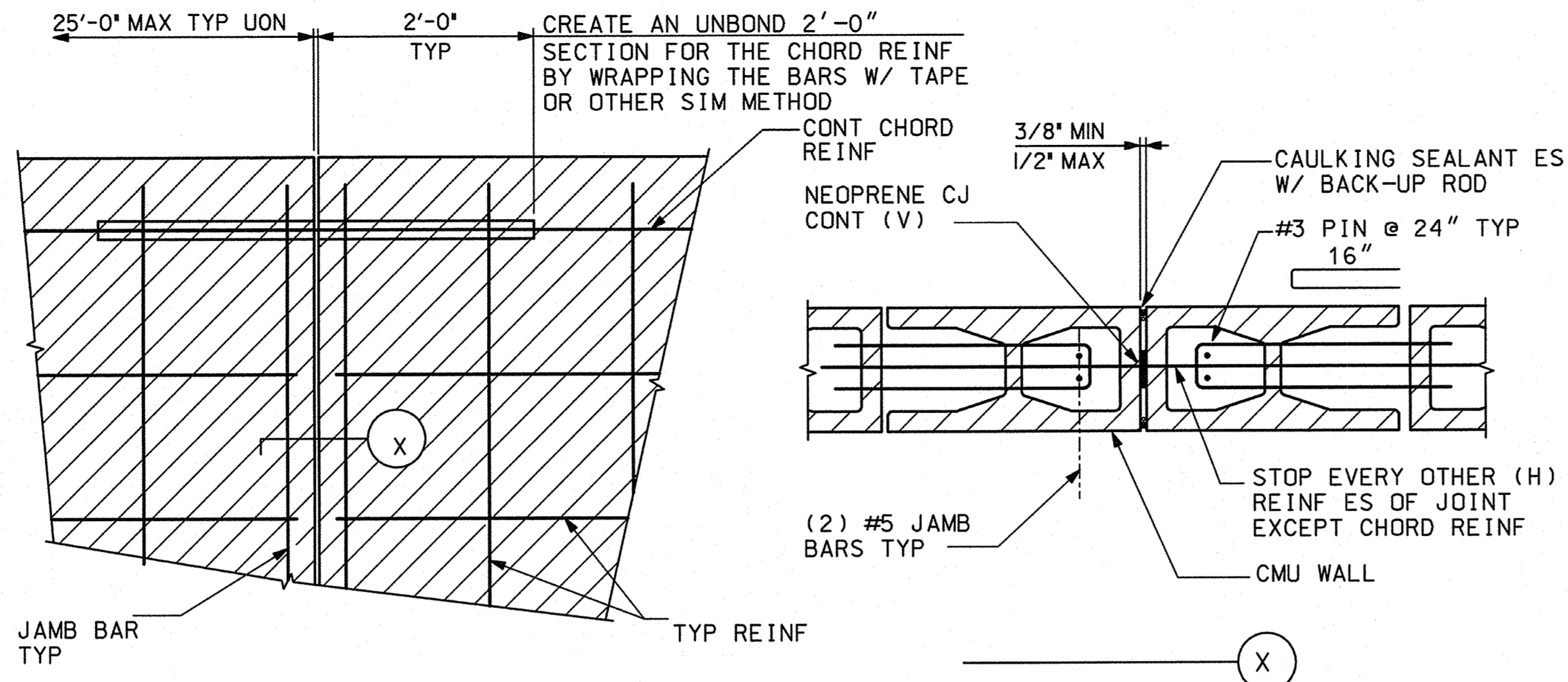


TYPICAL AB EMBED IN CMU
NTS
VAR

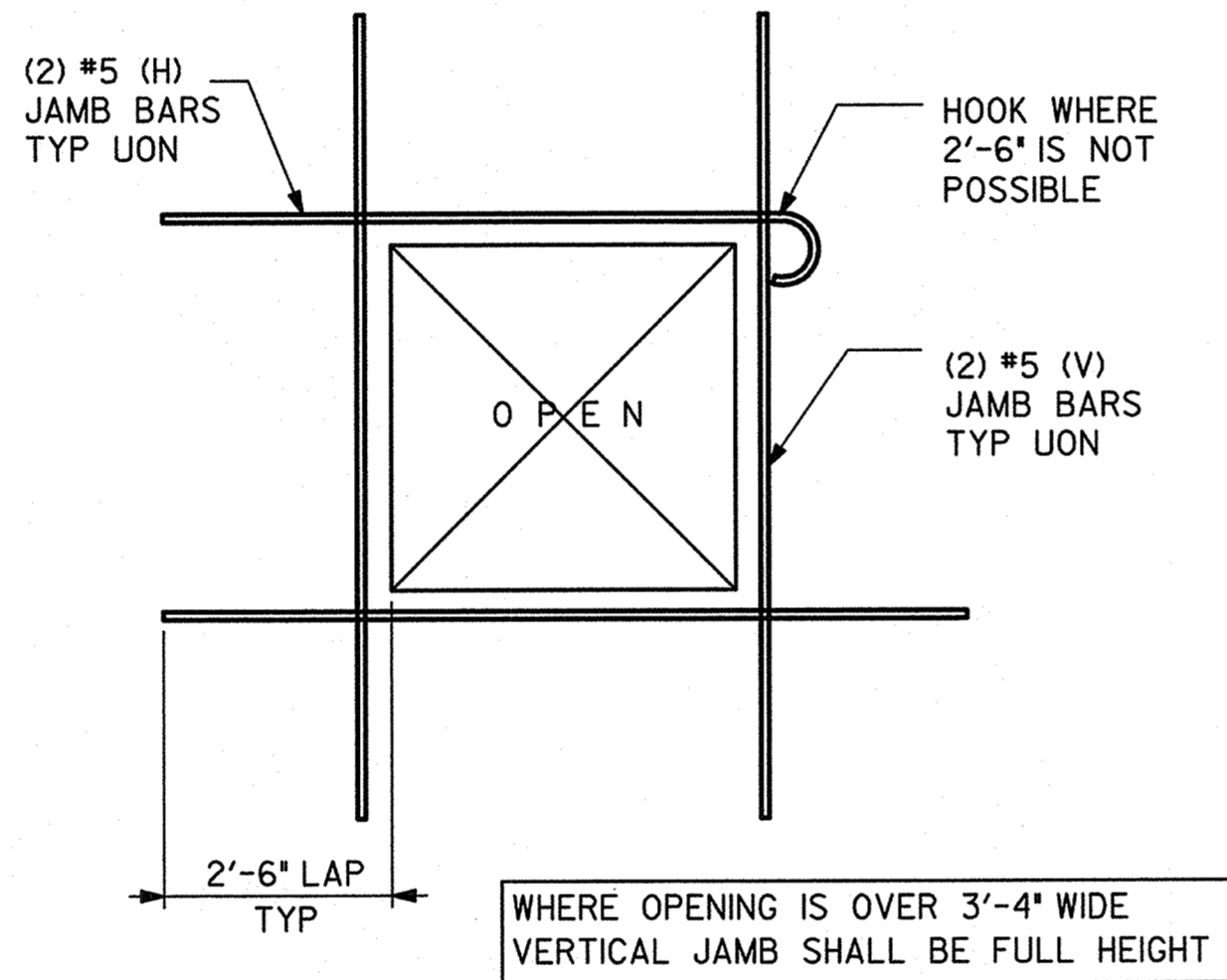


NOTE:
SINGLE CURTAIN OF REINF AT 8" CMU
DOUBLE CURTAIN OF REINF AT 12" CMU

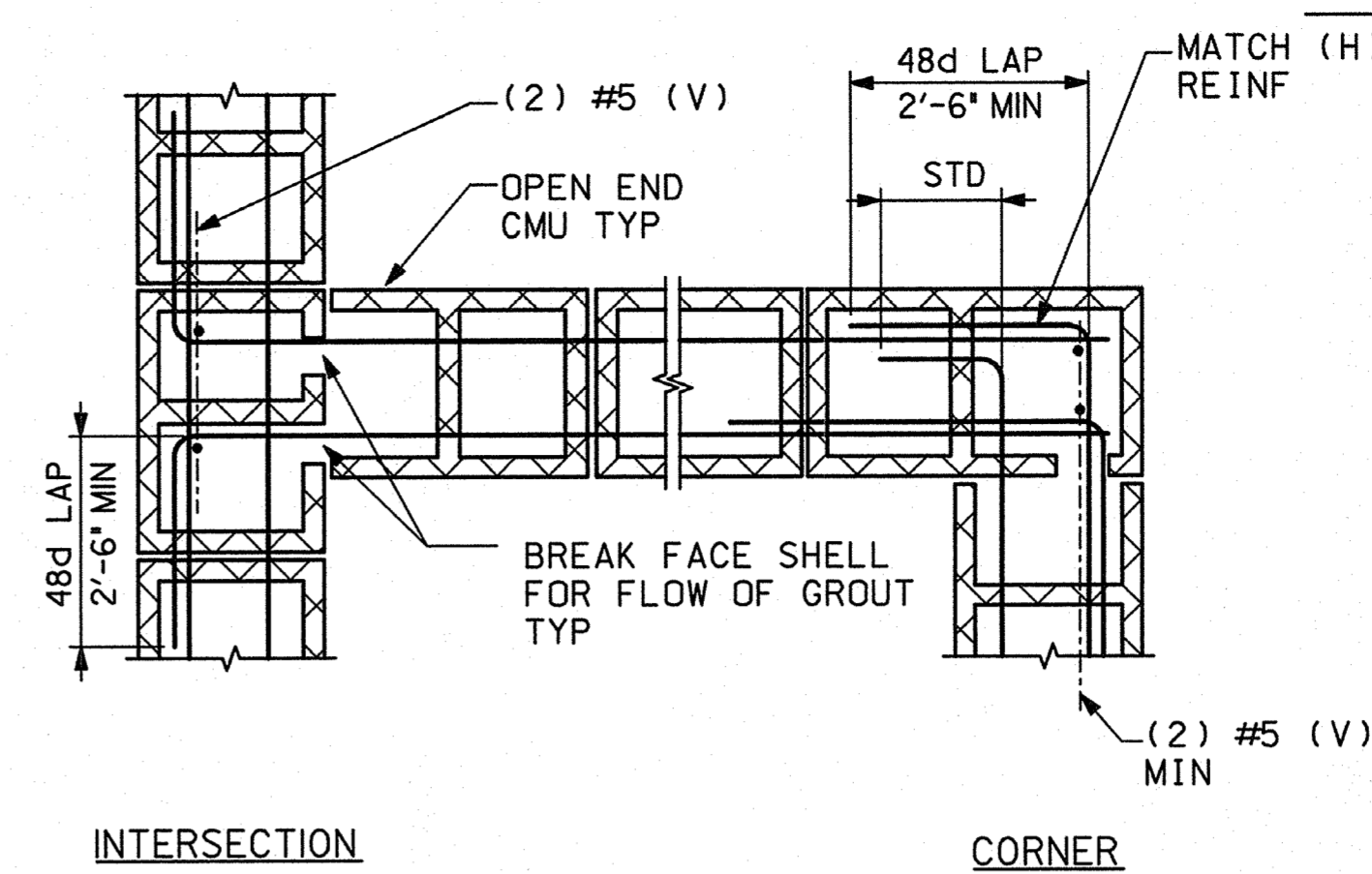
TYPICAL CMU COURSING
NTS
VAR



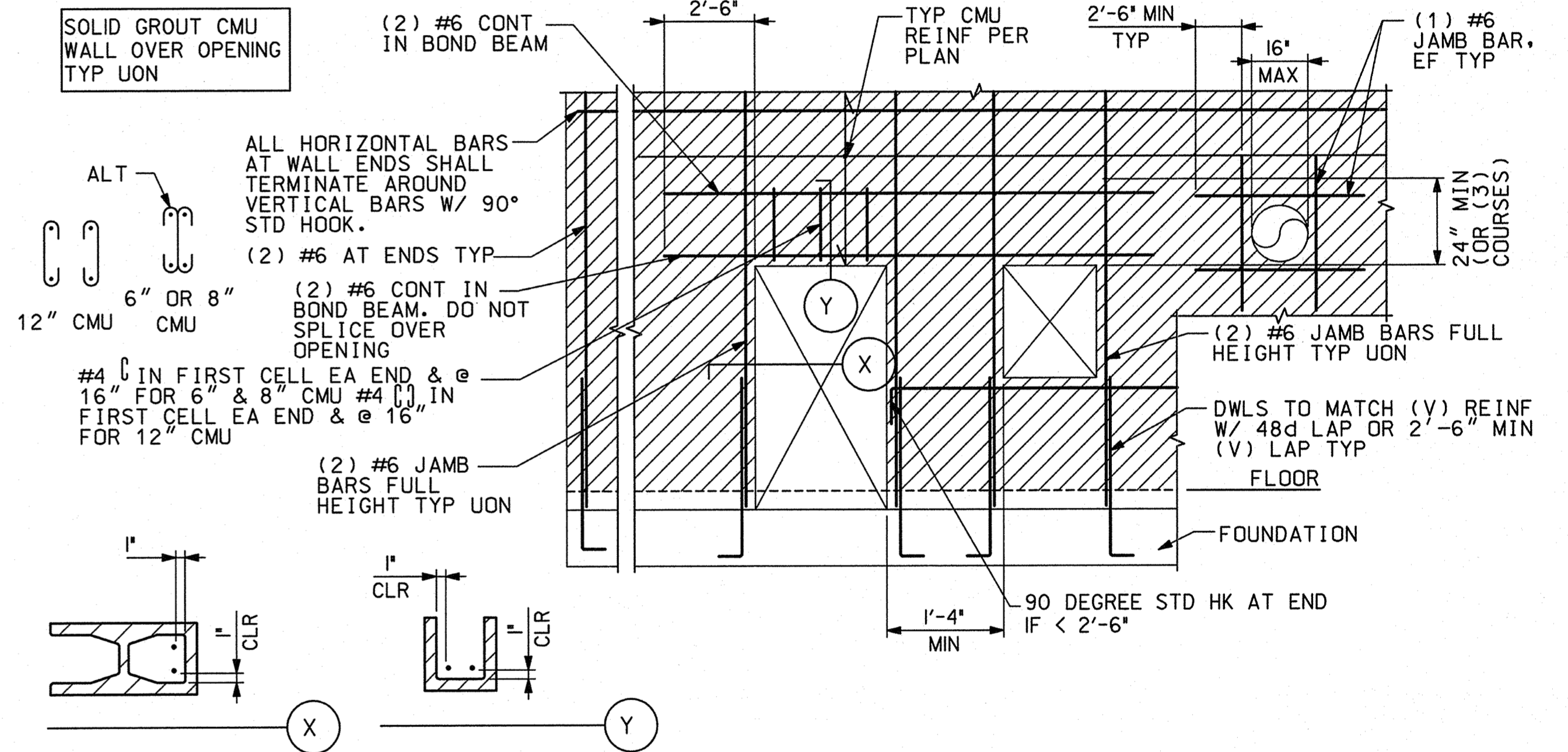
TYPICAL VERTICAL WCJ (WALL CONTROL JOINT)
NTS
VAR



TYP CMU JAMB AT OPENING
NTS
VAR



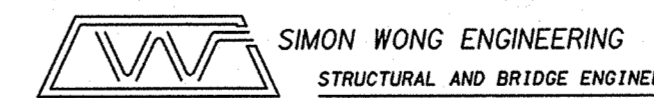
TYPICAL CMU REINF - PLAN VIEW
NTS
VAR



TYP CMU LINTEL
NTS
VAR

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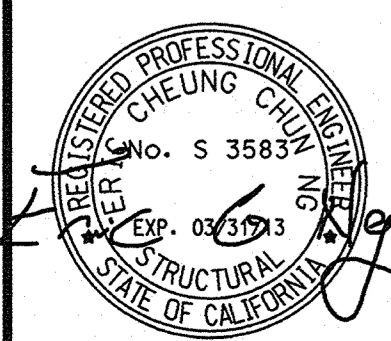
s-07.dgn



996 Hibert Street, Suite 202
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DRAWING NO. S-07	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 55	STRUCTURAL DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 55 OF 118 SHEETS	WATER SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hogee-Acar 10-25-11 FOR CITY ENGINEER	DATE
CHECKED BY: CONSTRUCTION ENGINEER		
CHECKED BY: INSPECTOR		
	DESCRIPTION	BY
	APPROVED	DATE
	FILED	
	CONTROL CERTIFICATION	
	302-1737	
	LAMBERT COORDINATES	
CONTRACTOR	DATE STARTED	
INSPECTOR	DATE COMPLETED	

DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE
1	09/11		BUILDING PERMIT	SML	JH	EN	



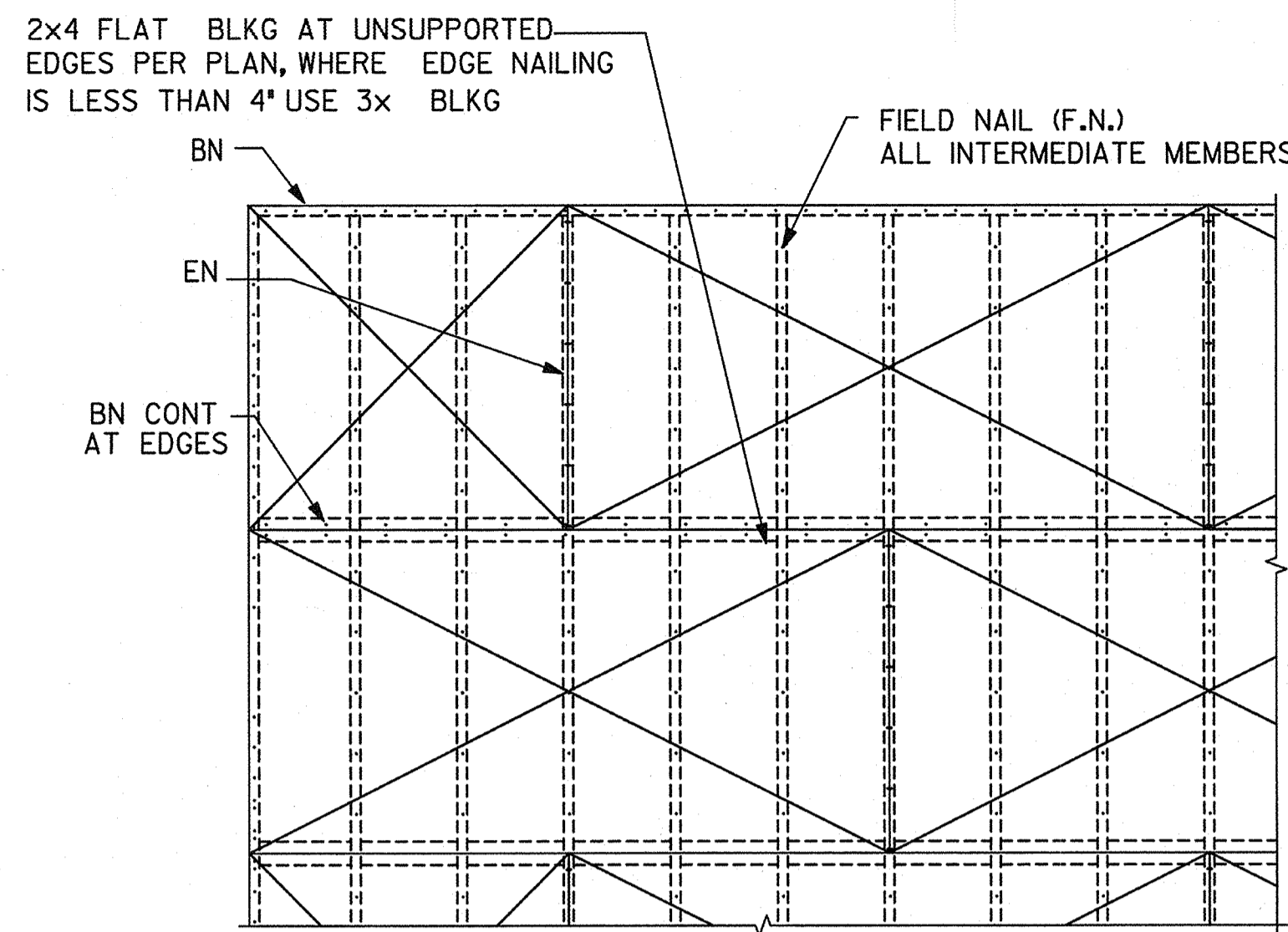
WARNING
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SCALE
HORIZONTAL AS SHOWN
VERTICAL AS SHOWN

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



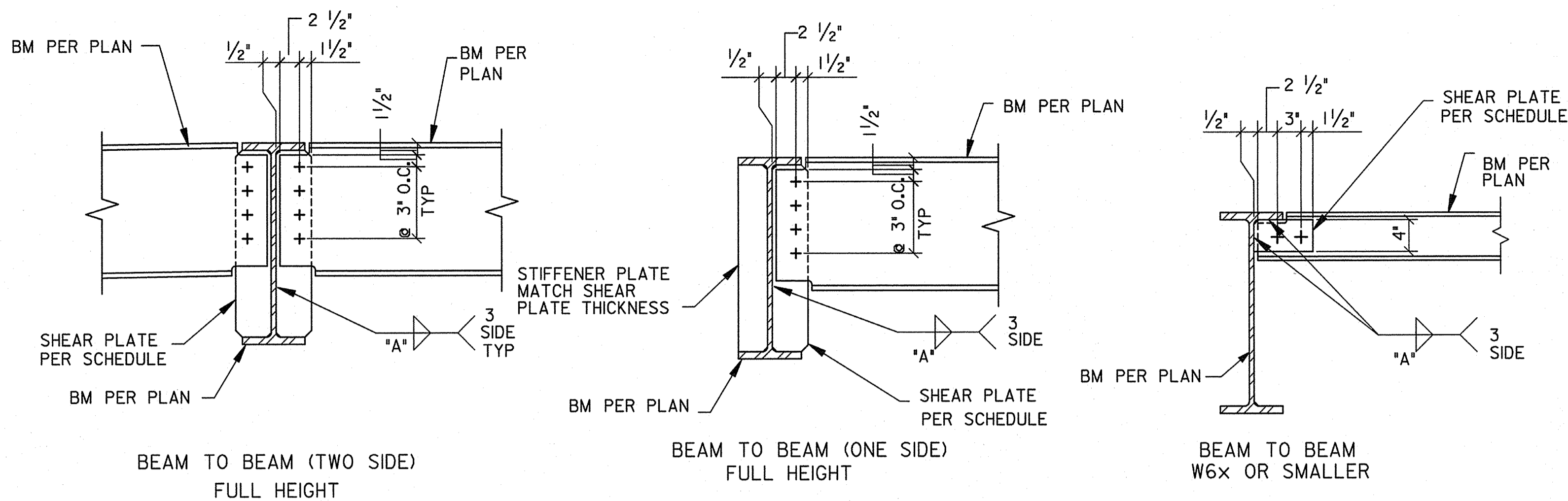


TYPICAL HORIZONTAL DIAPHRAGM NAILING

NTS

I
VAR

- NOTES:
- PLYWOOD NAILING SHALL BE INSPECTED BY THE GOVERNING BUILDING AUTHORITY PRIOR TO COVERING.
 - MINIMUM PLYWOOD SHEET SIZE SHALL BE 2'-0"x4'-0".
 - MINIMUM 3/8" NAILING EDGE DISTANCE.
 - BOUNDARY NAIL (B.N.) OVER ALL BEAMS AND AROUND ALL OPENINGS.
 - PLYWOOD SHEATHING SHALL BE LAID PERPENDICULAR TO FRAMING WITH 4'-0" STAGGERED JOINTS.
 - ALL FLOOR SHEATHING SHOULD BE GLUED TO FRAMING MEMBER WITH A.P.A. APPROVED ADHESIVE.
 - FRAMING AT ADJOINING PANEL EDGES SHALL BE 3" INCHES (76 MM) NOMINAL OR WIDER AND NAILS SHALL BE STAGGERED WHERE SPACED 2" INCHES (51MM) OR 2 1/2" INCHES (64 MM) ON CENTER.
 - DIAPHRAGM SHEATHING NAILS OR OTHER APPROVED SHEATHING CONNECTOR SHALL BE DRIVEN SO THAT THEIR HEAD OR CROWN IS FLUSH W/ THE SURFACE OF THE SHEATHING.



STEEL BEAM CONNECTION SCHEDULE

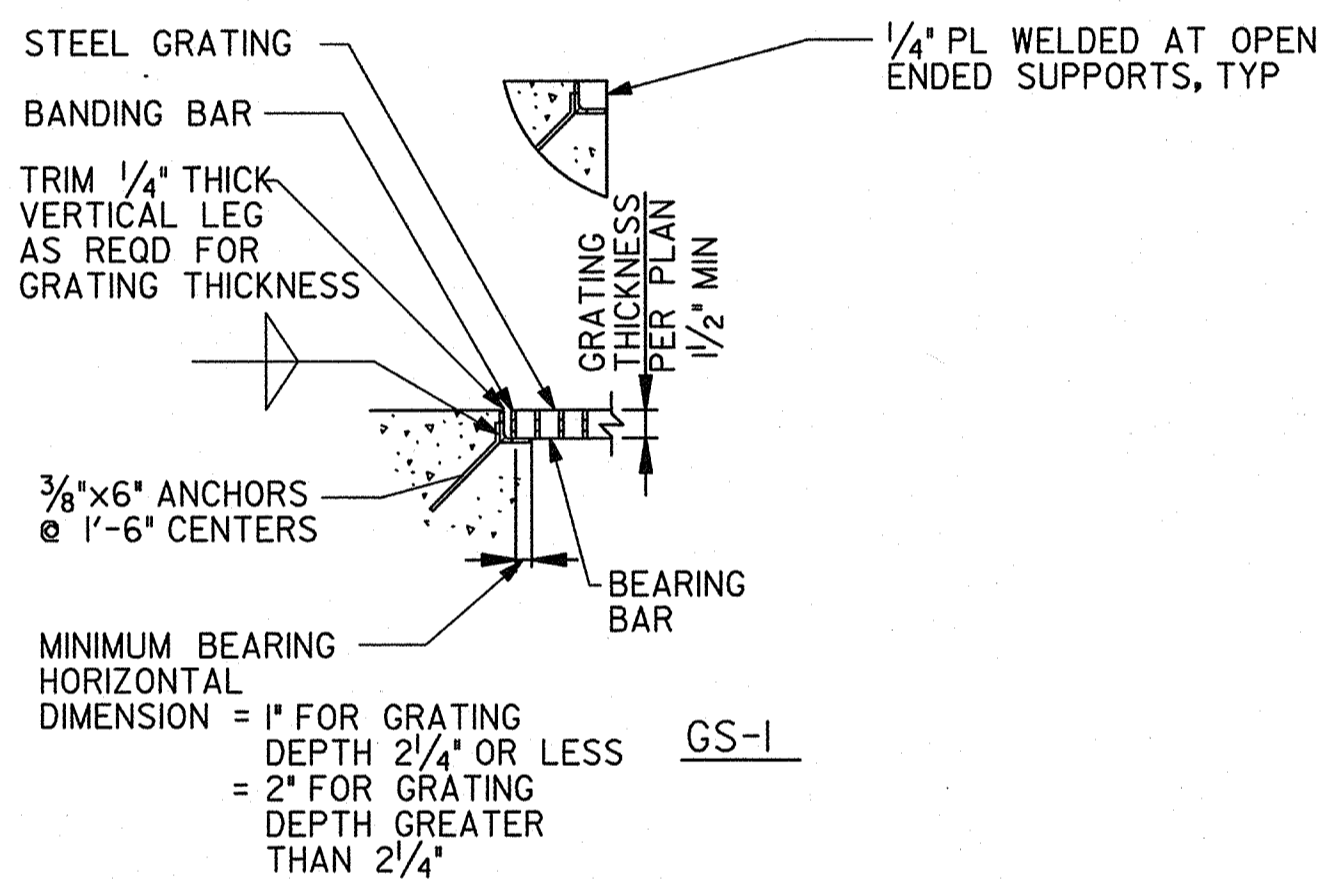
STEEL BEAM DEPTH	SHEAR PLATE THICKNESS	BOLTS			WELD "A"	CAPACITY (KIPS)	REMARKS
		NUMBER	DIAMETER	TYPE			
W 6x	1/4"	2	3/4"	A325N	1/4"	-	
W 8x	1/4"	2	3/4"	A325N	1/4"	8.2	
W 10x	1/4"	2	3/4"	A325N	1/4"	-	
W 12x	1/4"	3	7/8"	A325N	1/4"	16.5	
W 14x	3/8"	3	7/8"	A325N	1/4"	16.5	
W 16x	3/8"	4	7/8"	A325N	1/4"	26.3	
W 18x	3/8"	5	7/8"	A325N	5/16"	36.4	
W 21x	3/8"	6	7/8"	A325N	5/16"	46.4	
W 24x	3/8"	7	7/8"	A325N	5/16"	56.4	

- NOTES:
- FOR SPECIAL STEEL CONNECTIONS NOT NOTED, SEE FRAME ELEVATIONS, SECTIONS, AND DETAILS.
 - SLOTTED HOLES ARE NOT PERMITTED, UNLESS NOTED OTHERWISE.
 - SPECIAL INSPECTION IS REQUIRED FOR HIGH STRENGTH BOLTING (A-325)

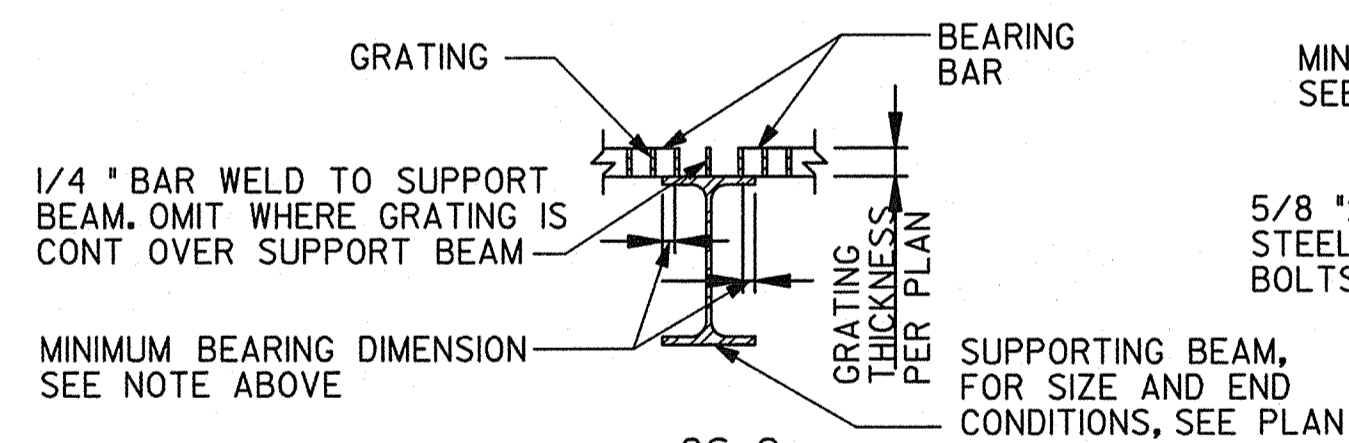
GRATING NOTES

- EXTEND GRATING CONTINUOUSLY OVER GATE GUIDES AND GATES.
- NOTCH GRATING SUPPORTS AT GATES AS REQUIRED.
- GRATING SPAN - SEE PLAN.
- WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
- SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER PRIOR TO FABRICATION.
- MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING TO BE SAME AS GRATING, EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.
- BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
- BAND ALL EDGES WITH 3/16" x DEPTH OF BEARING BAR.
- PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.
- TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES 3 TYPES, ALTHOUGH ALL 3 MAY NOT BE INCLUDED IN PROJECT.
- THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRAING SUPPORTS SHALL NOT BE LESS THAN 1/4" NOR GREATER THAN 1/2" AND AS SPECIFIED.
- ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS AS SPECIFIED AND AS IN DET 4.

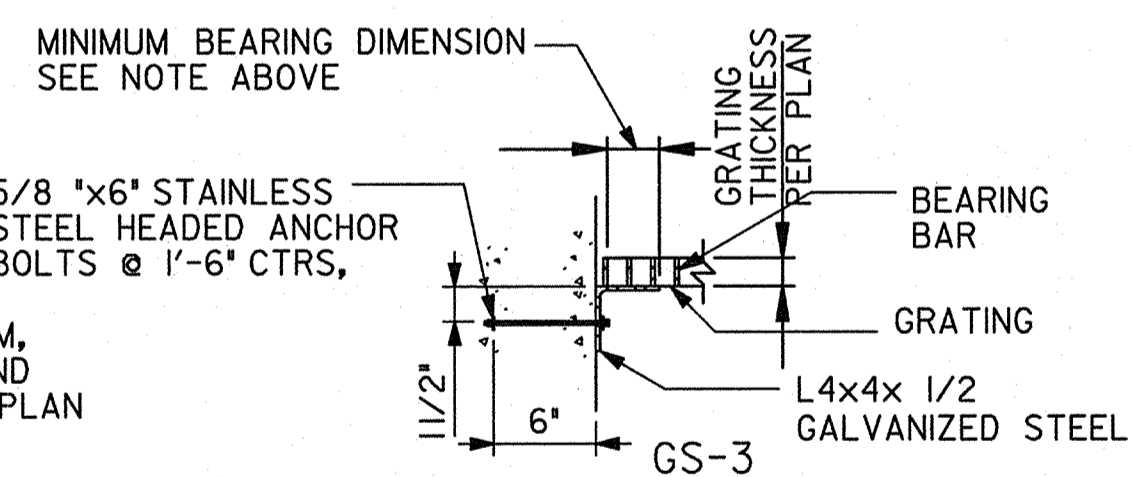
4
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GS-1



GS-2



GS-3

GRATING SUPPORT DETAILS

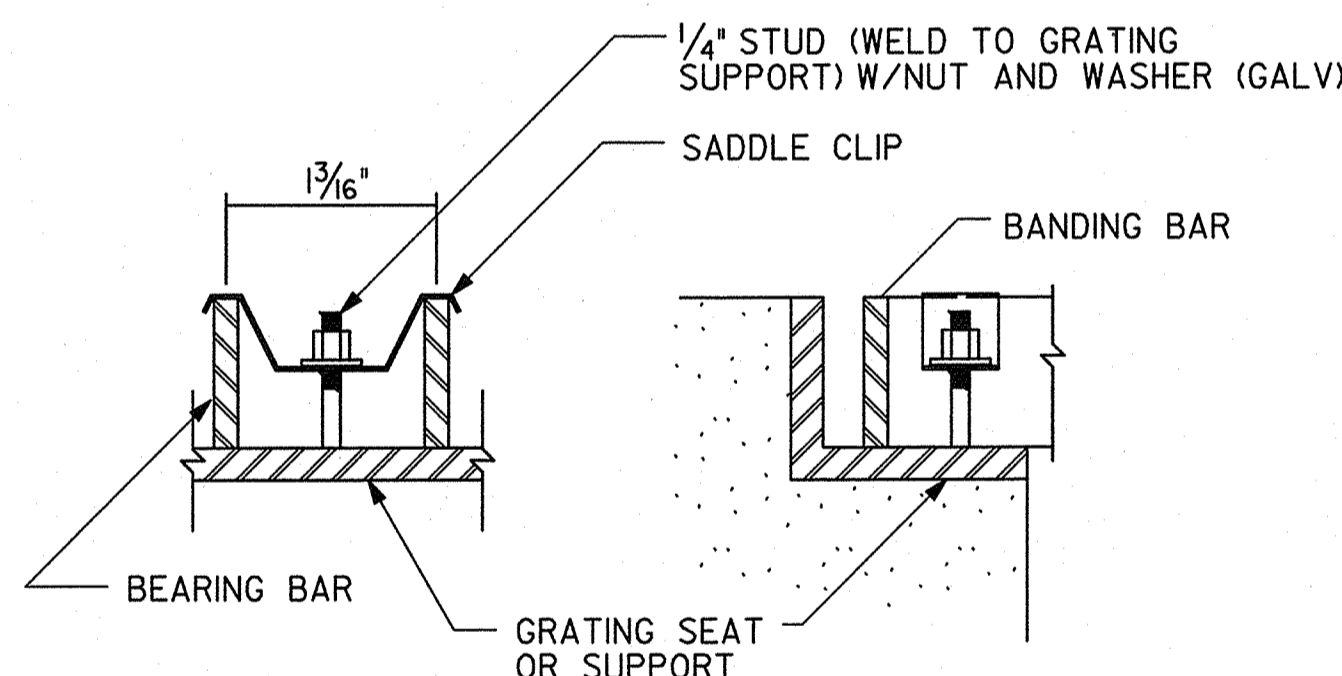
NTS

2
VAR

SHEAR PLATE CONNECTION SCHEDULE

NTS

3
VAR



NOTES:

- PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL, APPROX 4" FROM PANEL CORNERS. MAXIMUM CLIP SPACING AT 36" OC.
- STUD, NUT, WASHER AND CLIP TO BE OF SAME MATERIAL AS GRATING SEAT OR SUPPORT.
- TOUCH UP GALV AFTER WELDING AND NUT HAS BEEN TIGHTENED

GRATING PER PLAN ANCHOR PER

4
-

GRATING EDGE DETAIL

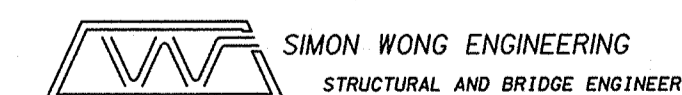
NTS

5
VAR

GRATING ANCHOR DETAIL

NTS

4
VAR



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DRAWING NO. S-08	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT			WATER WBS
SHEET NO. 56	STRUCTURAL DETAILS			SEWER WBS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 56 OF 118 SHEETS			WBS S-00308
APPROVED BY: <i>Hogel-Acey</i>	DATE: 7-26-11	PROJECT MANAGER: <i>Paul A. Lee</i>		
CHECKED BY:	DESCRIPTION:	BY:	APPROVED:	DATE:
CHECKED BY:	CONSTRUCTION ENGINEER:	CHECKED BY:	INSPECTOR:	DATE STARTED:
CHECKED BY:	INSPECTOR:	CHECKED BY:	INSPECTOR:	DATE COMPLETED:
CONTRACTOR:				36196-56-D

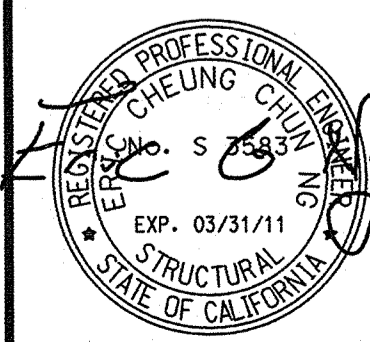
DRAWING STATUS							
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



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SCALE
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VERTICAL AS SHOWN



WARNING
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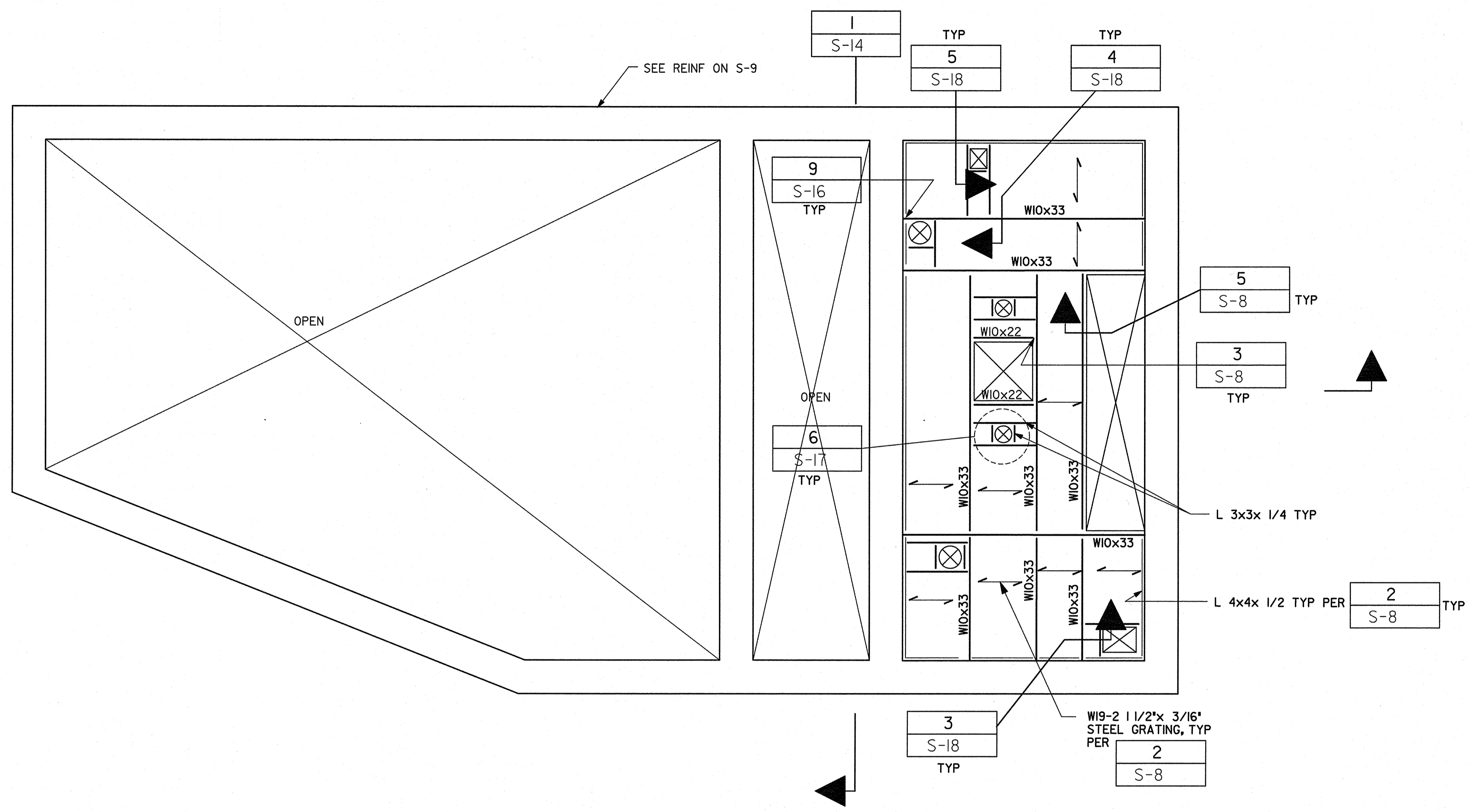
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s-08.dgn

- NOTES:
- SEE MECH AND ARCH FOR OPENING SIZE AND LOCATION.
 - SEE

3
S-8

 FOR TYP STEEL BEAM TO BEAM CONNECTIONS.
 - TYPICAL FRAMING MEMBERS AROUND OPENINGS SHALL BE L4x4x1/4 TYP. UON



MEZZANINE FL FRAMING PLAN
SCALE: 1/4"=1'-0"

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s-10.dgn

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DRAWING NO. S-10	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		WATER WBS
SHEET NO. 58	MEZZANINE FL FRAMING PLAN		SEWER WBS S-00308
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 58 OF 118 SHEETS		APPROVED BY: <i>Hosca Acar</i> 7-26-11
FOR CITY ENGINEER		BY	DATE
CHECKED BY:		APPROVED	DATE
CONSTRUCTION ENGINEER		APPROVED	DATE
CHECKED BY:		APPROVED	DATE
INSPECTOR		APPROVED	DATE
INSPECTOR		DATE STARTED	DATE COMPLETED
CONTRACTOR		302-1737	
INSPECTOR		LAMBERT COORDINATES	
		36196-58-D	

DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

WARNING

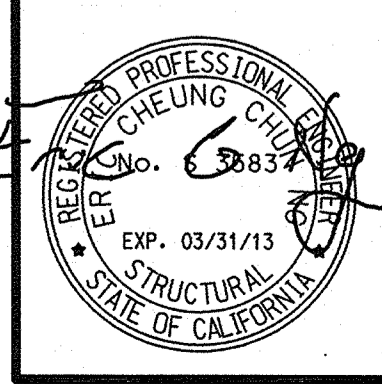
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CITY OF SAN DIEGO

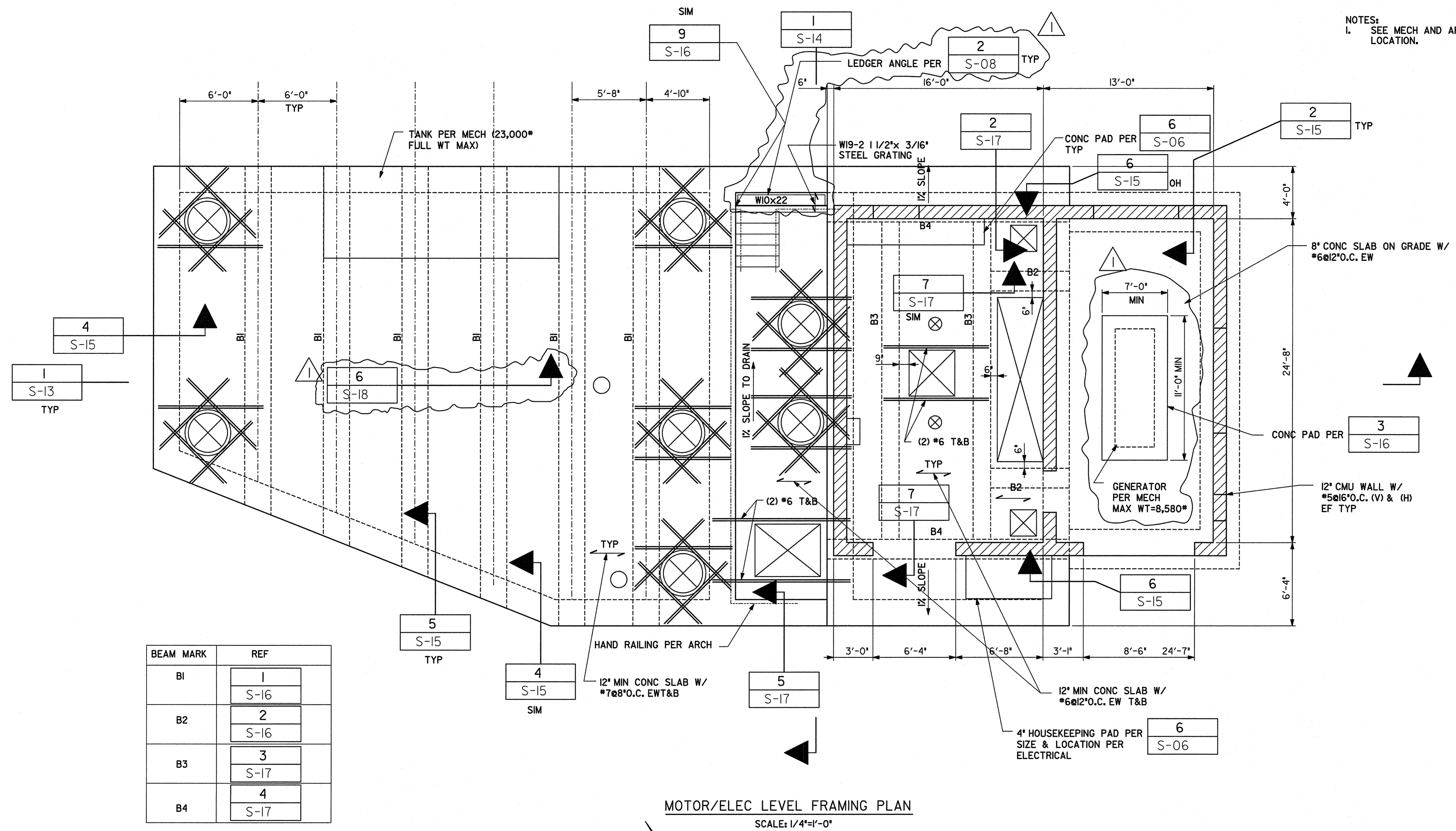
PUBLIC WORKS PROJECT



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s-11.dgn

NOTES:
1. SEE MECH AND ARCH FOR OPENING SIZE AND LOCATION.

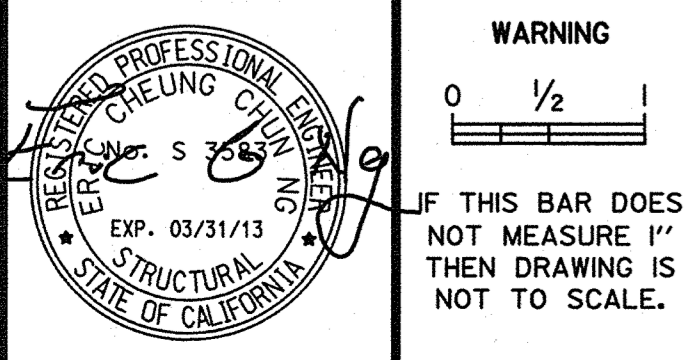


BEAM MARK	REF
B1	1 S-16
B2	2 S-16
B3	3 S-17
B4	4 S-17

MOTOR/ELEC LEVEL FRAMING PLAN
SCALE: 1/4"=1'-0"

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DRAWING NO. S-11	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 59	MOTOR/ELEC LEVEL FRAMING PLAN		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA	WATER WBS	302-1737
	SHEET 59 OF 118 SHEETS	SEWER WBS	302-1737
		WBS	S-00308
APPROVED BY: FOR CITY ENGINEER	Hoggi Alar 10-25-11		
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY: INSPECTOR			
	CONTRACTOR		DATE STARTED
	INSPECTOR		DATE COMPLETED
			36196- 59 -D



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SCALE: HORIZONTAL AS SHOWN
VERTICAL AS SHOWN

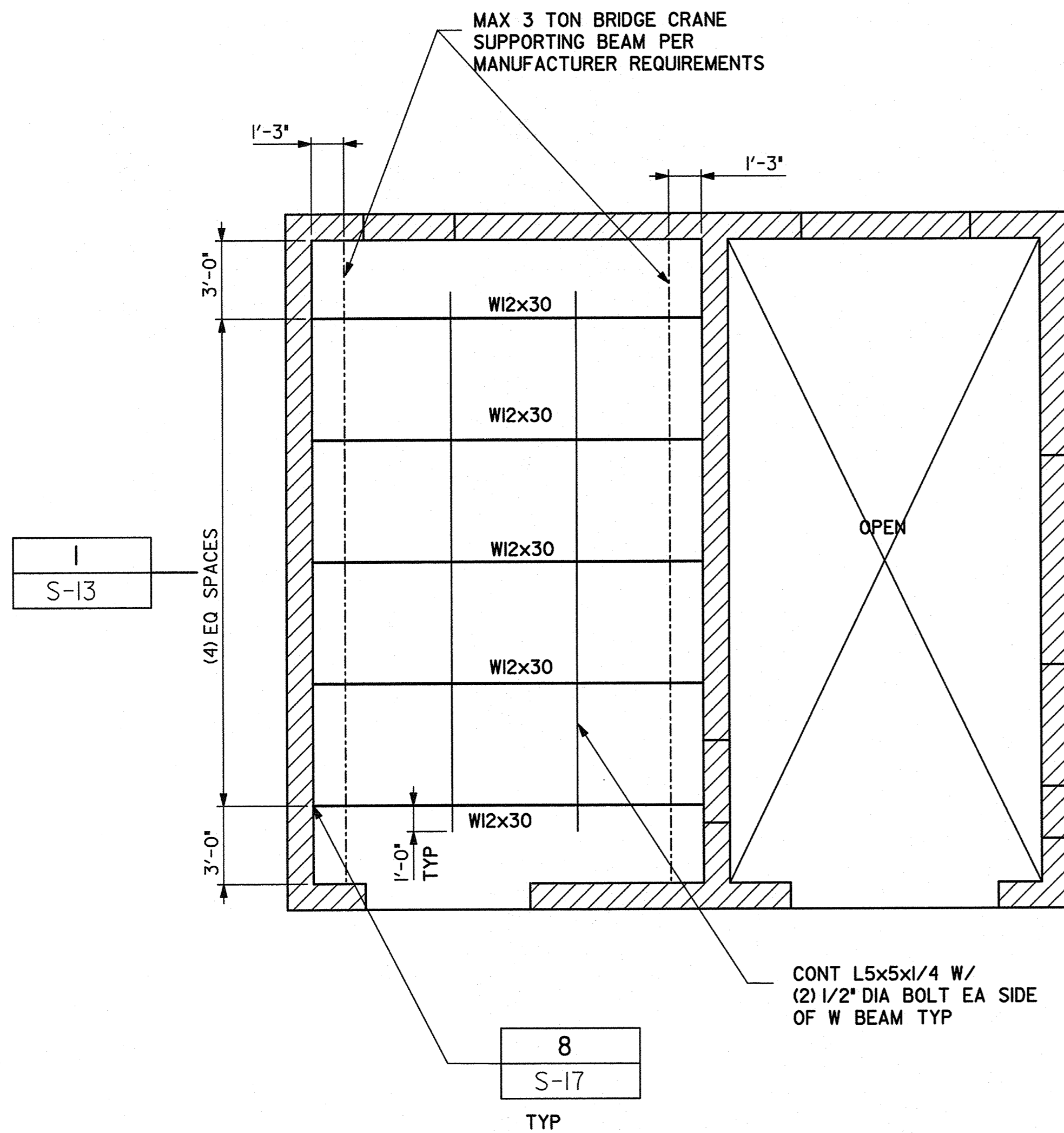
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



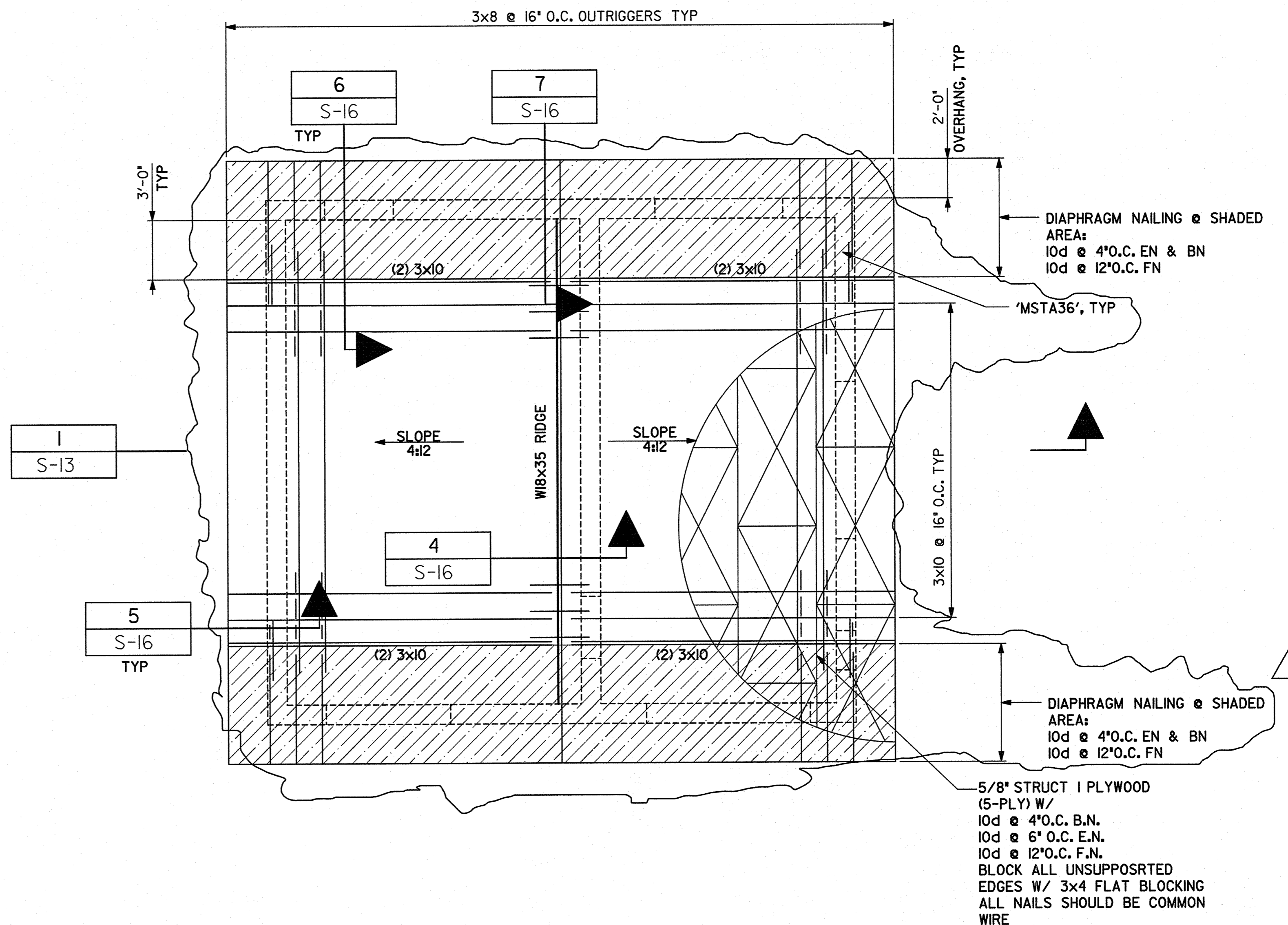
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NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

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s-12.dgn



LOWER ROOF FRAMING PLAN
SCALE: 1/8"=1'-0"



ROOF FRAMING PLAN
SCALE: 1/8"=1'-0"

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DRAWING NO. S-12	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		WATER WBS
SHEET NO. 60	LOWER ROOF AND ROOF FRAMING PLANS		SEWER WBS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 60 OF 118 SHEETS	S-00308	
APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	<i>Hocci Hyan</i> FOR CITY ENGINEER DATE: 10-25-11	BY: _____ APPROVED: _____ DATE: _____ FILMED: _____	PROJECT MANAGER <i>Paul K. Lee</i> CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196- 60 -D
CONTRACTOR _____		DATE STARTED _____	DATE COMPLETED _____

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VERTICAL AS SHOWN

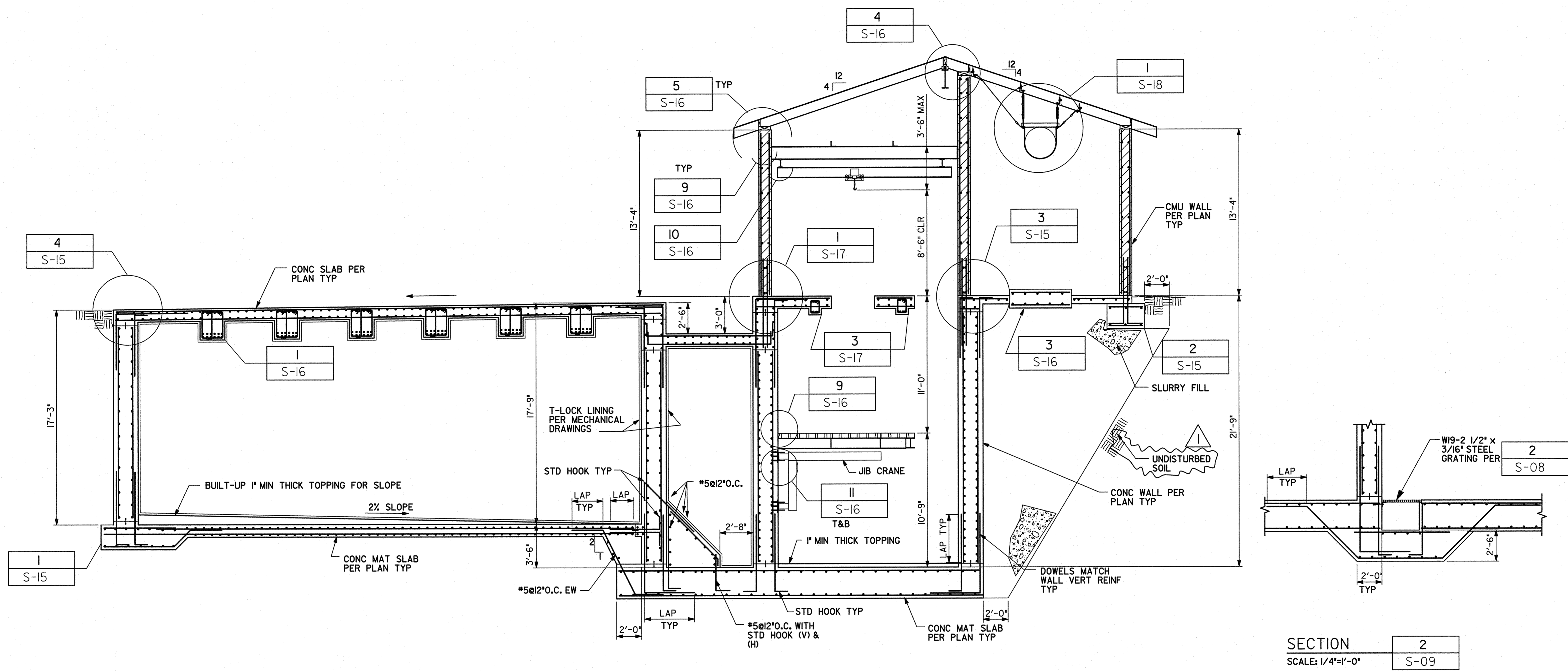
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DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

NOTE:
CONTRACTOR SHALL LATERALLY BRACE TOP OF BELOW GRADE WALLS PRIOR TO INSTALLATION OF FLOOR SLAB.



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s-13.dgn

SECTION 1
SCALE: 1/4"=1'-0" VAR

SECTION 2
SCALE: 1/4"=1'-0" S-09

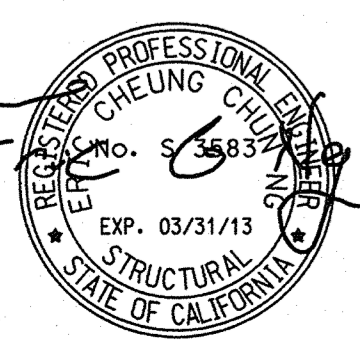
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DRAWING NO. S-13	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 61	SECTIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 61 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hosai Acar 10-25-11 FOR CITY ENGINEER DATE	PROJECT MANAGER 302-1737 LAMBERT COORDINATES
CHECKED BY: CONSTRUCTION ENGINEER	BY APPROVED DATE FILMED	CONTRACTOR INSPECTOR
CHECKED BY: INSPECTOR	DATE STARTED DATE COMPLETED	36196- 61 -D

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

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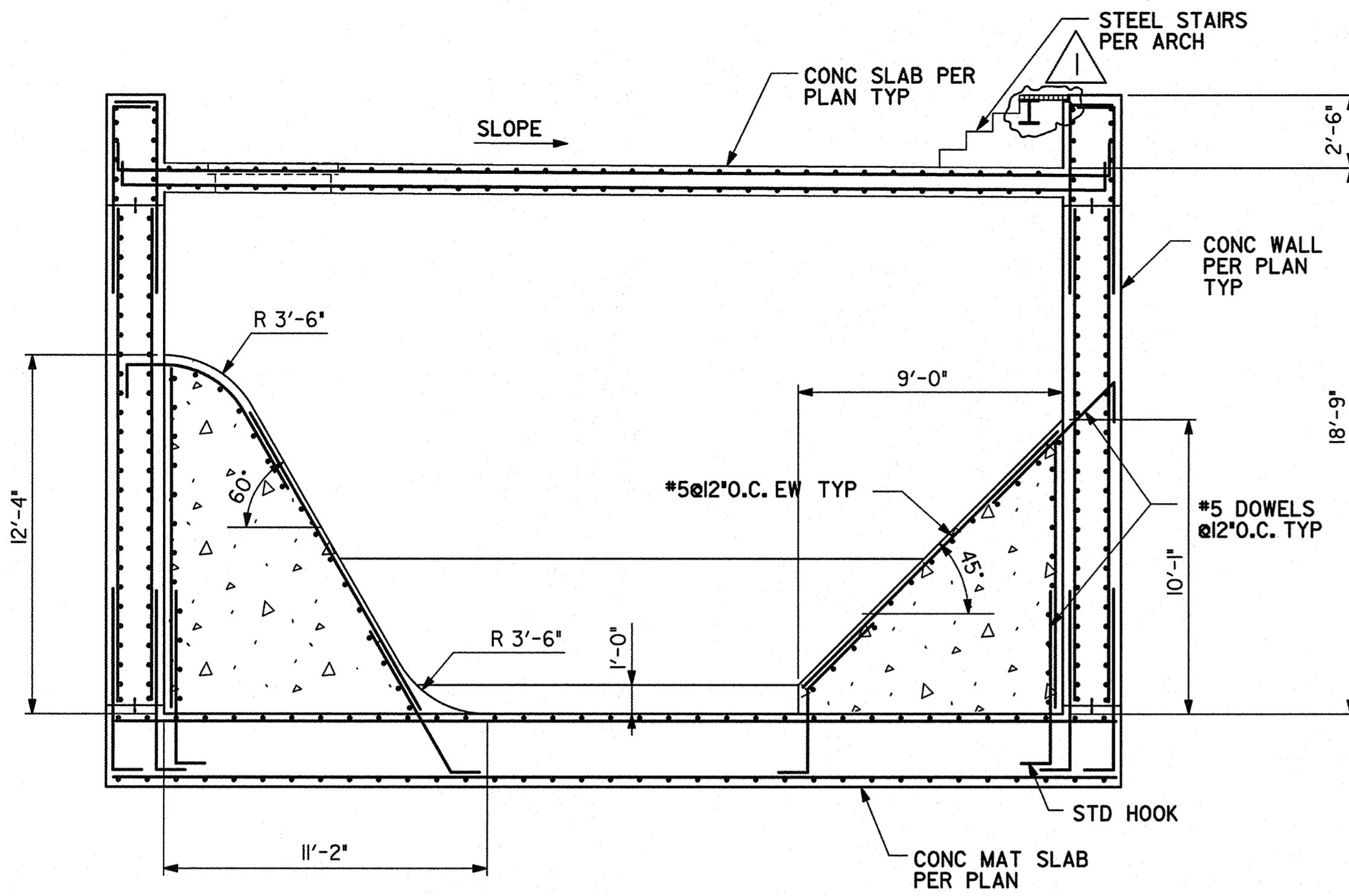


WARNING
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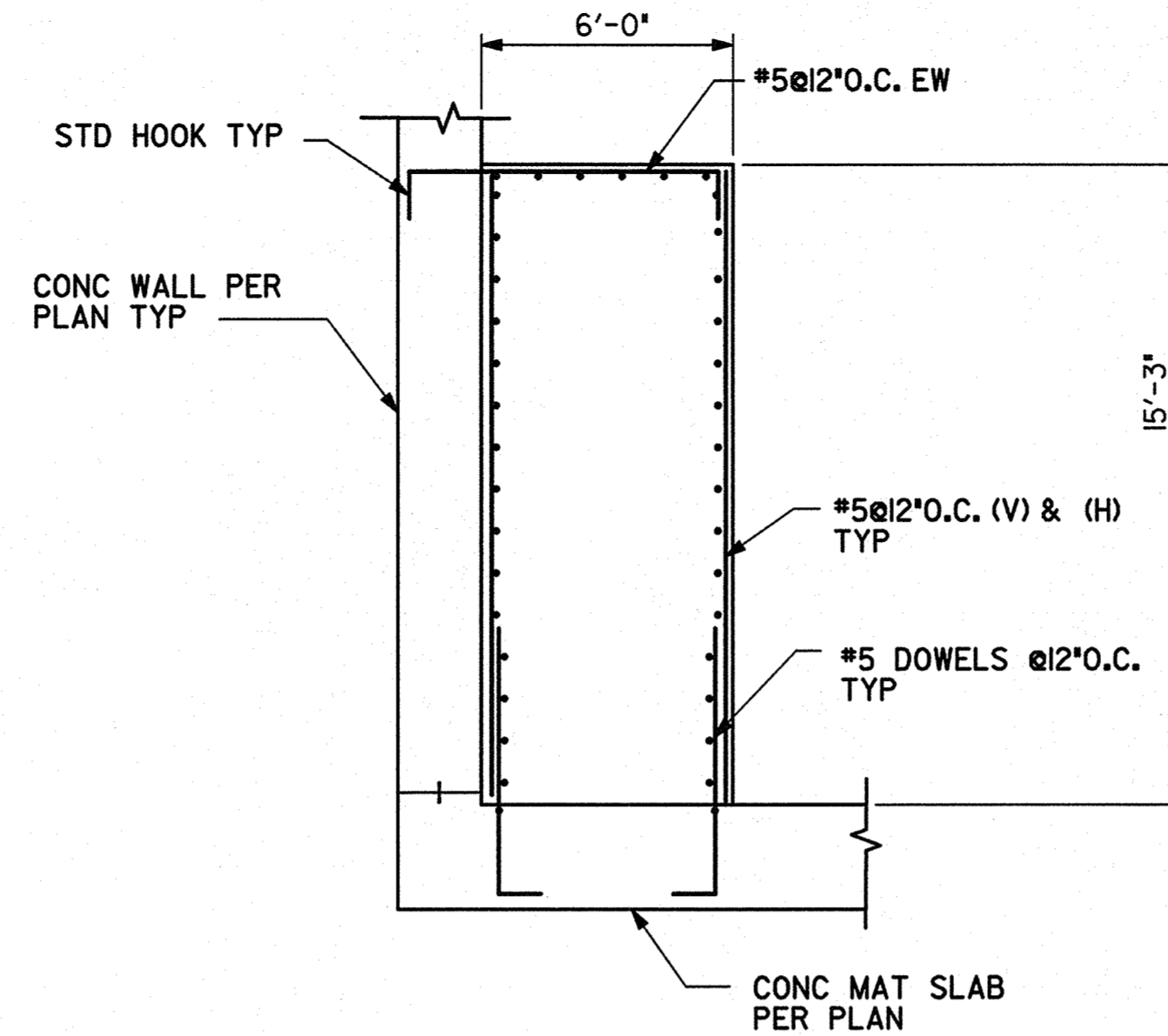
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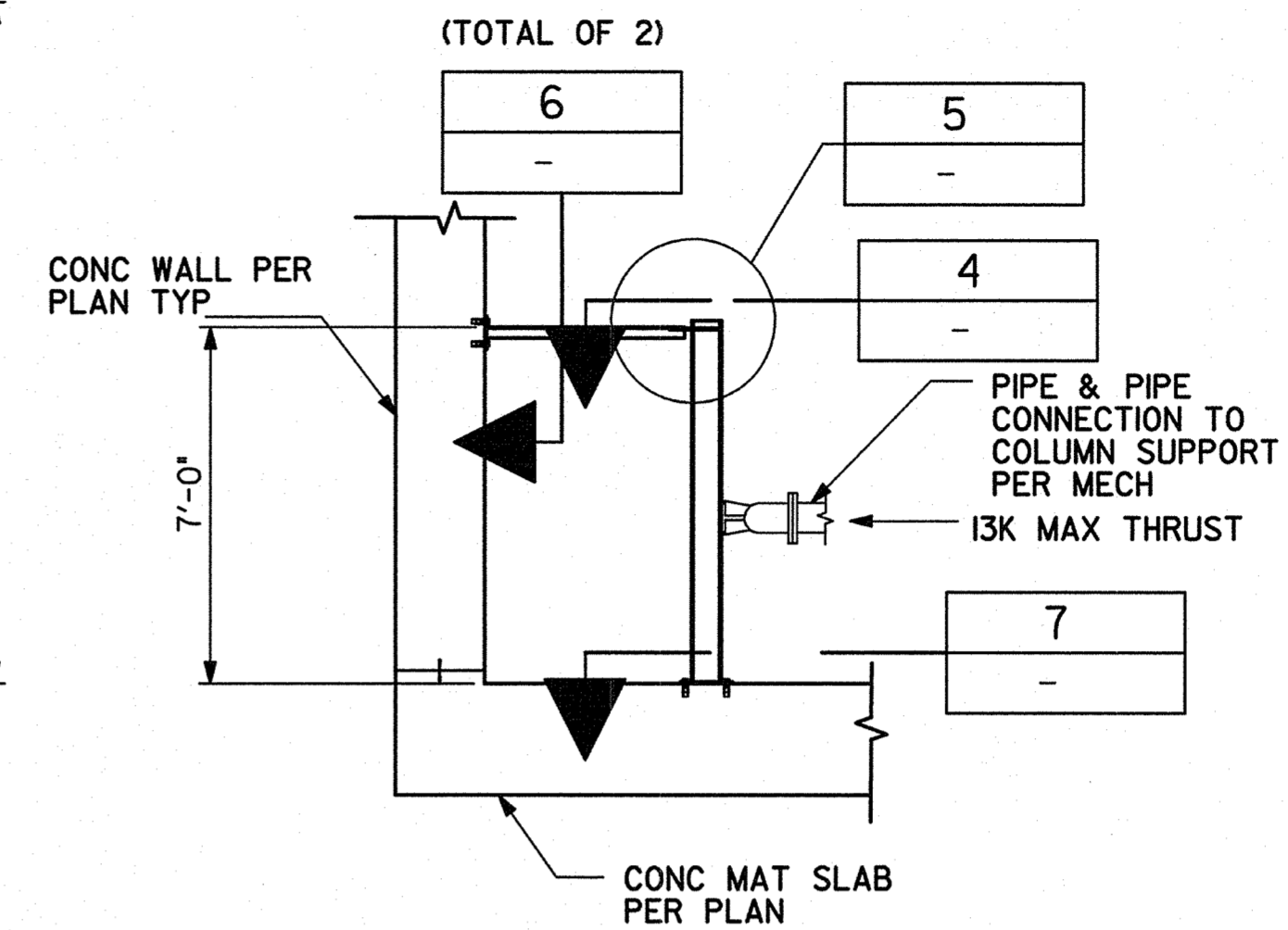
s-14.dgn



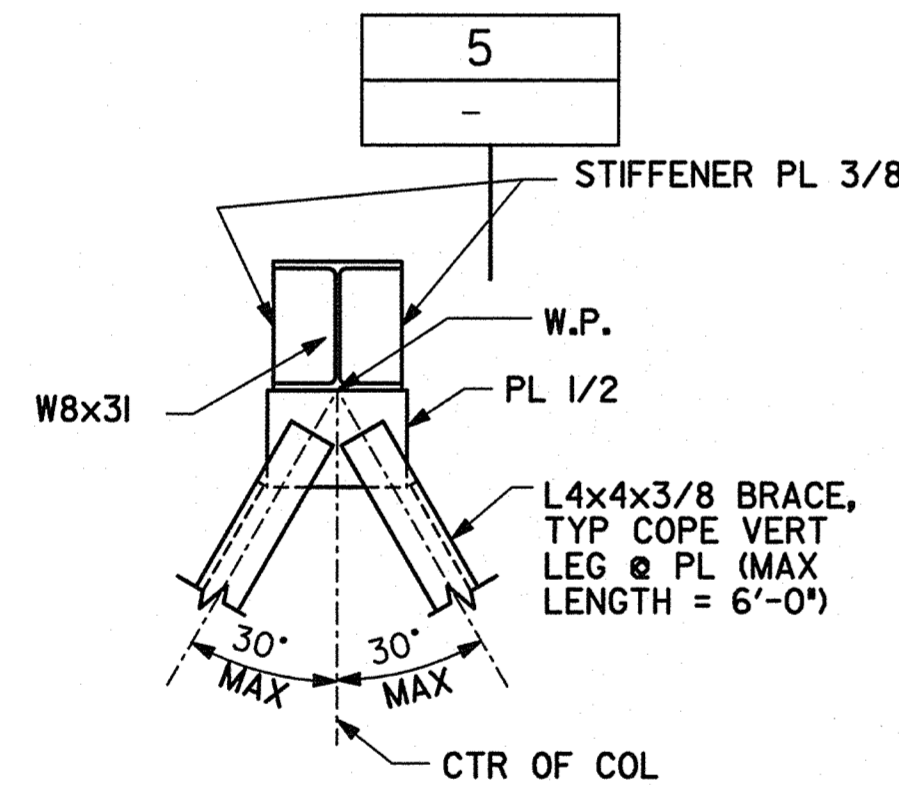
SECTION 1
SCALE: 1/4"=1'-0"
VAR



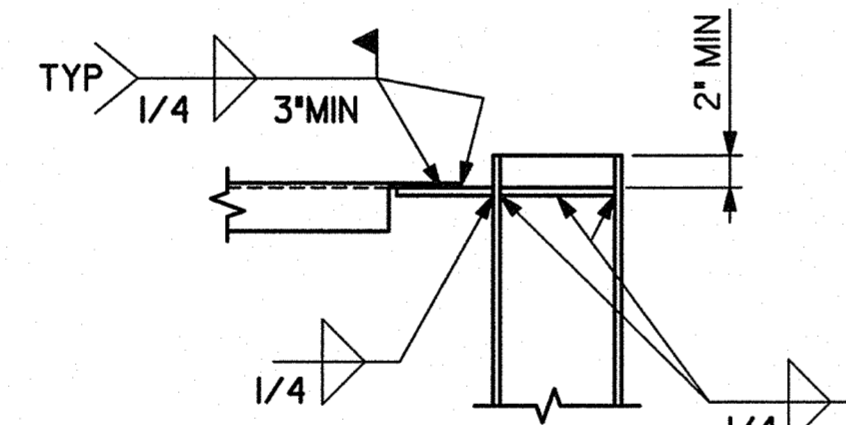
SECTION 2
SCALE: 1/4"=1'-0"
S-09



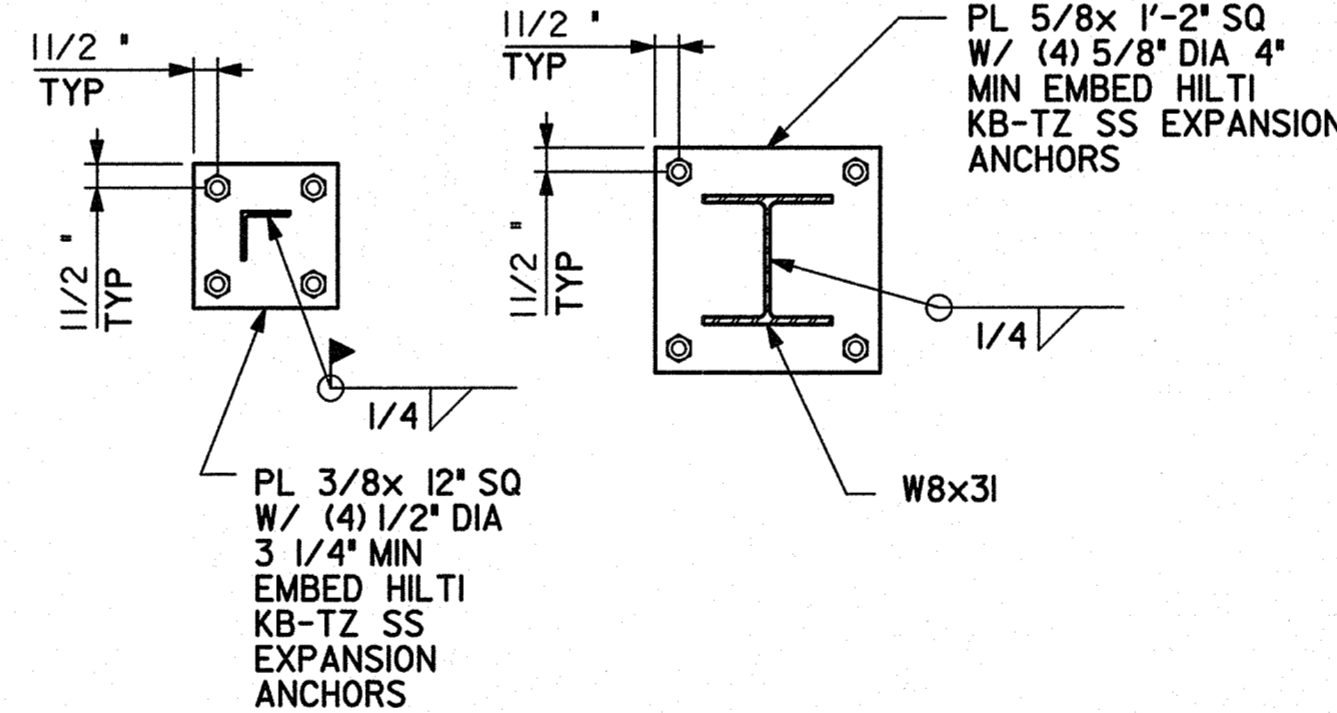
SECTION 3
SCALE: 1/4"=1'-0"
S-09



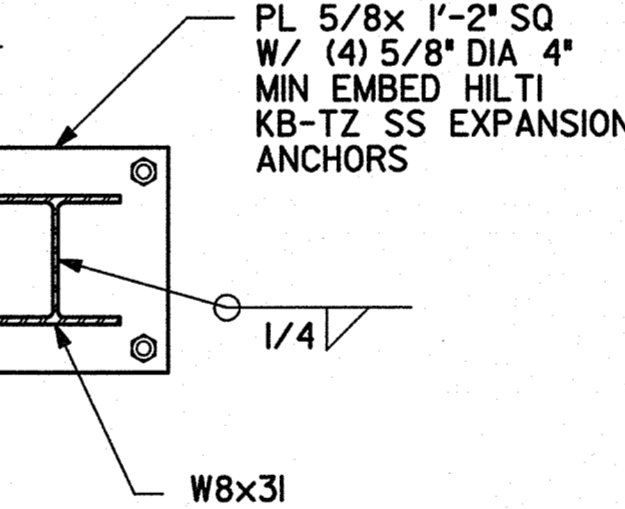
DETAIL 4
SCALE: 1"=1'-0"



DETAIL 5
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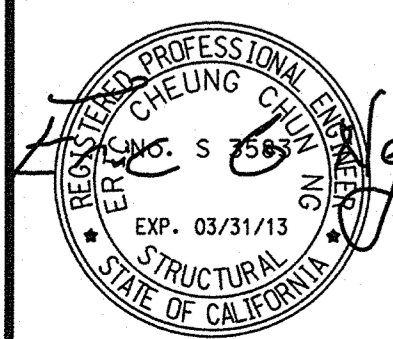
DETAIL 6
NOT TO SCALE



DETAIL 7
SCALE: 1"=1'-0"

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DRAWING NO. S-14	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 62	SECTIONS AND DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 62 OF 118 SHEETS	WATER WBS SEWER WBS S-00308



WARNING
0 1/2 1
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PUBLIC WORKS PROJECT**

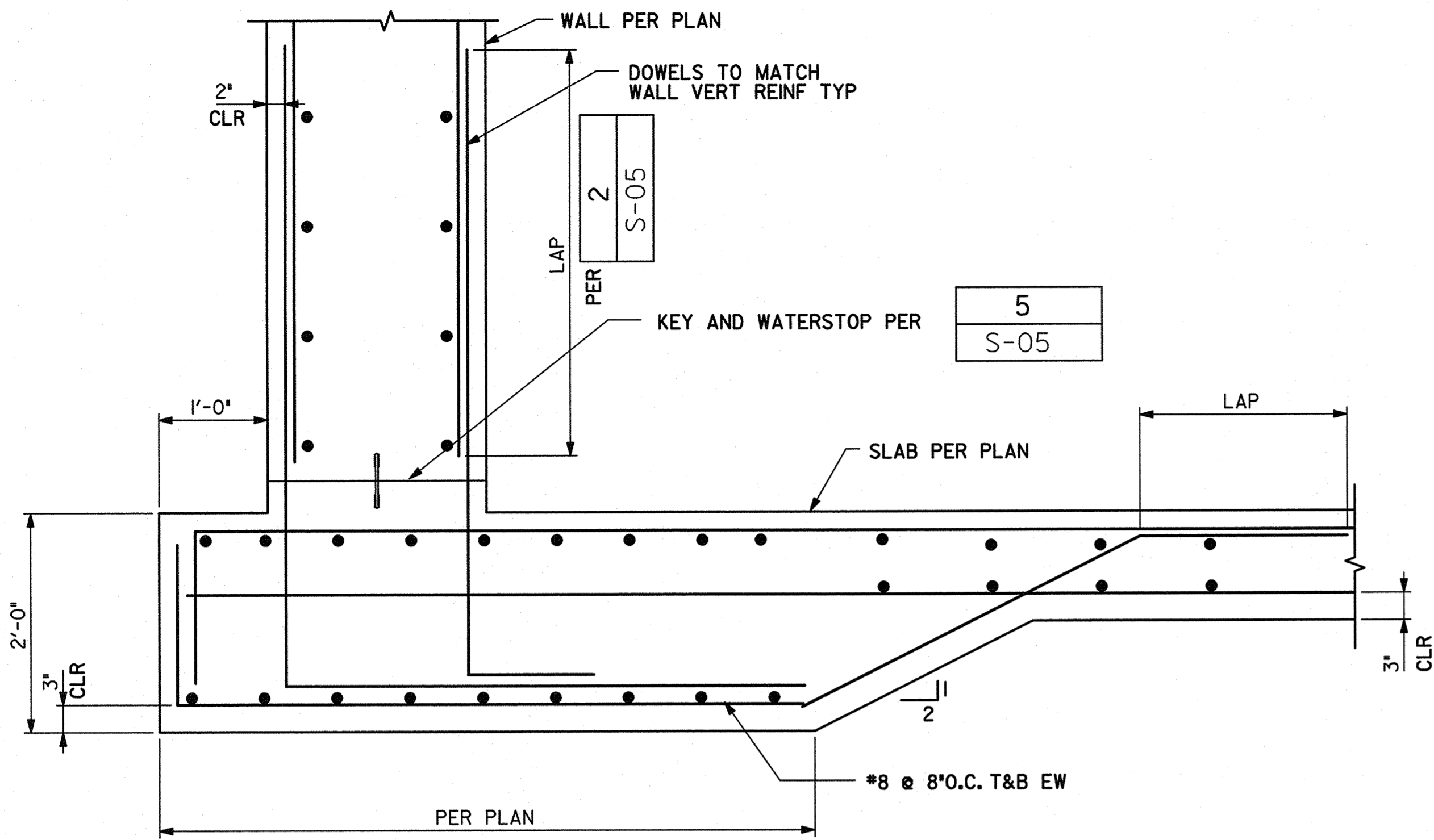


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

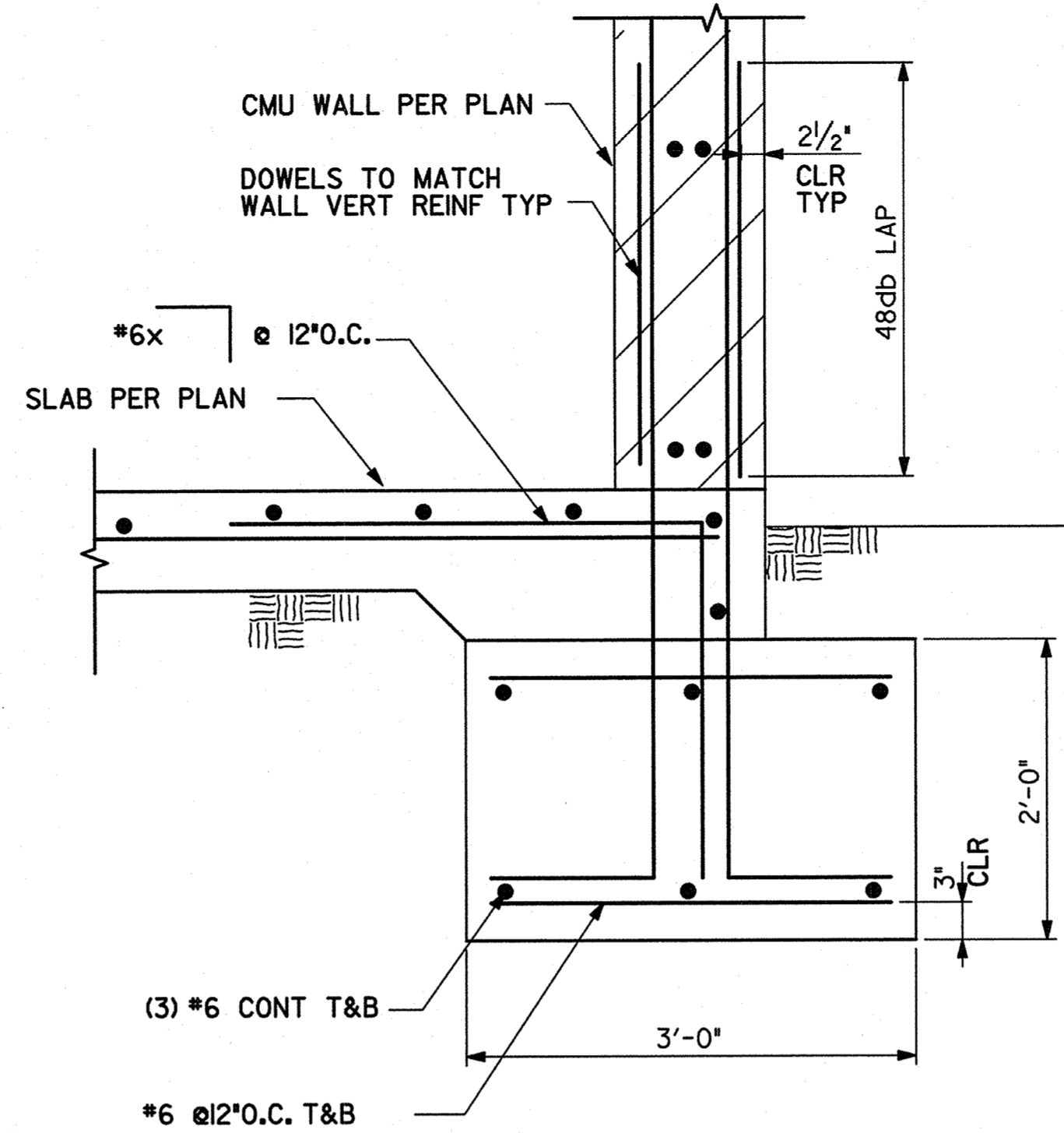
APPROVED BY: FOR CITY ENGINEER CHECKED BY: CONSTRUCTION ENGINEER CHECKED BY: INSPECTOR	DESCRIPTION BY APPROVED DATE FILMED	DATE 10-25-11	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES 36196-62-D
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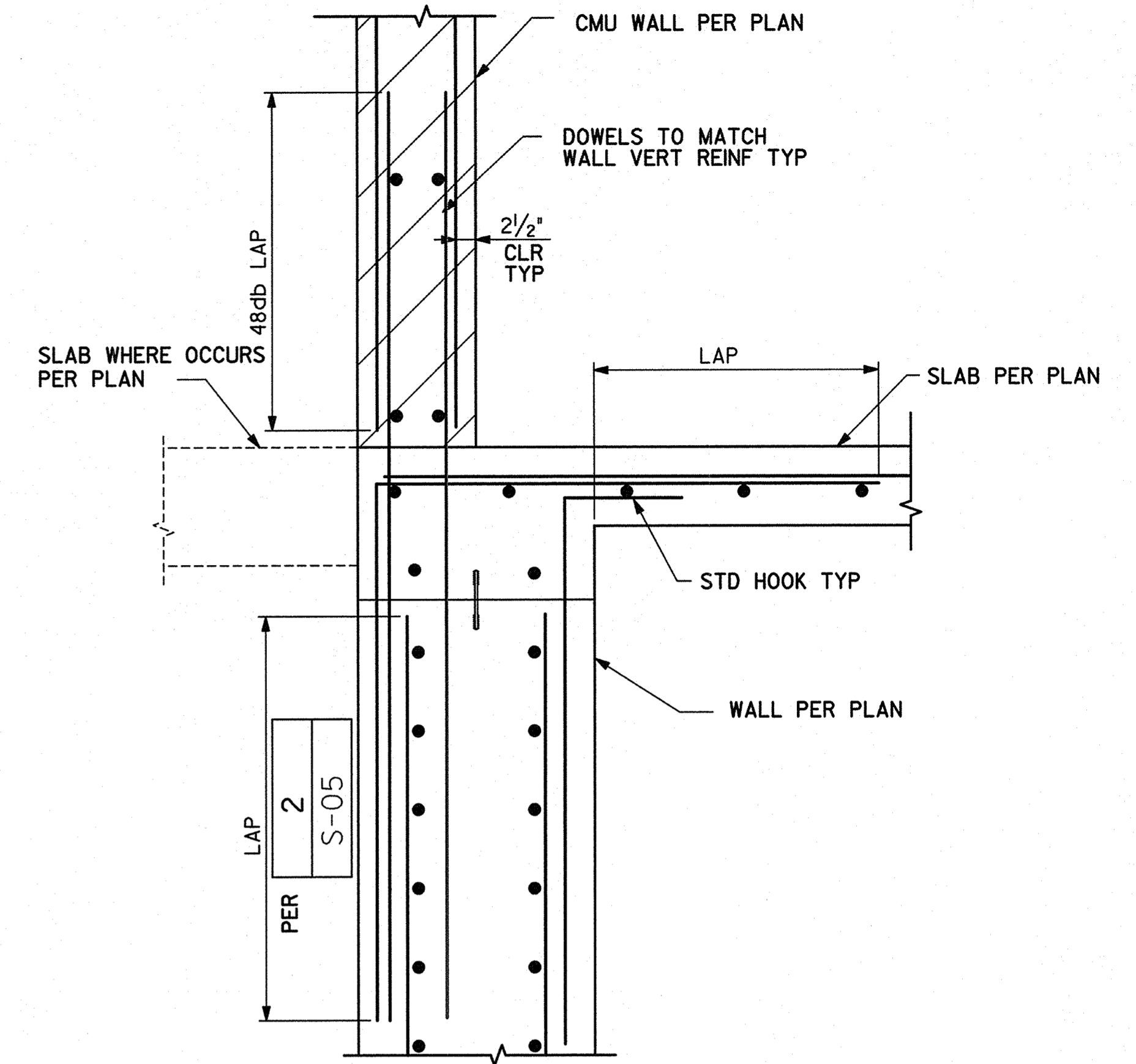
s-15.dgn



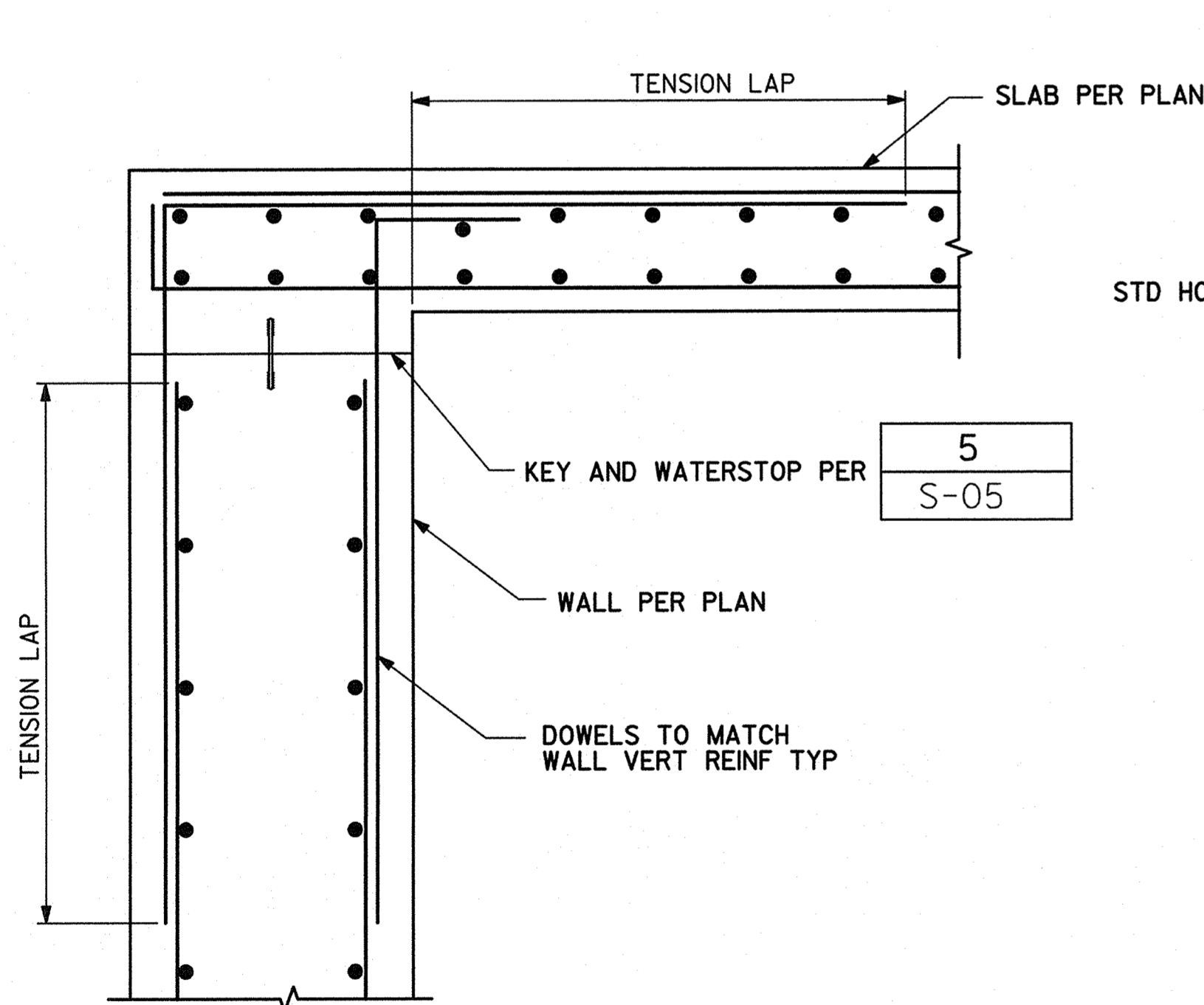
WALL FTG DETAIL 1
1'-1'-0" VAR



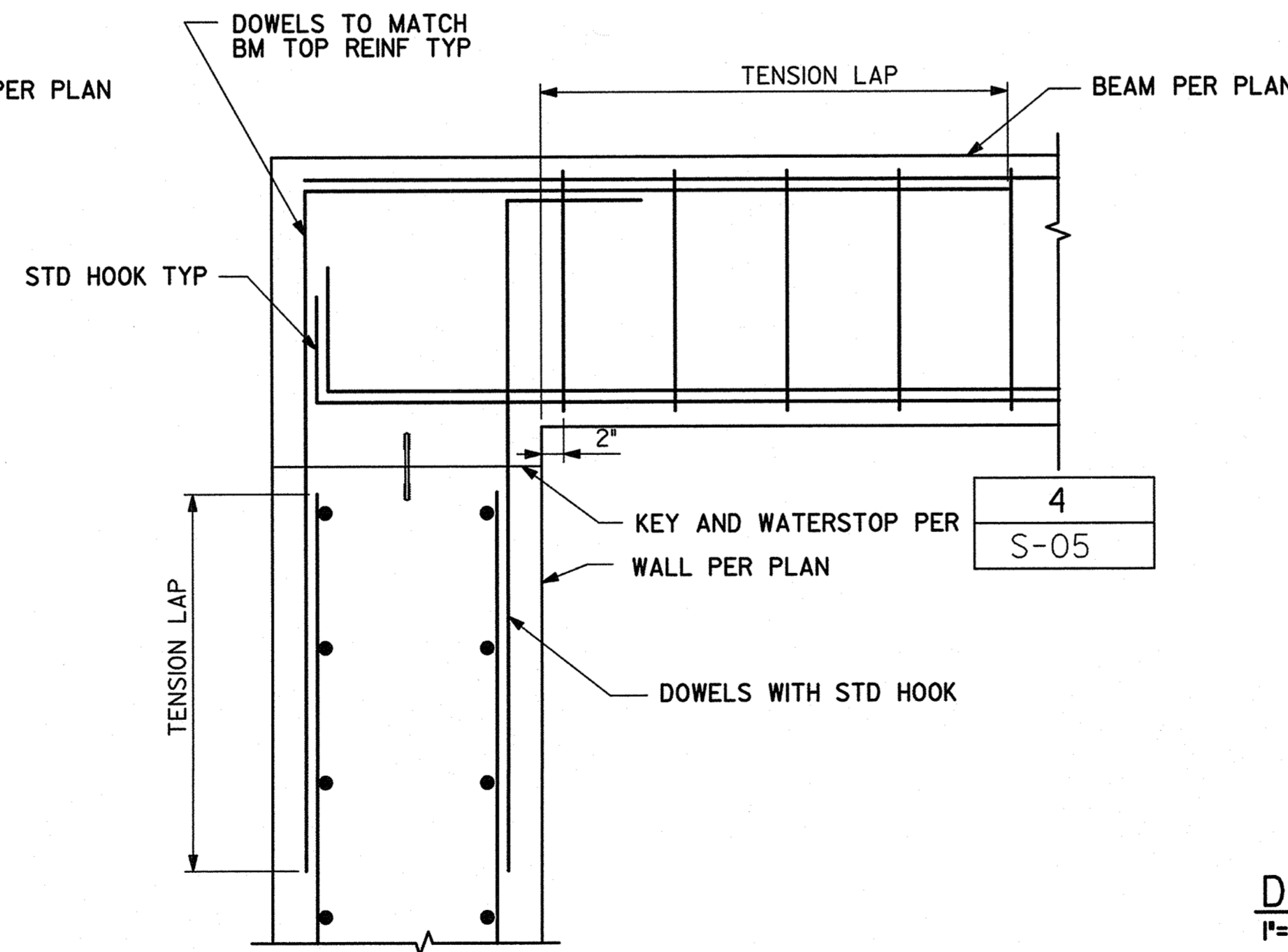
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1'-1'-0" VAR



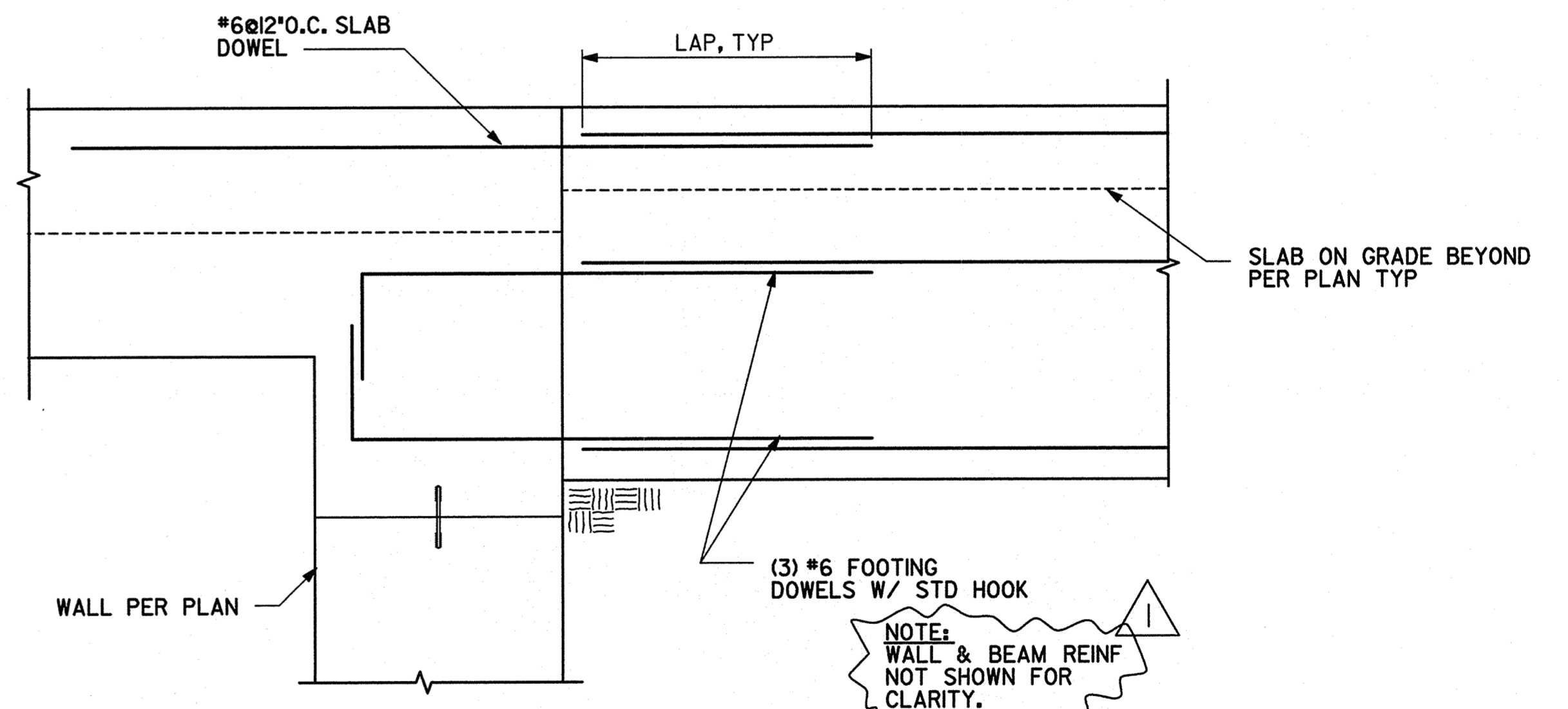
DETAIL 3
1'-1'-0" VAR



SLAB TO WALL DETAIL 4
1'-1'-0" VAR



BEAM TO WALL DETAIL 5
1'-1'-0" VAR



DETAIL 6
1'-1'-0" VAR

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San Diego, CA 92131 (858) 566-3113

DRAWING NO. S-15	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 63	STRUCTURAL DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 63 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DATE 10-25-11	PROJECT MANAGER Paul J. Lee
CHECKED BY: CONSTRUCTION ENGINEER	BY	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
INSPECTOR	DATE STARTED	CONTRACTOR 36196-63-D
	DATE COMPLETED	

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			



WARNING
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE.

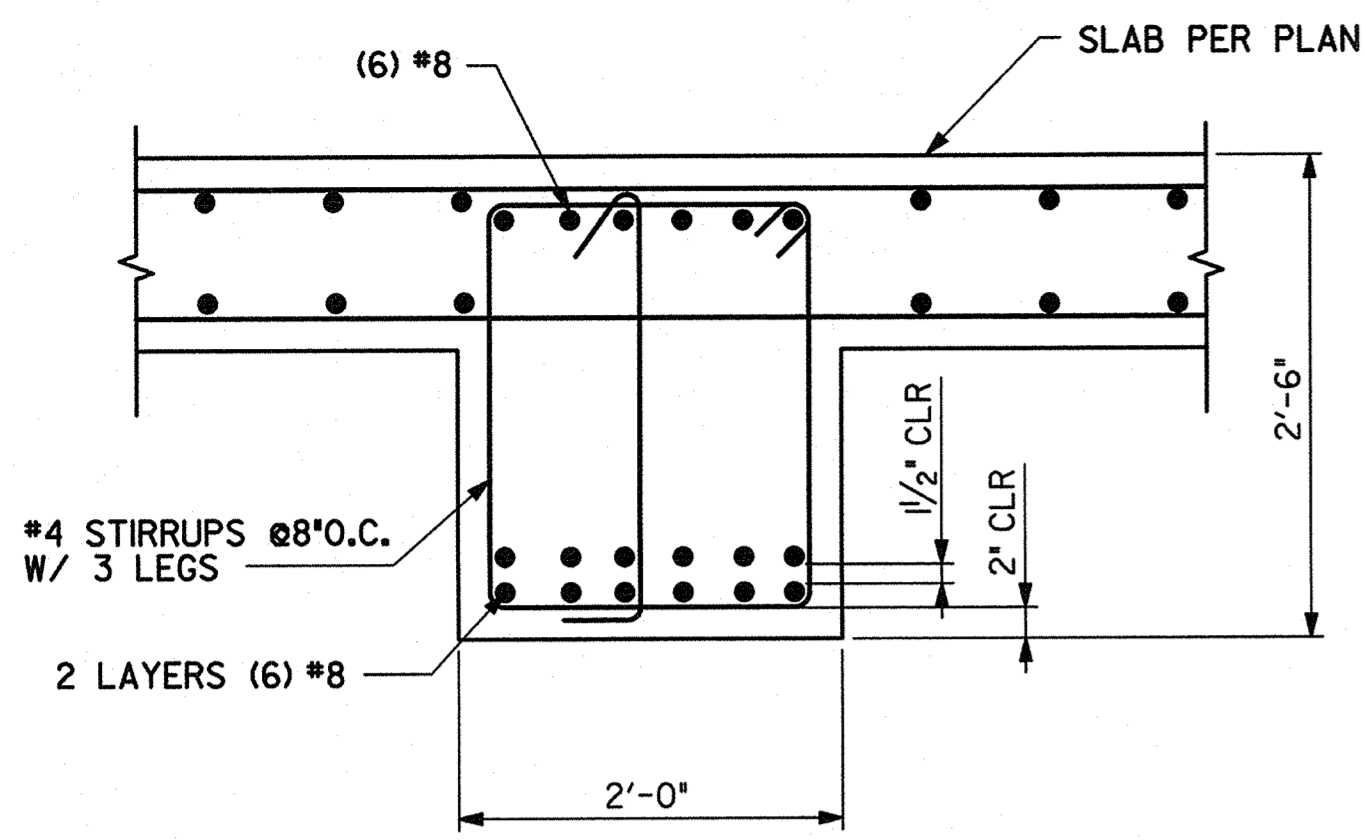
HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858) 712-8400 FAX (858) 712-8333

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

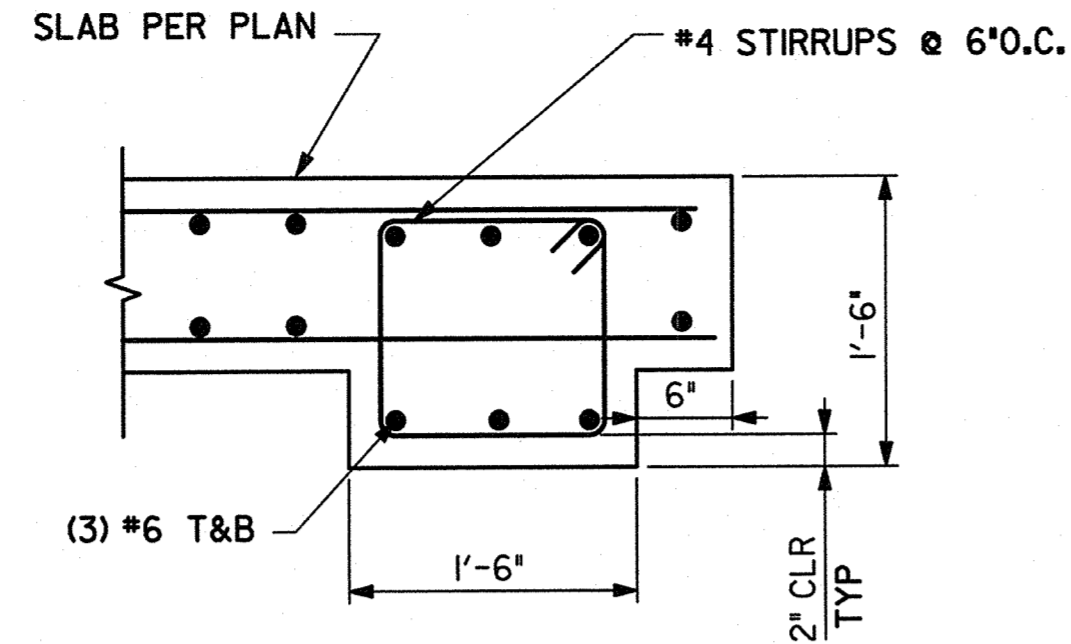


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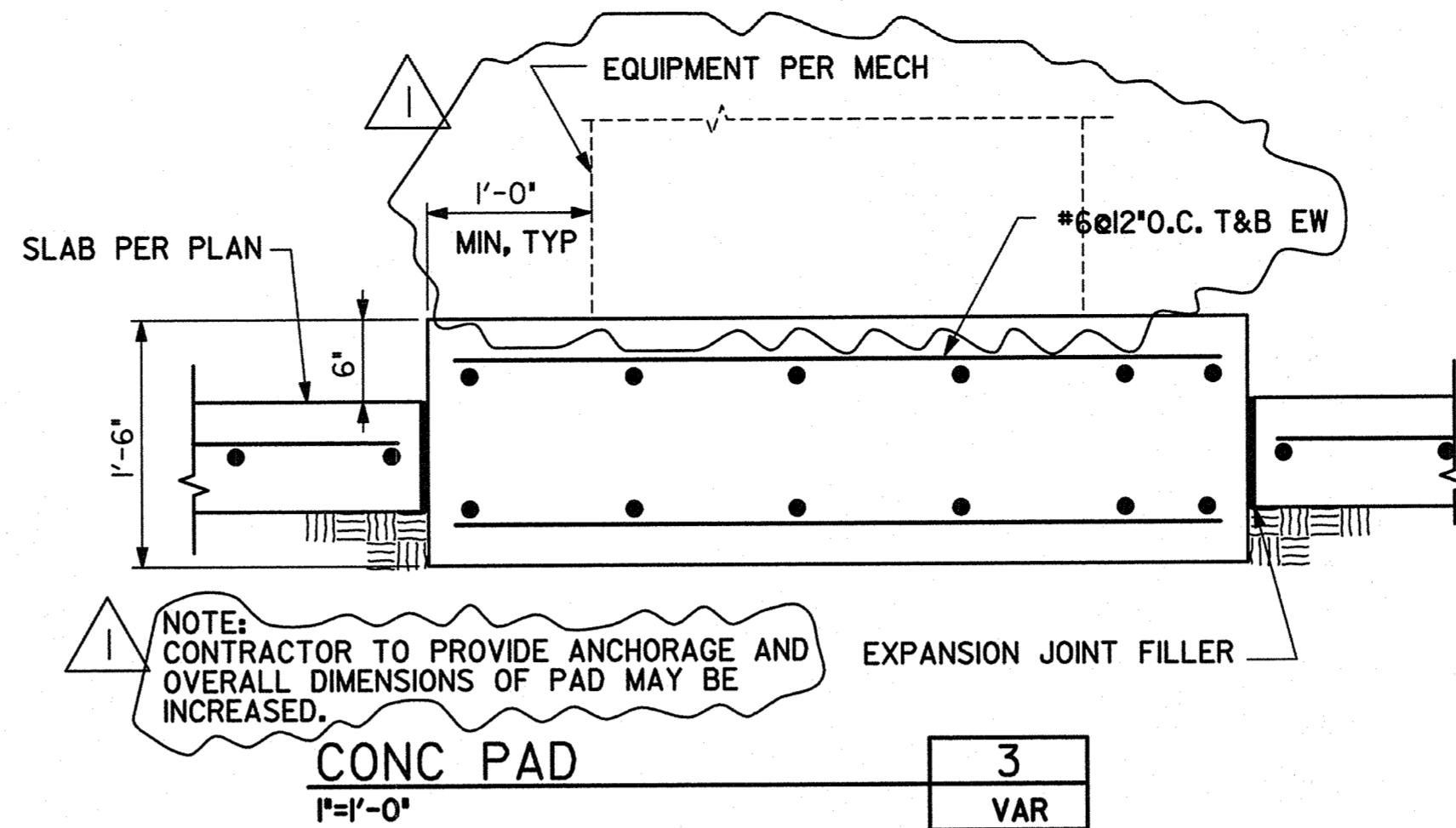
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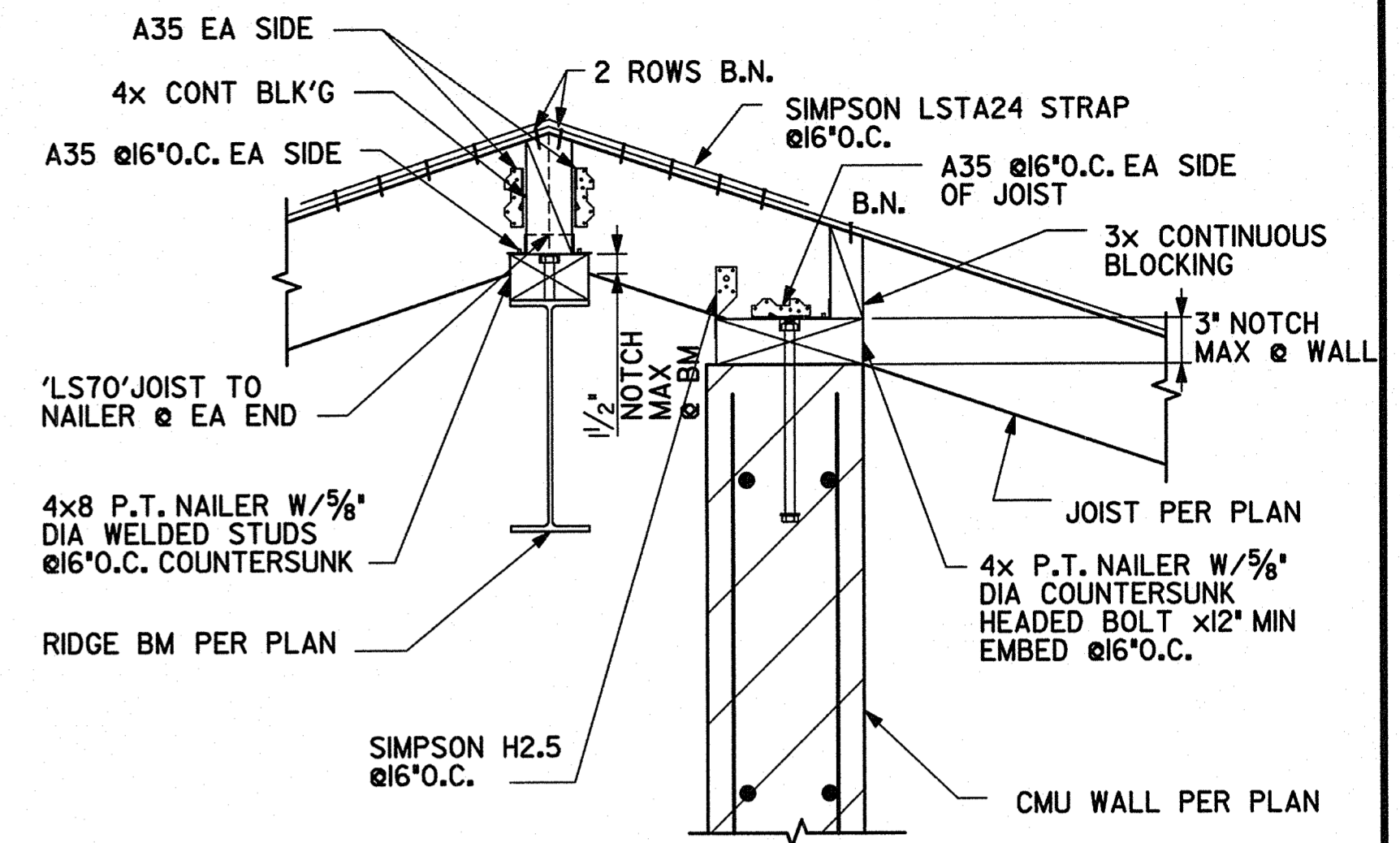
CONC BEAM SECTION B1
1'-0" VAR



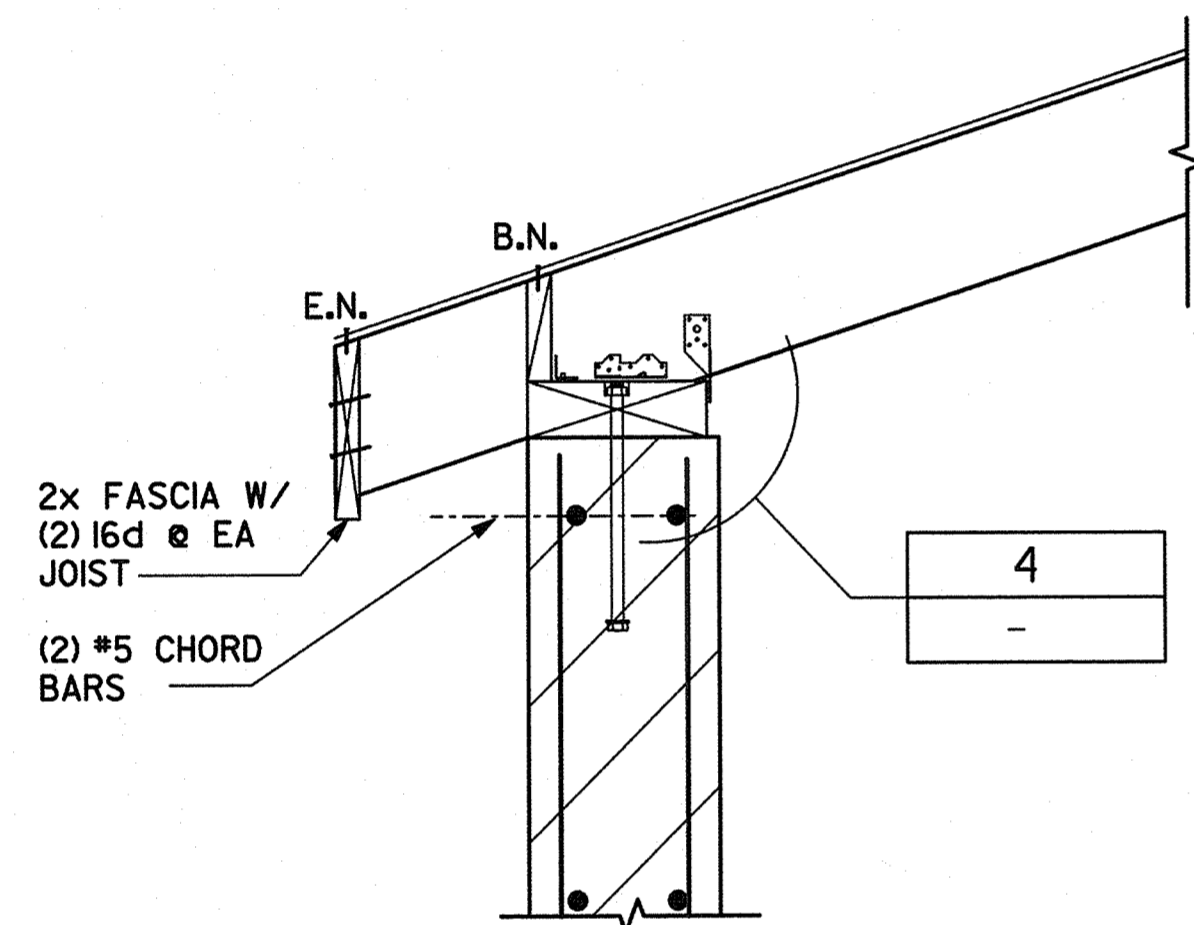
CONC BEAM SECTION B2
1'-0" VAR



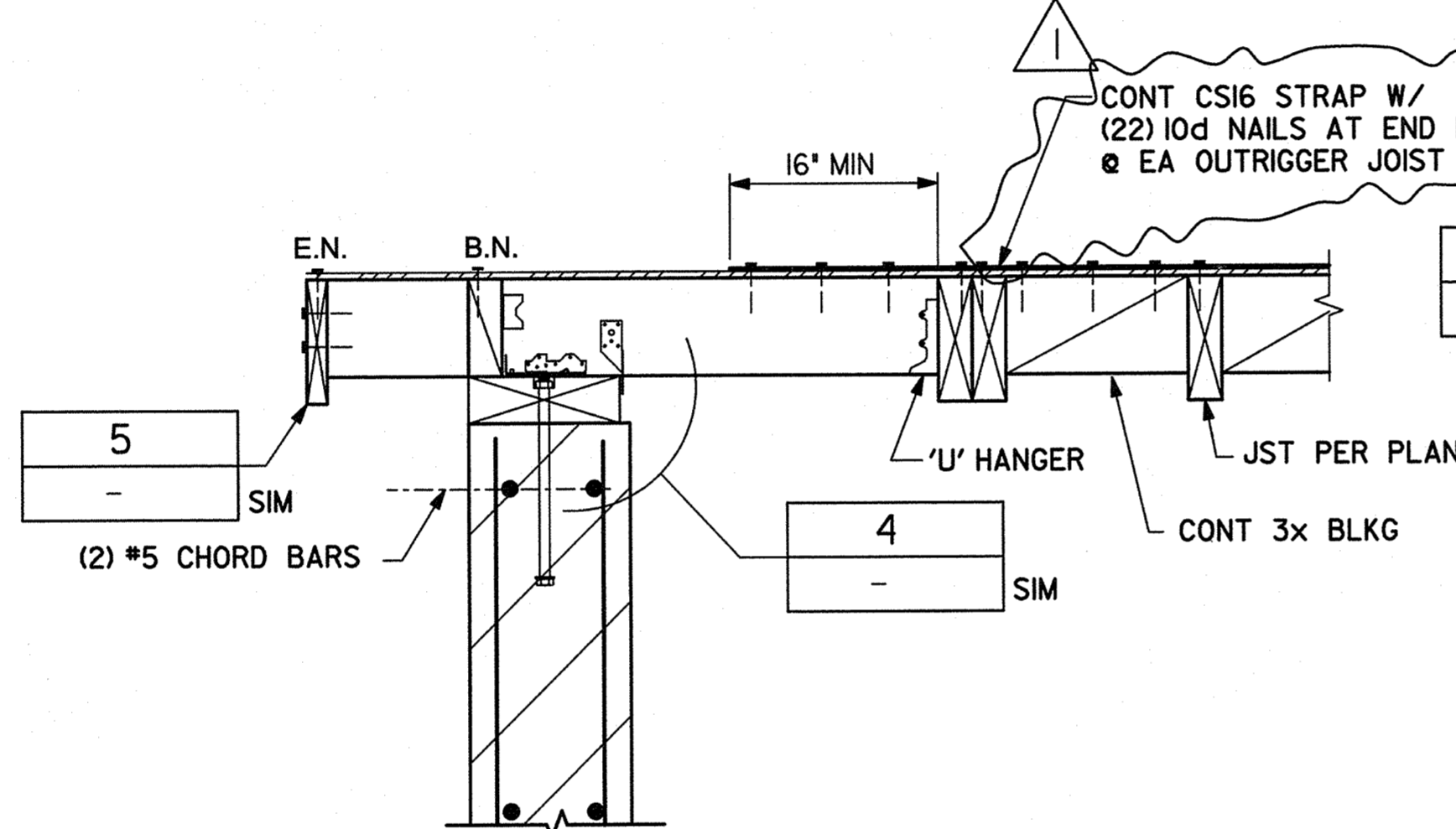
CONC PAD
1'-0" 3 VAR



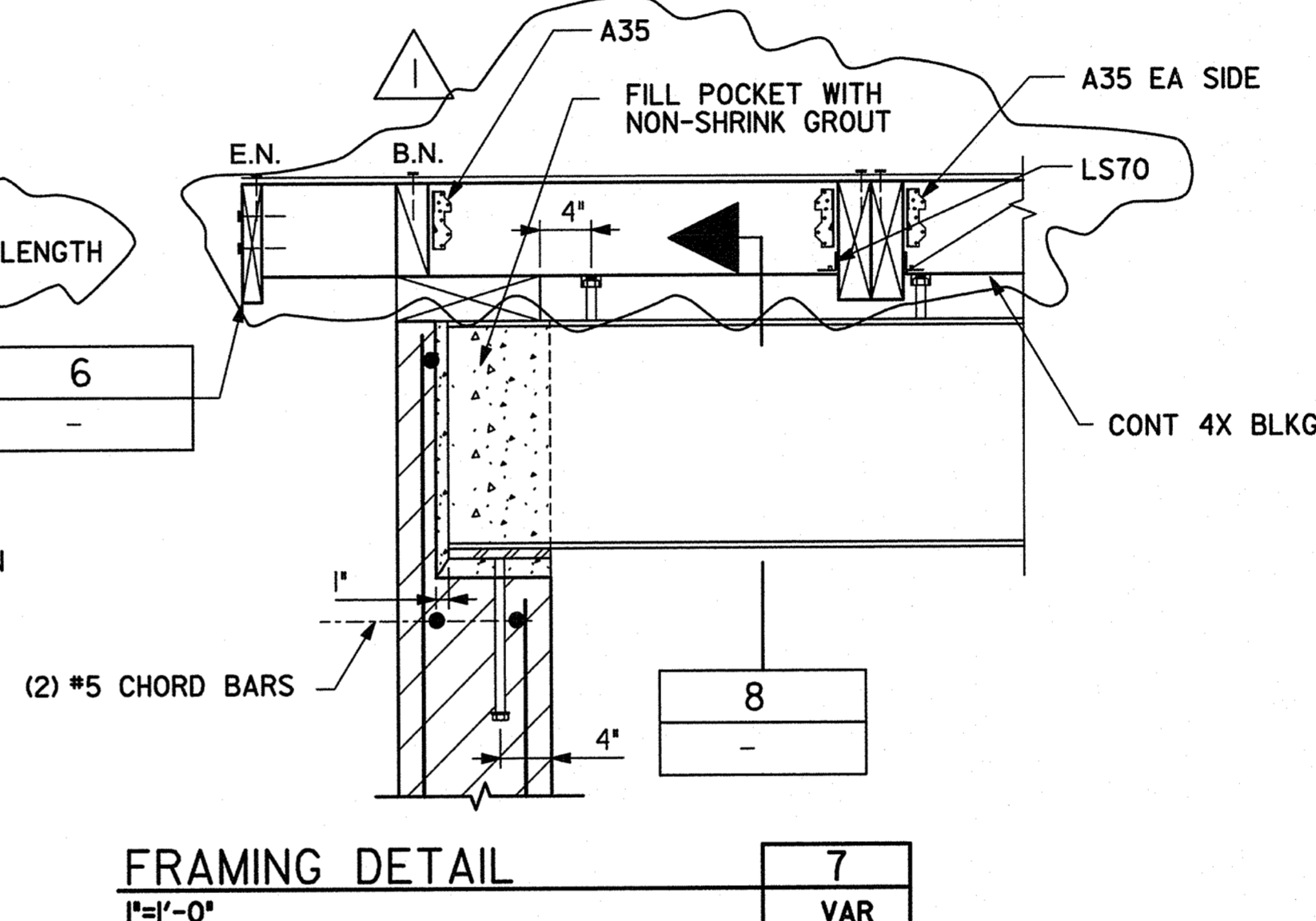
FRAMING DETAIL
1'-0" 4 VAR



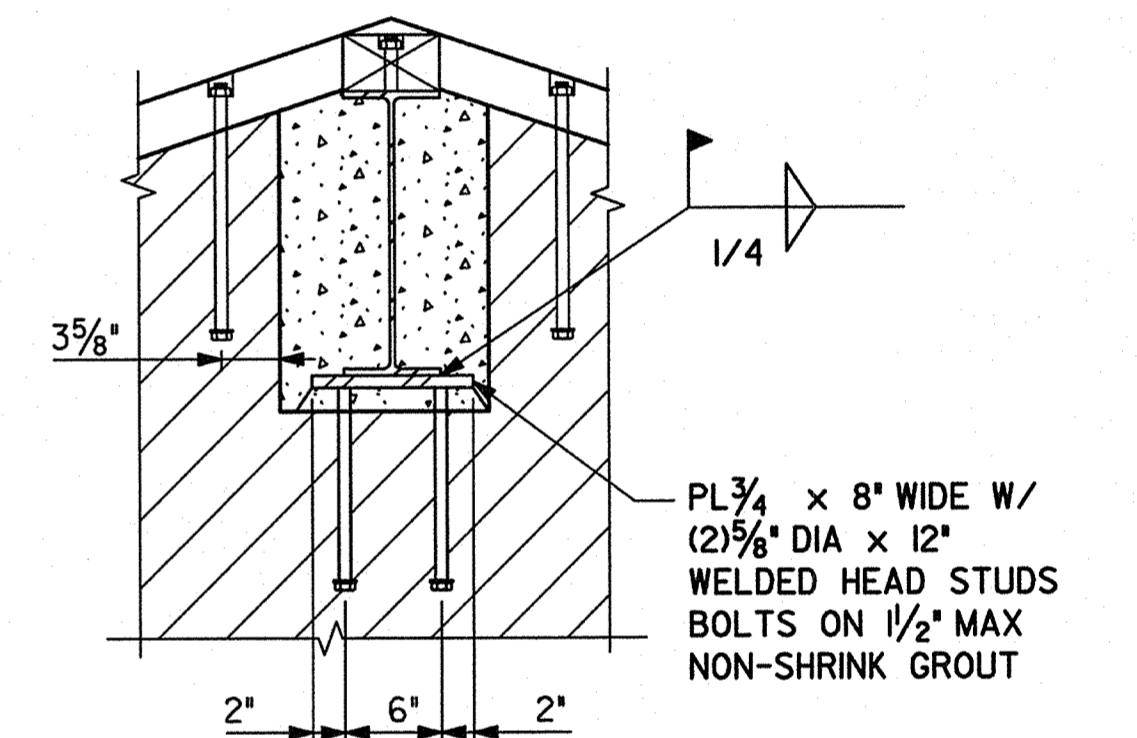
FRAMING DETAIL
1'-0" 5 VAR



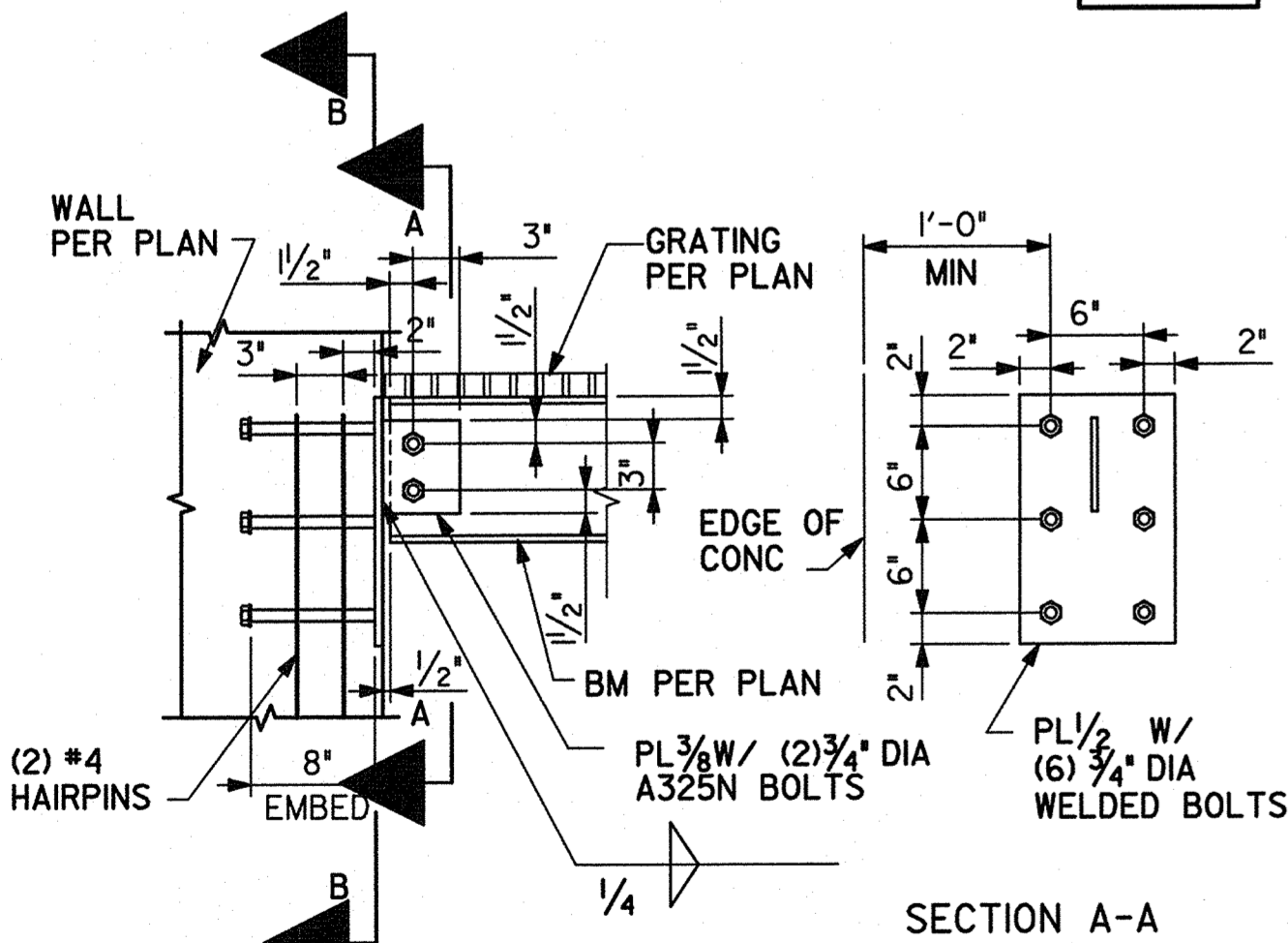
FRAMING DETAIL
1'-0" 6 VAR



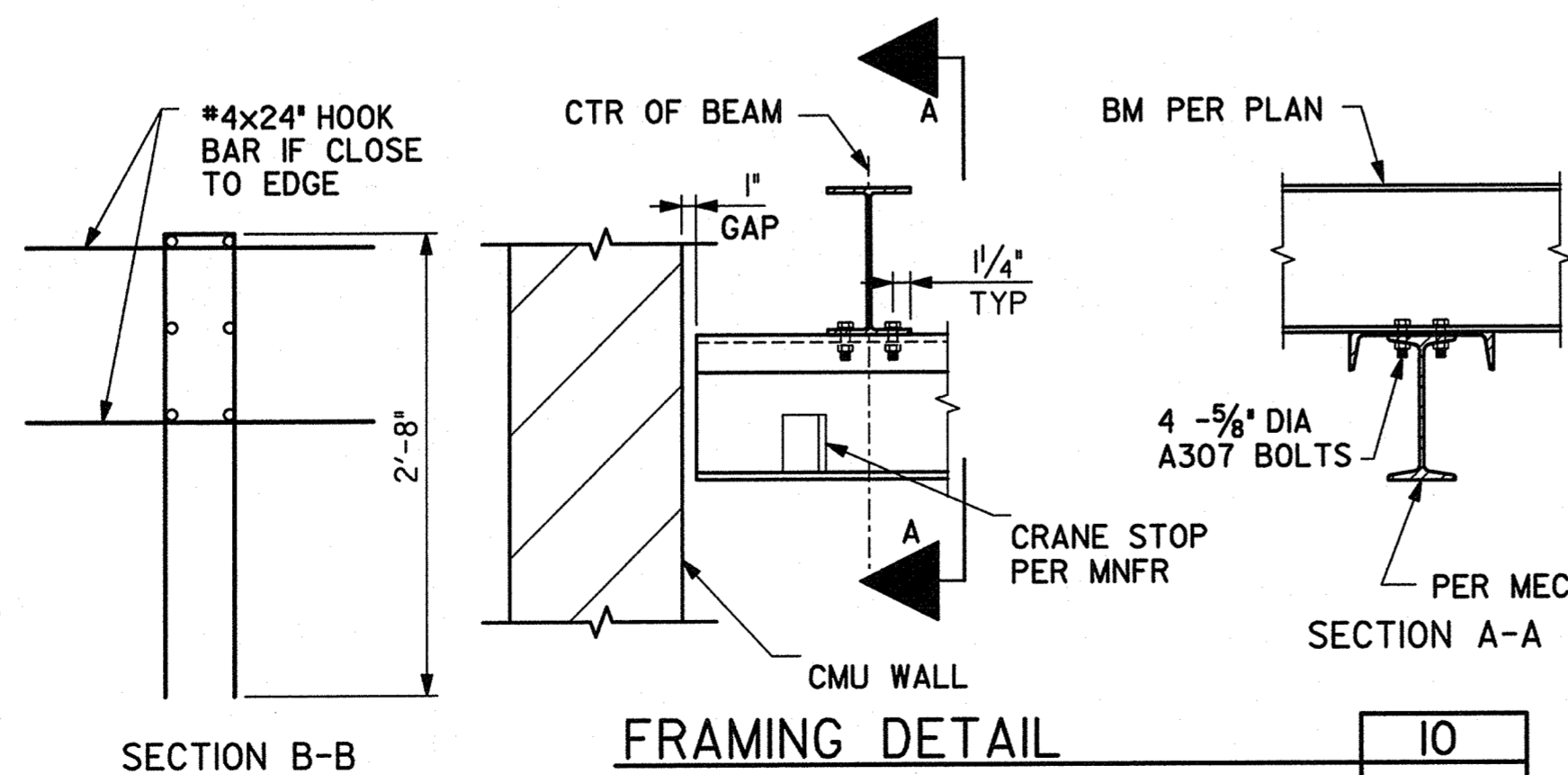
FRAMING DETAIL
1'-0" 7 VAR



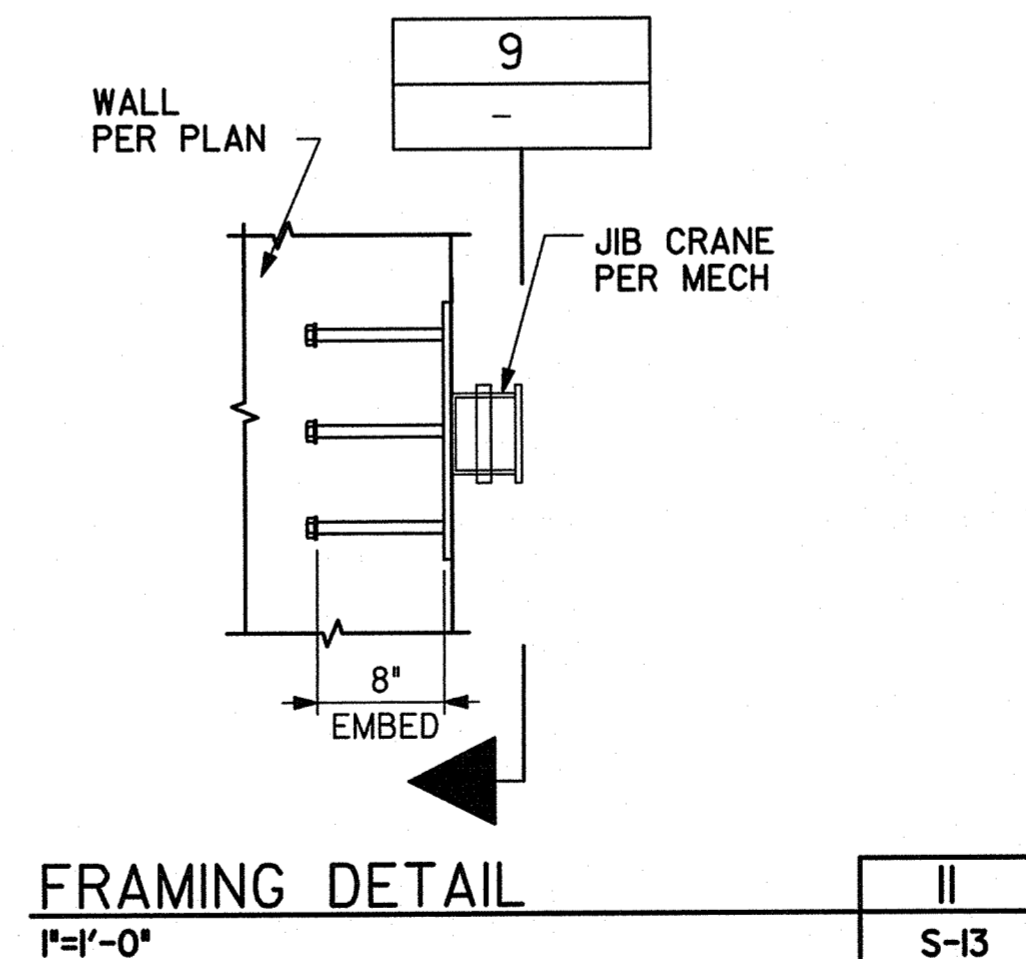
FRAMING DETAIL
1'-0" 8



FRAMING DETAIL
1'-0" 9 VAR



FRAMING DETAIL
1'-0" 10 VAR

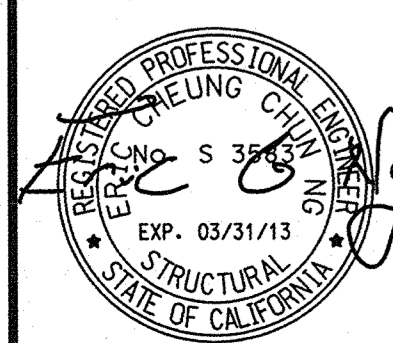


FRAMING DETAIL
1'-0" 11 S-13

SW SIMON WONG ENGINEERING
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DRAWING NO. S-16	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 64	STRUCTURAL DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 64 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION Hogca	DATE 10-25-11
CHECKED BY: CONSTRUCTION ENGINEER	BY	APPROVED DATE FILMED
CHECKED BY: INSPECTOR	INSPECTOR	DATE STARTED DATE COMPLETED
CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES		36196-64-D



WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1\"/>

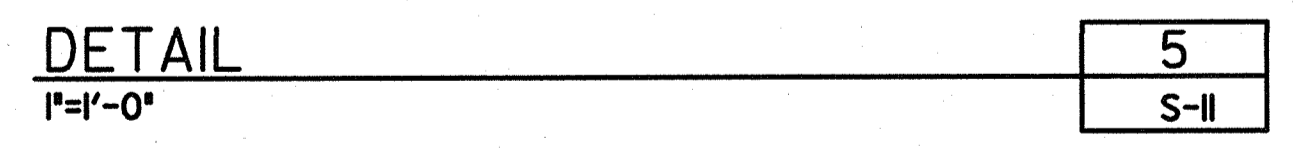
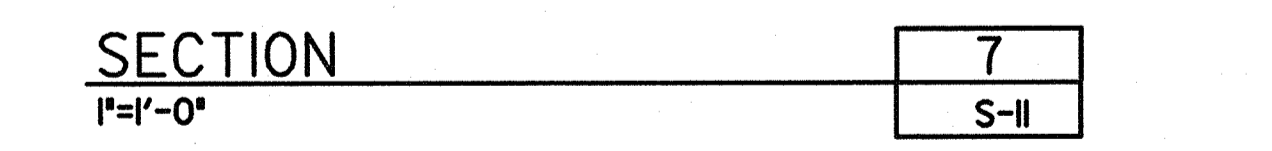
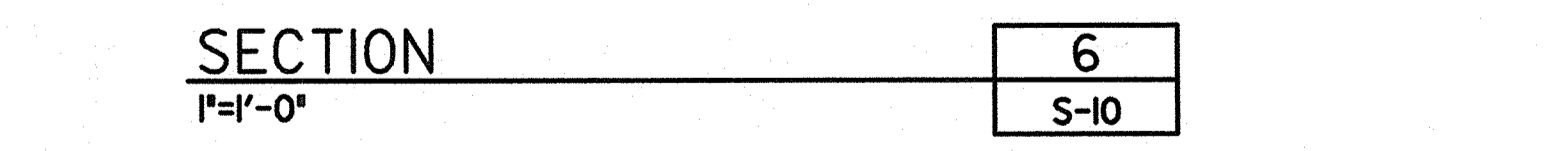
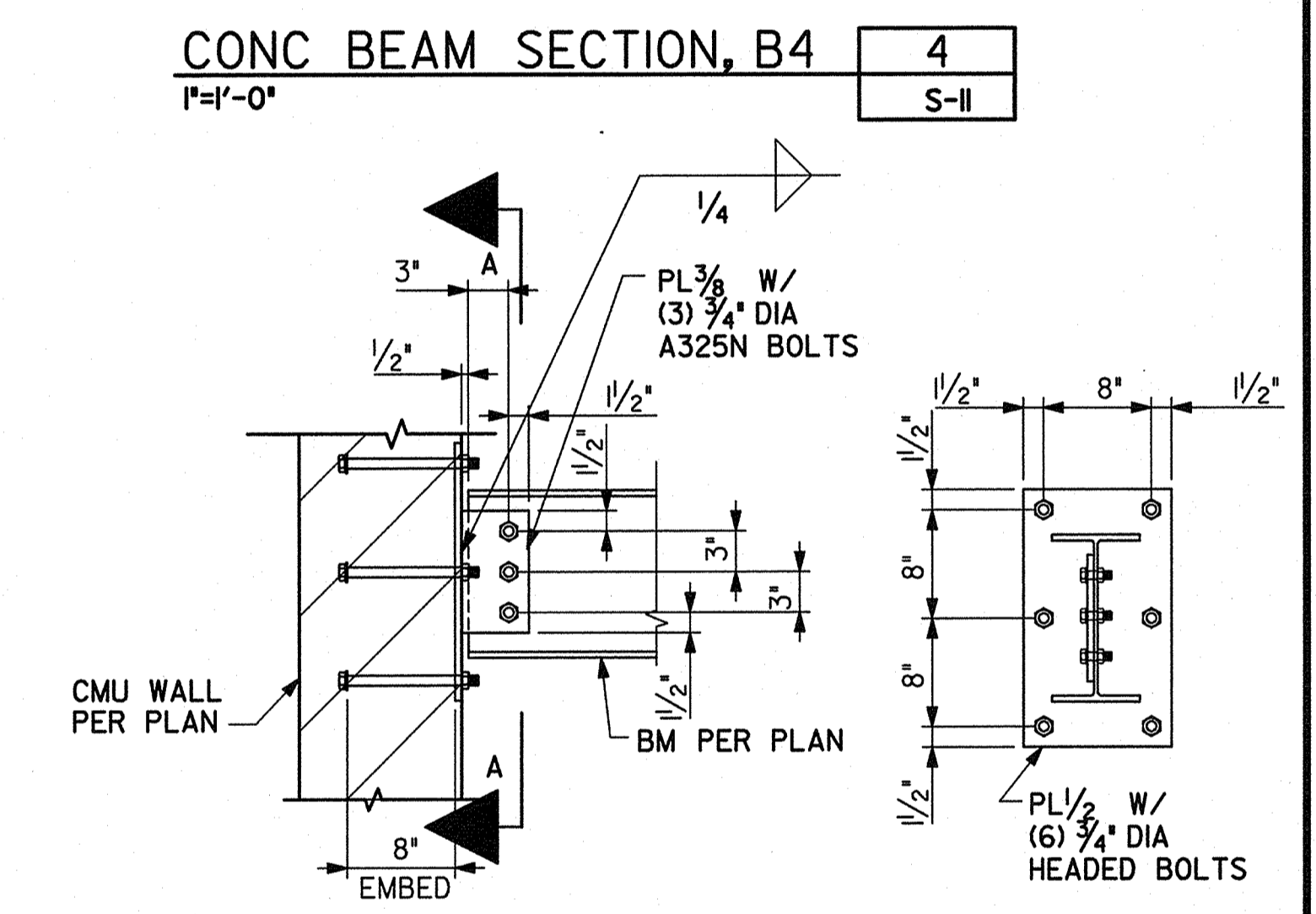
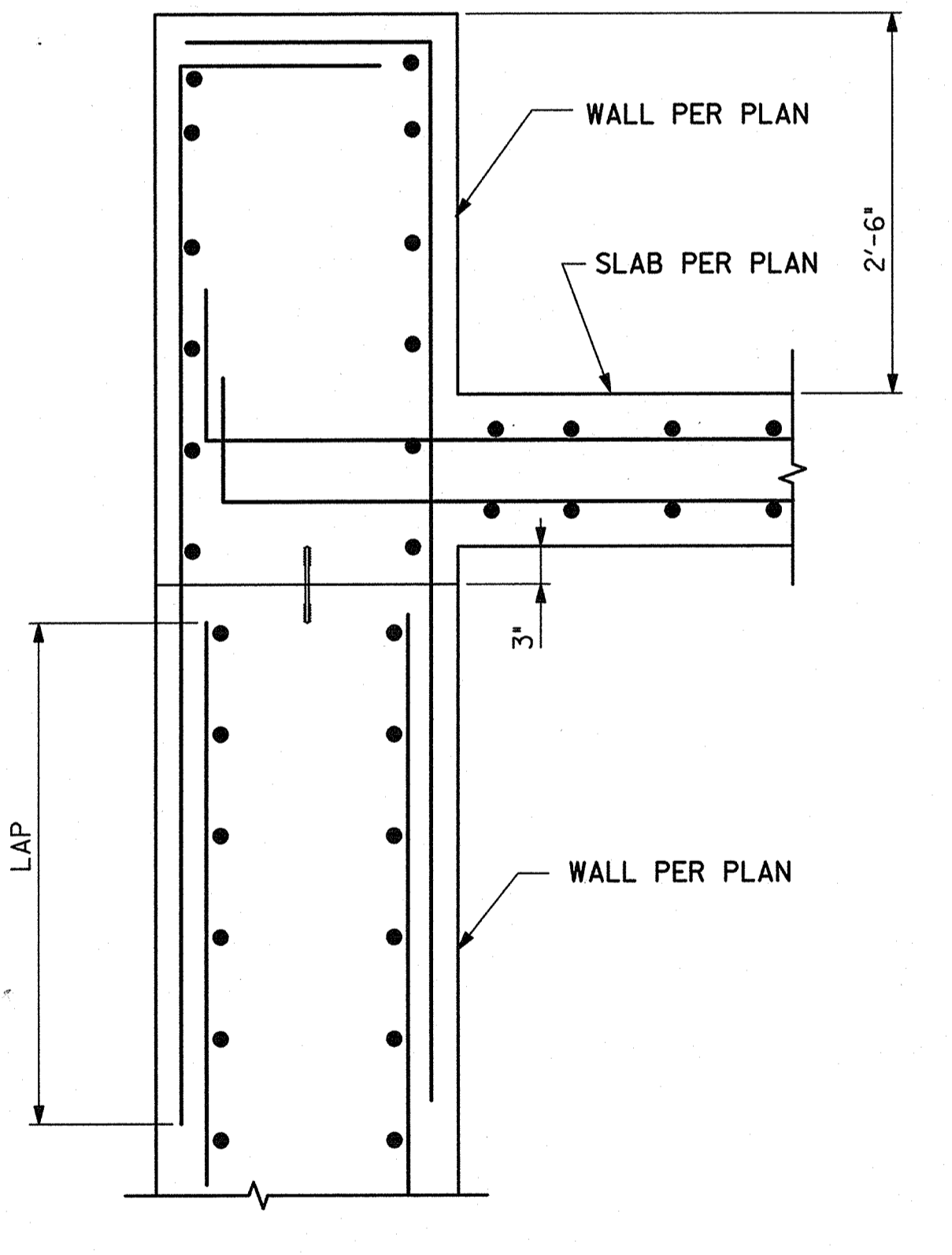
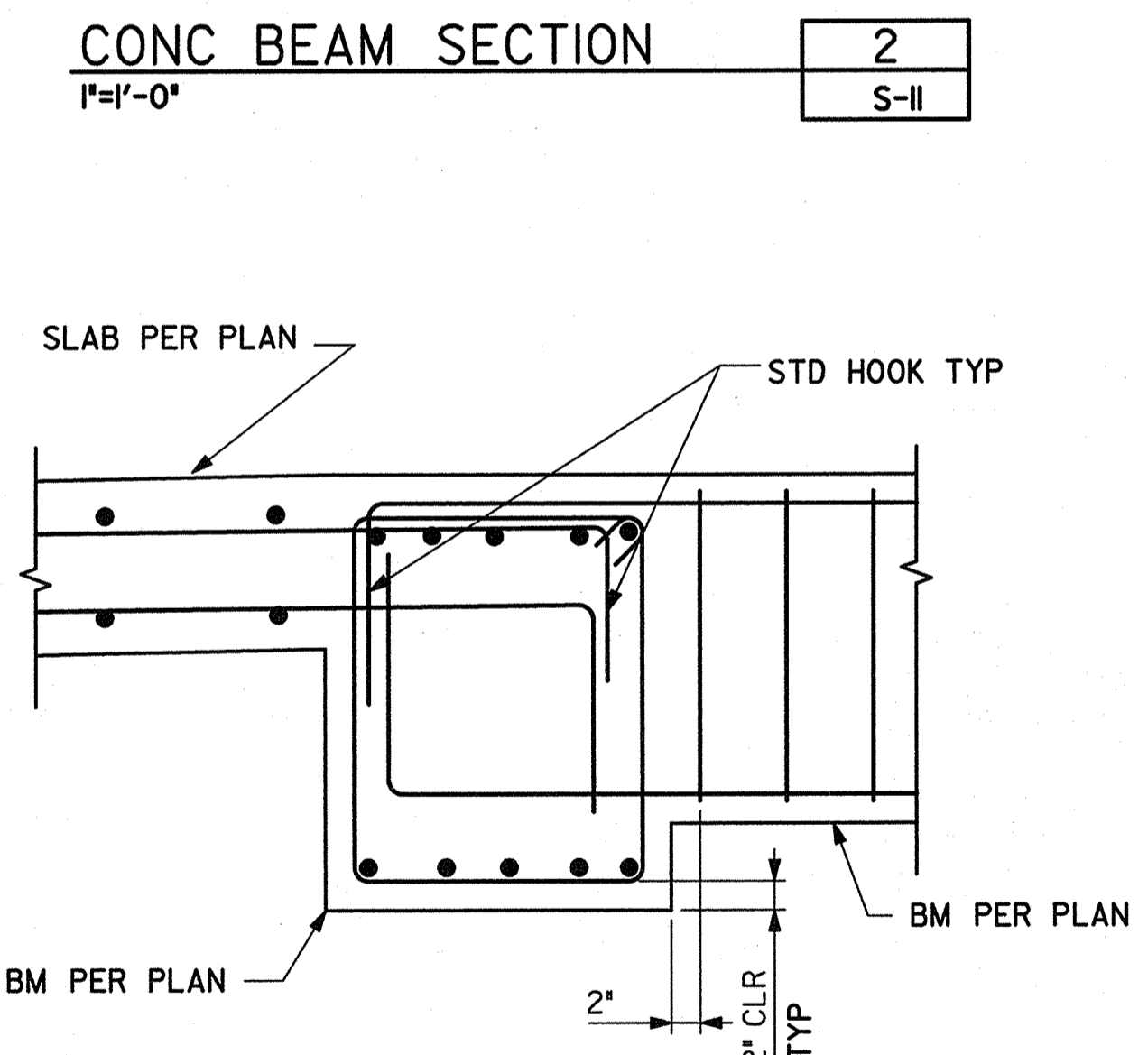
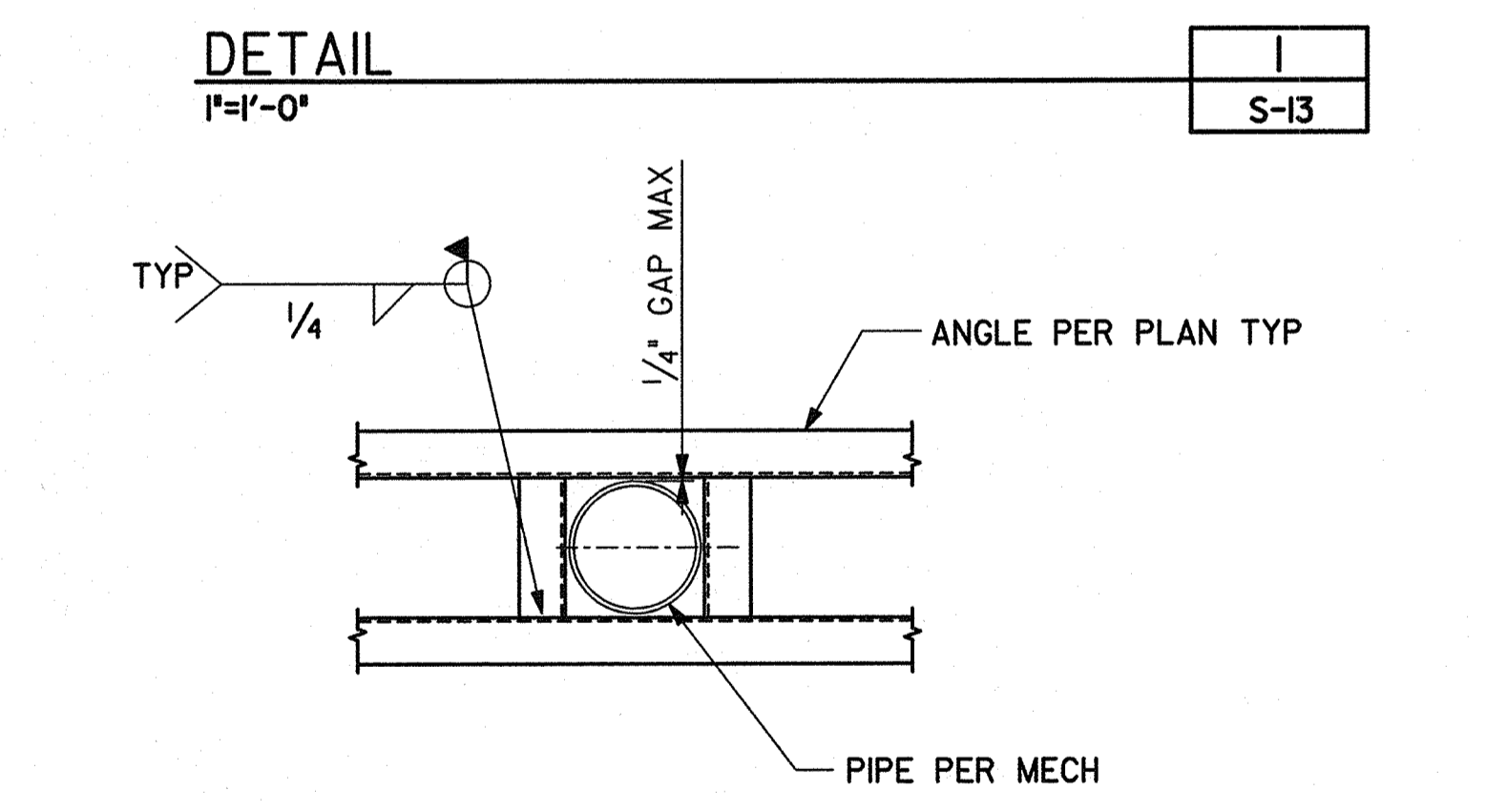
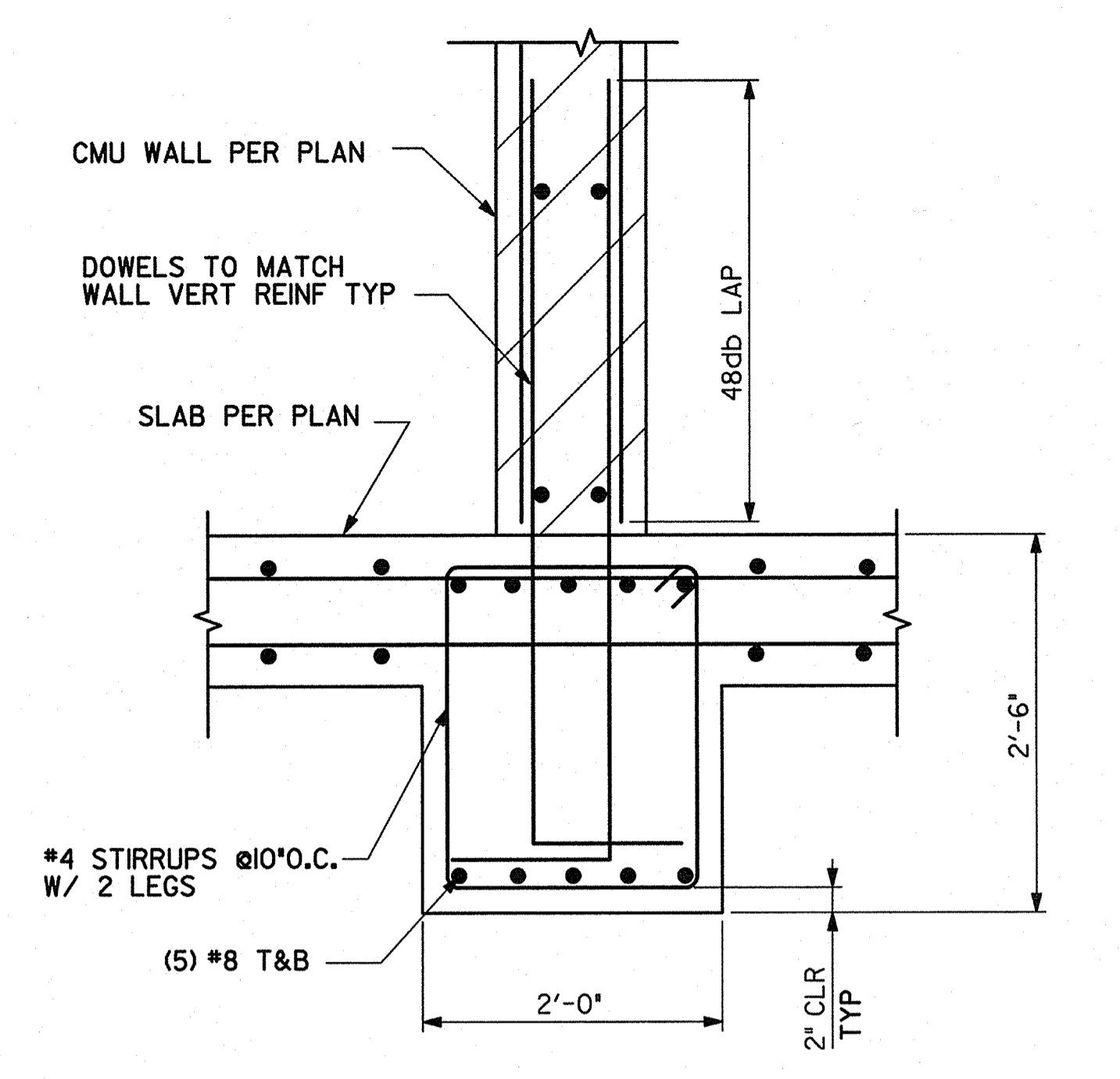
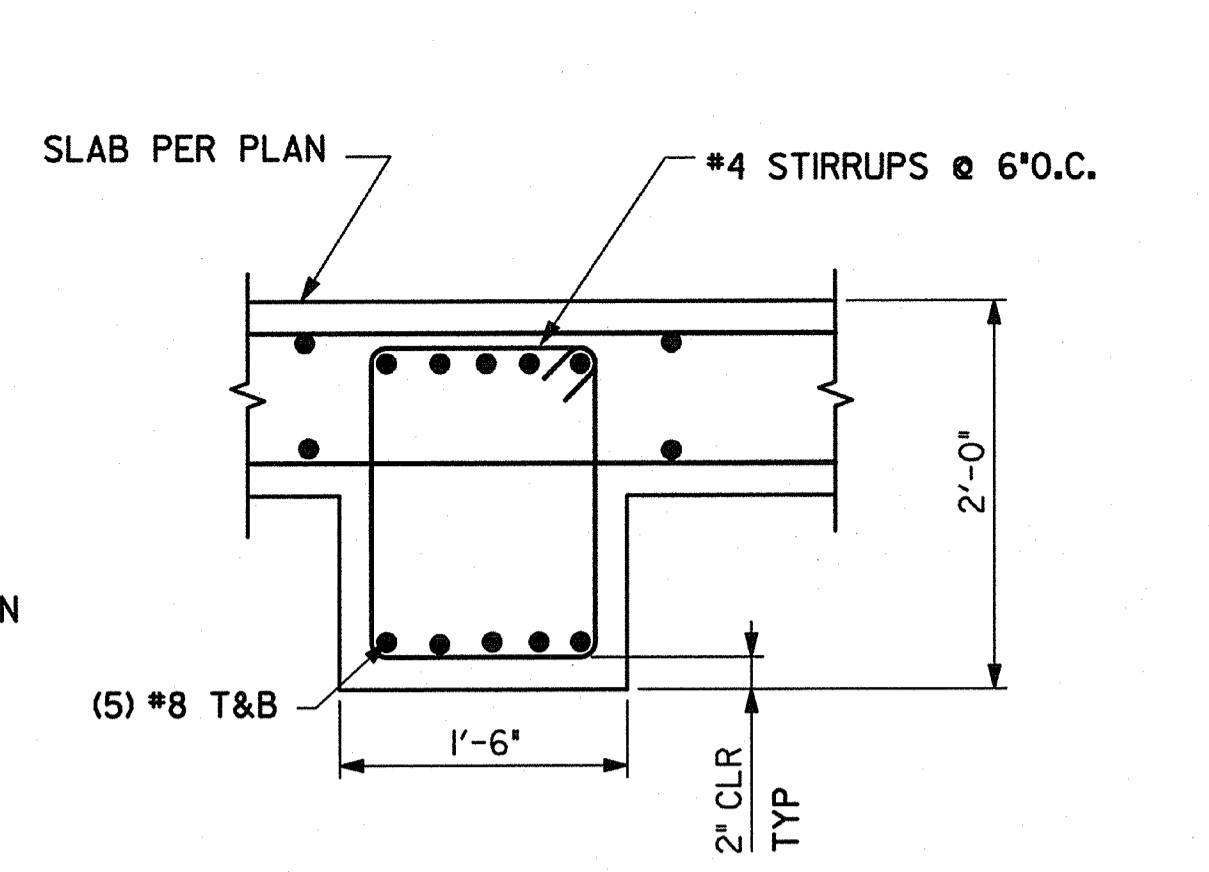
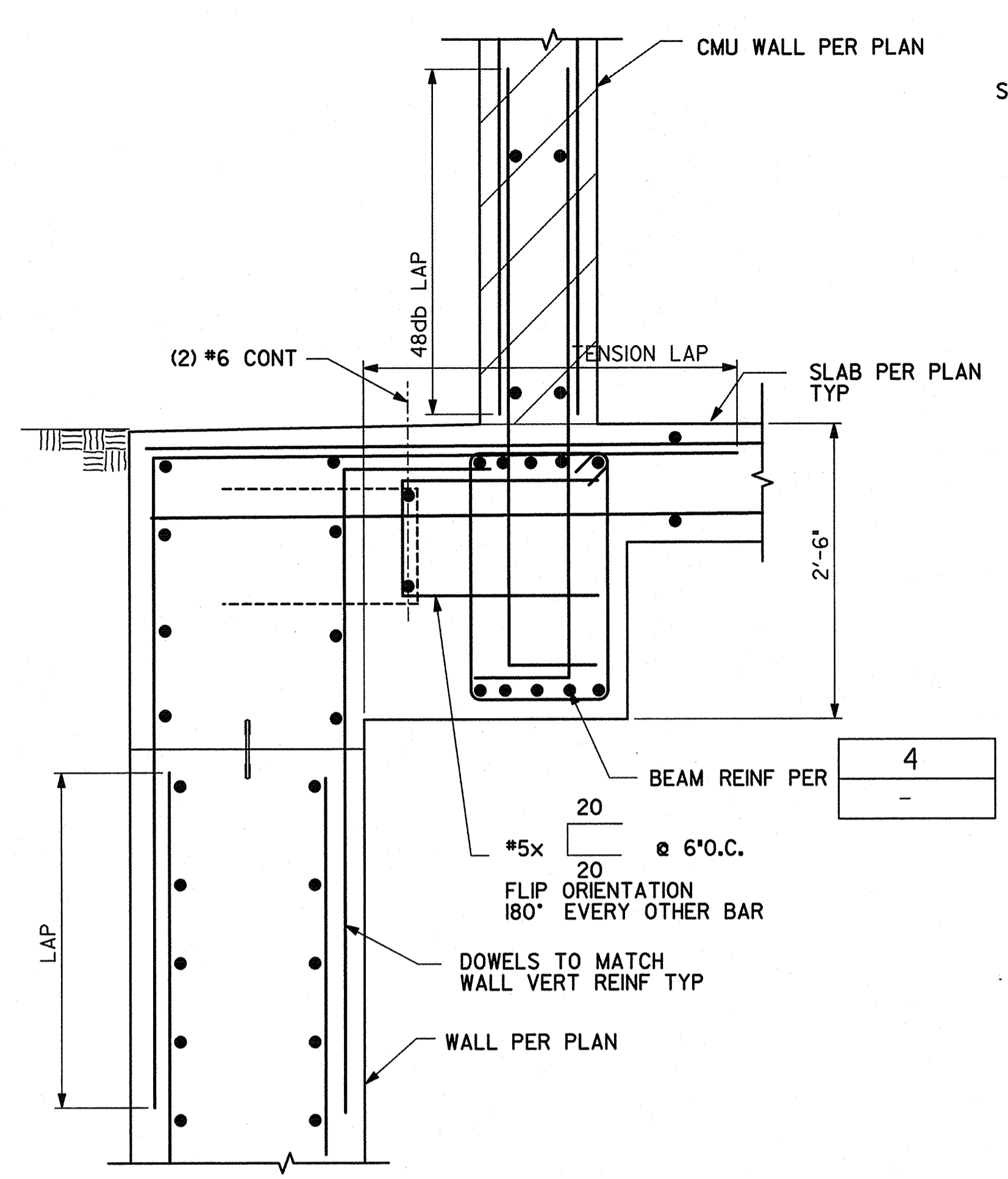
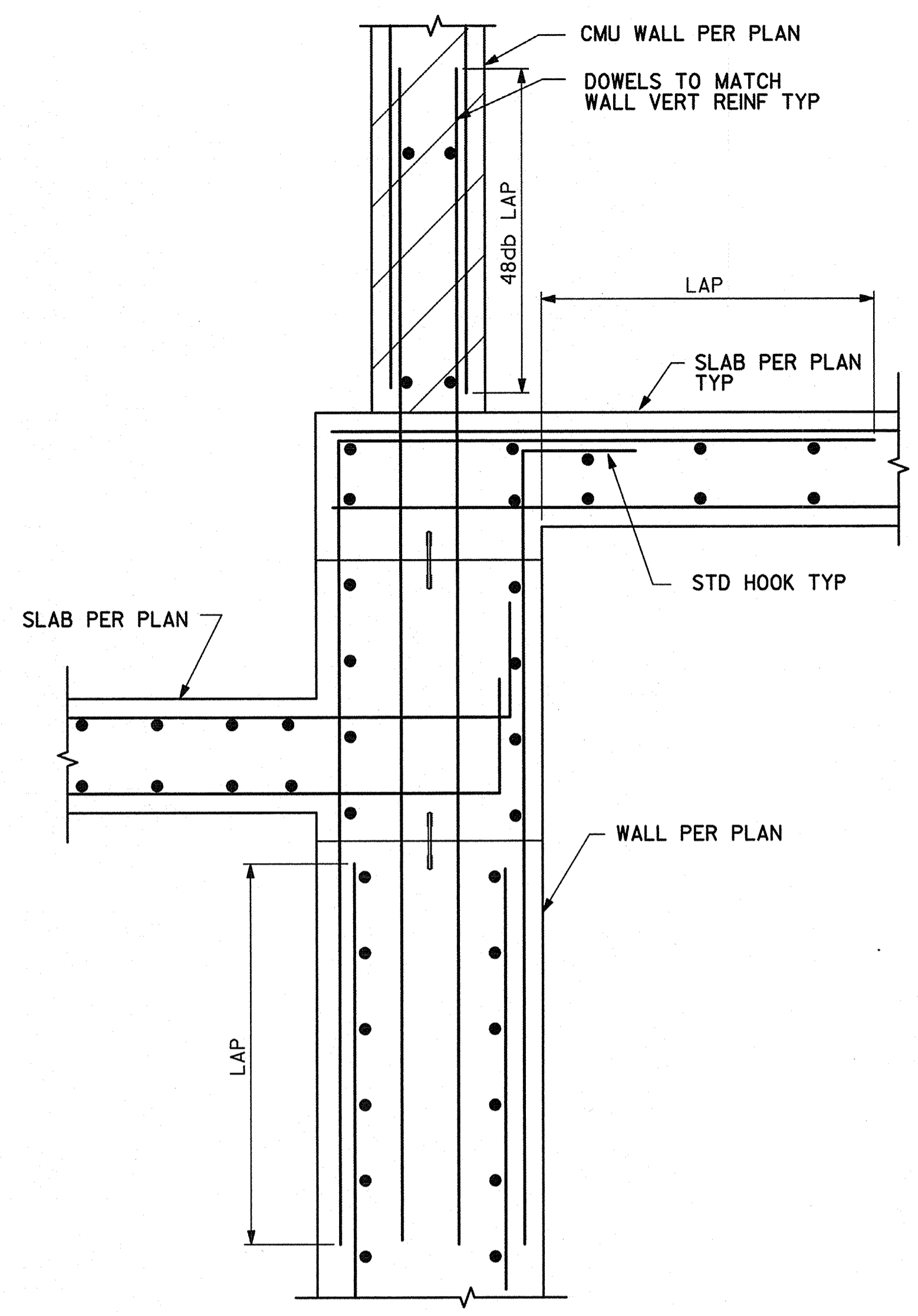
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8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM.	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

7/20/2011 12:30:18 PM

s-17.dgn



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DRAWING NO. S-17	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 65	STRUCTURAL DETAILS		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 65 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: <i>Hosei Arar</i>	DATE 7-26-11		
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY:			
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR	DATE STARTED	36196-65-D	
INSPECTOR	DATE COMPLETED		

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

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SCALE
HORIZONTAL AS SHOWN
VERTICAL AS SHOWN

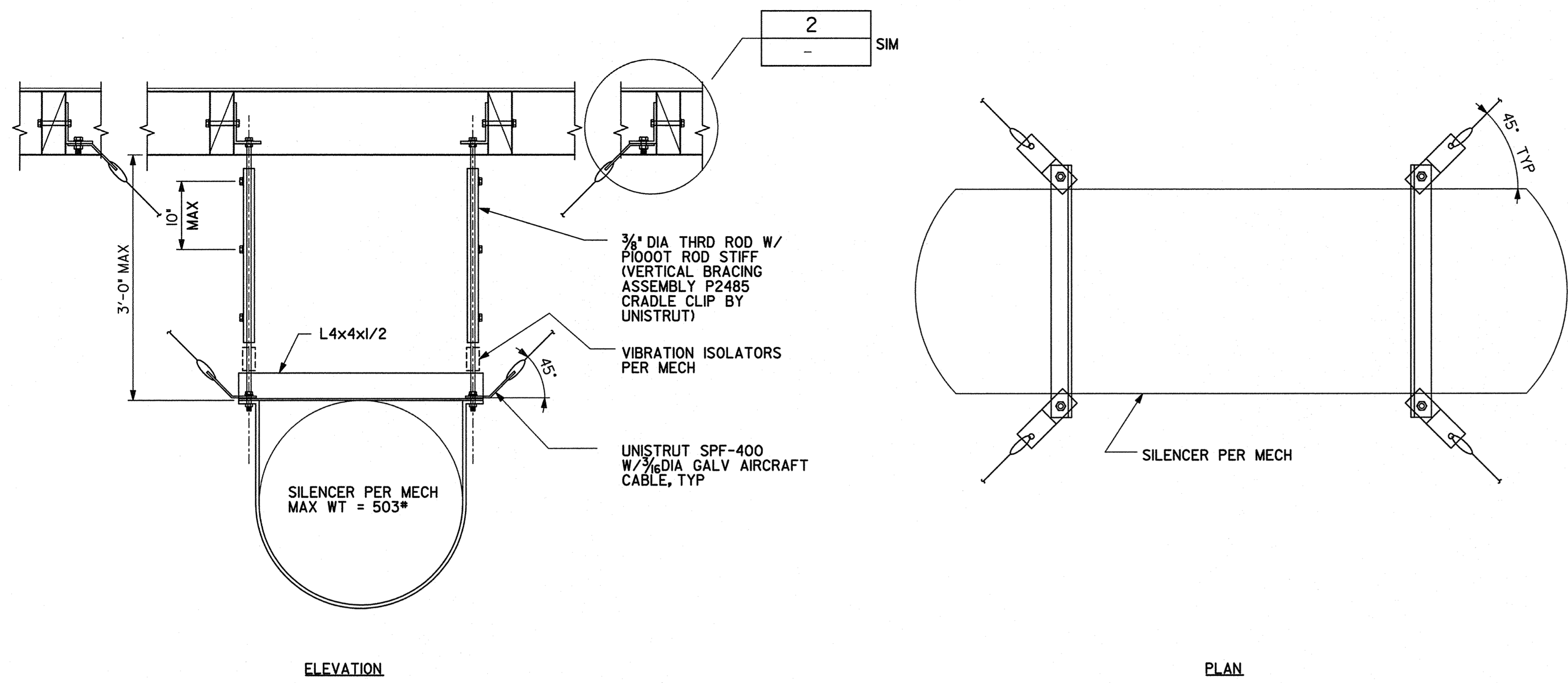
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



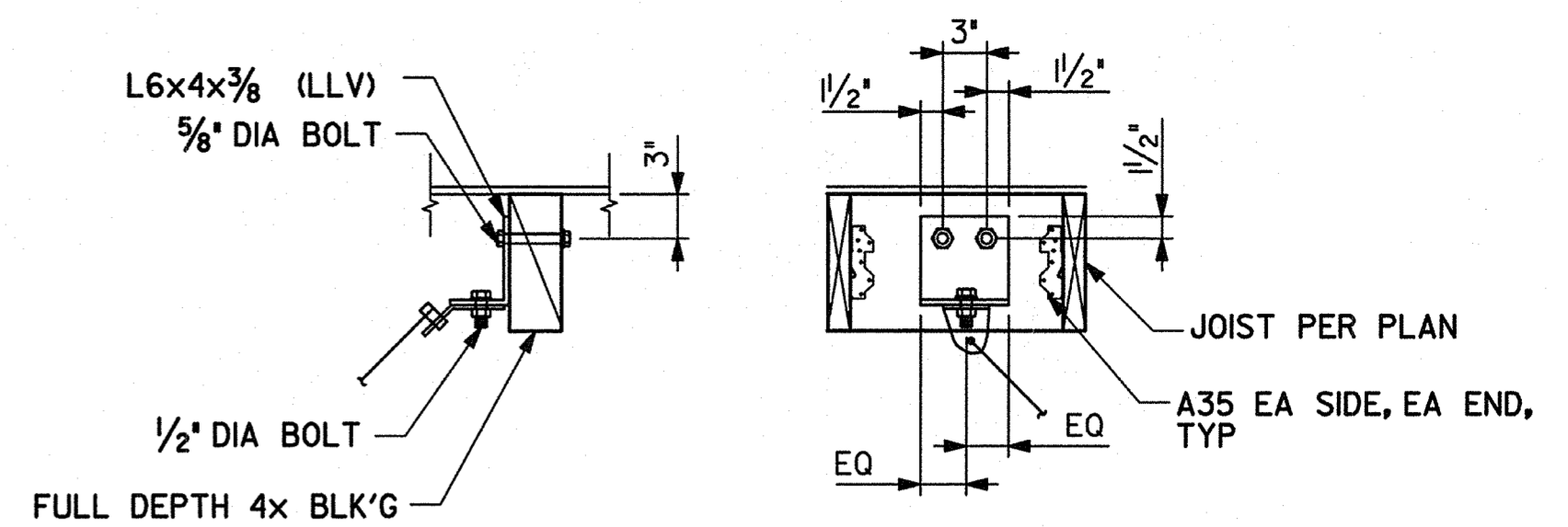
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NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

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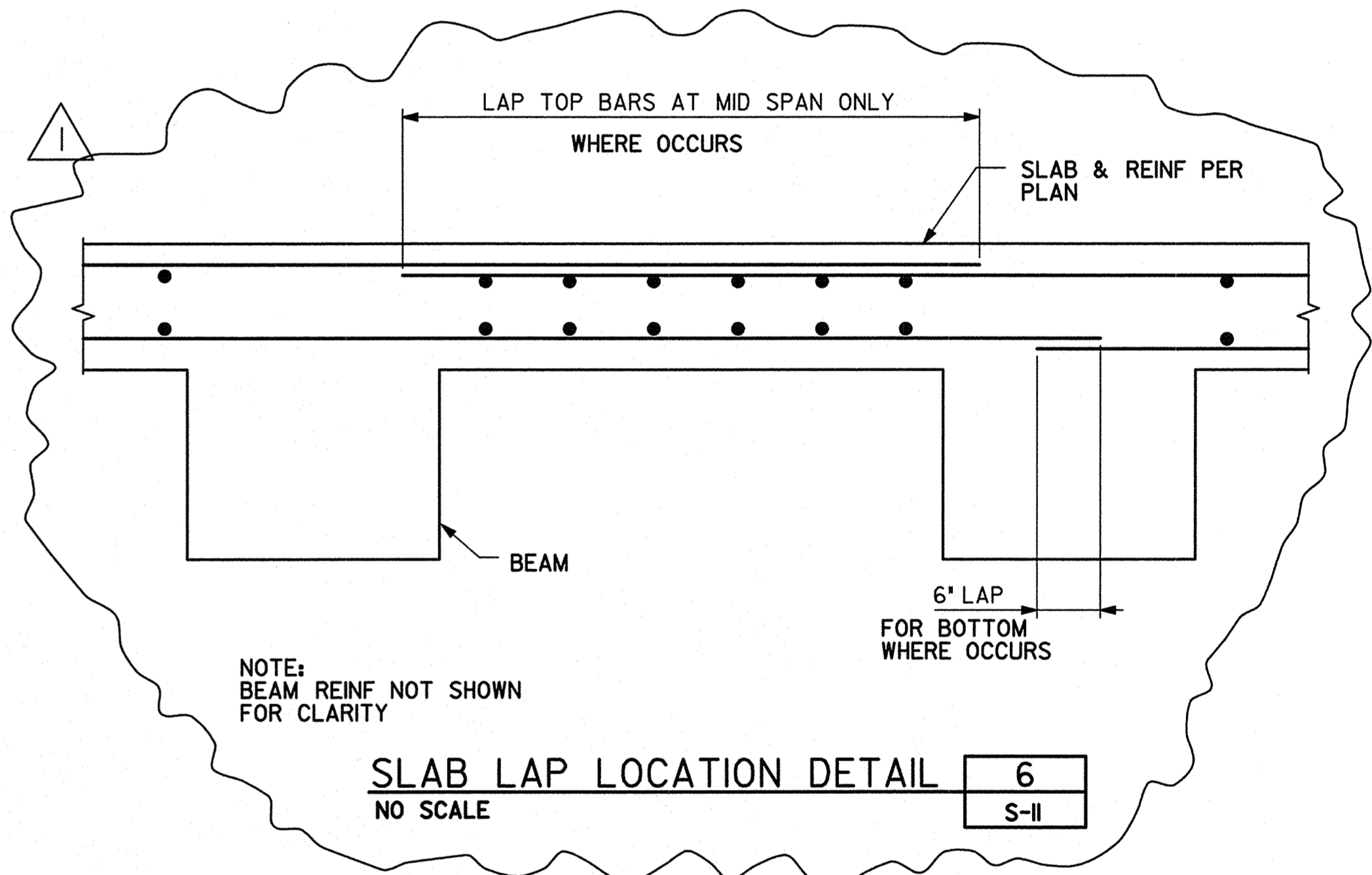
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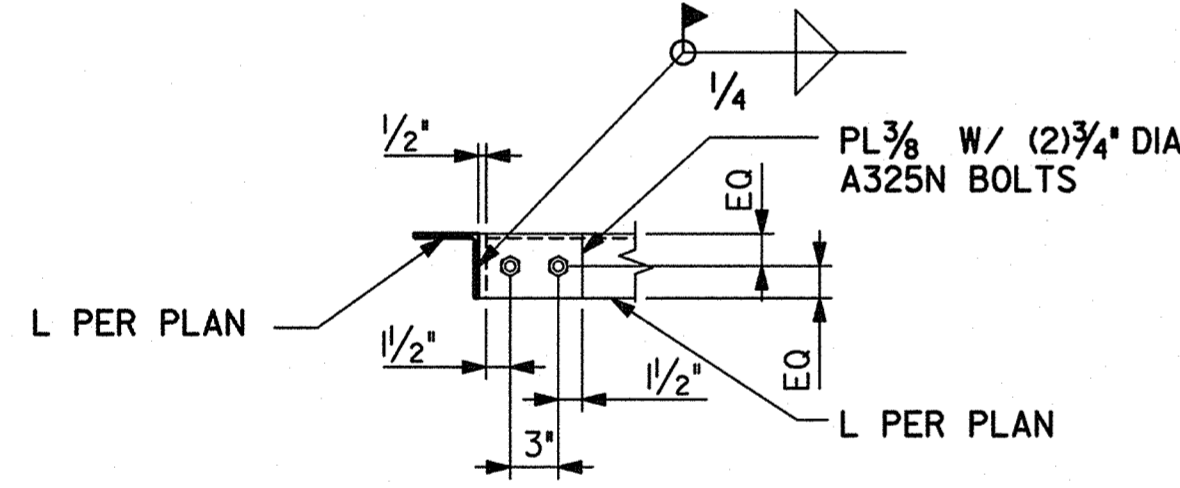
SUSPENDED SILENCER SUPPORT
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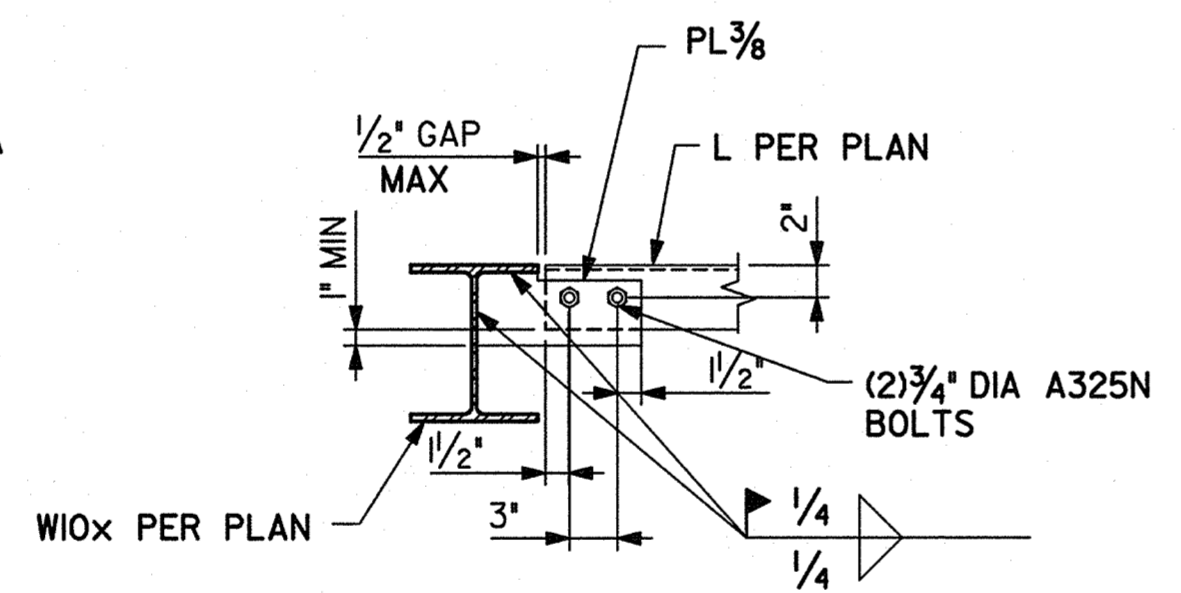
CABLE BRACE TO WOOD ROOF CONNECTION
NO SCALE



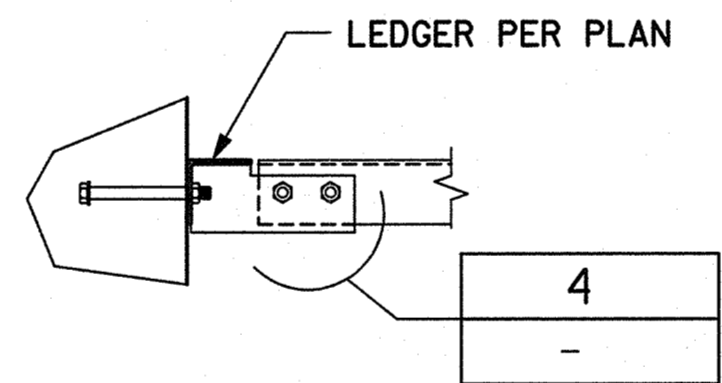
SLAB LAP LOCATION DETAIL
NO SCALE



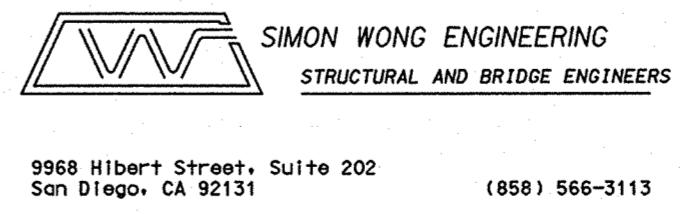
CONN DETAIL
NO SCALE



CONN DETAIL
NO SCALE



CONN DETAIL
NO SCALE



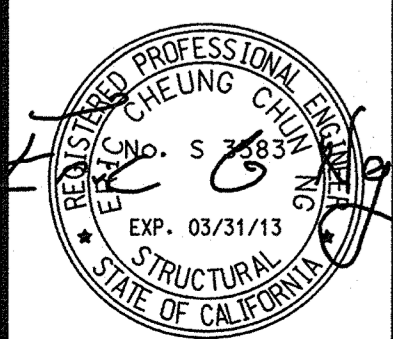
DRAWING NO. S-18	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 66	STRUCTURAL DETAILS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 66 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	FOR CITY ENGINEER 10-25-11	DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY
CHECKED BY: INSPECTOR	APPROVED	DATE
INSPECTOR	DATE STARTED	DATE COMPLETED
CONTRACTOR		36196-66-D

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	09/11		BUILDING PERMIT	SML	JH	EN			

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

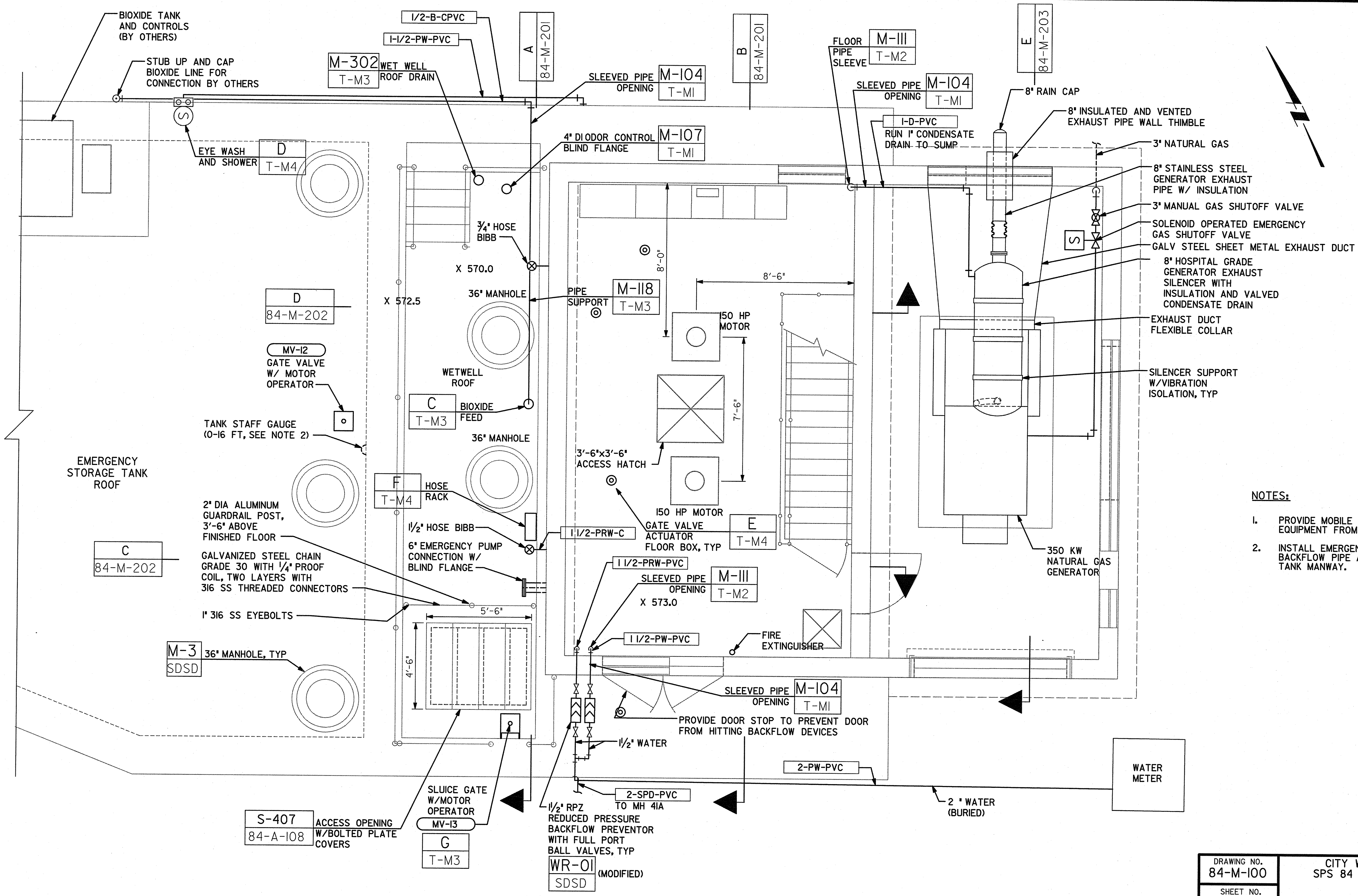
HDR
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SAN DIEGO, CA 92123-1502
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WARNING
IF THIS BAR DOES NOT MEASURE 1\"/>



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SPS84-M-100.dgn



NOTES:

1. PROVIDE MOBILE 3 TON CRANE FOR REMOVAL OF EQUIPMENT FROM THE BUILDING.
2. INSTALL EMERGENCY STORAGE TANK GAUGE NEAR BACKFLOW PIPE AND WHERE READILY VISIBLE FROM TANK MANWAY.

MECHANICAL PLAN AT ELEVATION 573

DRAWING NO. 84-M-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 67	GROUND LEVEL MECHANICAL PLANS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA 64 SHEET 67 OF 118 SHEETS	WATER SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hoge, A. J. 7-20-11 DATE	PROJECT MANAGER P. J. J. J.
CHECKED BY: CONSTRUCTION ENGINEER		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
INSPECTOR	CONTRACTOR	DATE STARTED
	INSPECTOR	DATE COMPLETED

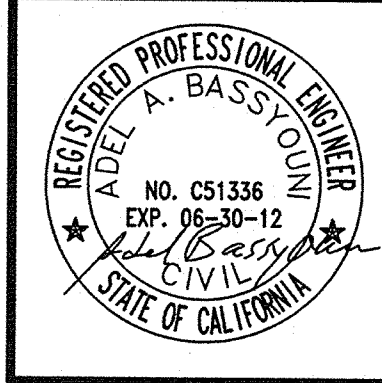
DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

HDR
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SAN DIEGO, CA 92123-1502
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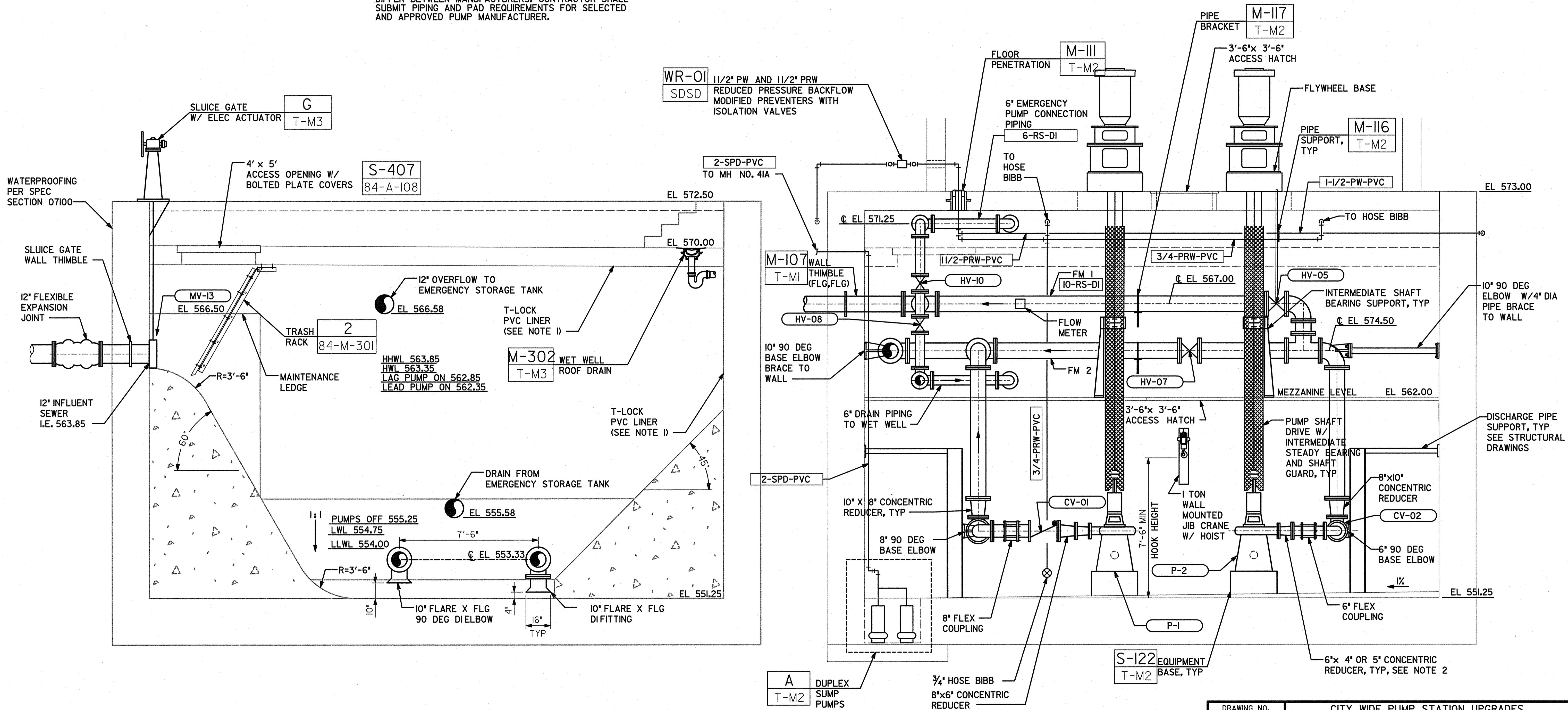
SCALE
HORIZONTAL 3/8" = 1'0"
VERTICAL

WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



NOTES:

1. WET WELL INTERIOR TOP AND VERTICAL SIDES (NON-SLOPED) SHALL HAVE CAST-IN-PLACE LOCK PVC LINER IN ACCORDANCE WITH SPECIFICATION SECTION 06650. WET WELL FLOOR AND SLOPED SIDES SHALL BE COATED WITH 100 MIL OF POLYURETHANE OVER AN EPOXY PRIMER BASE IN ACCORDANCE WITH SPECIFICATION SECTION 09800.
2. PUMP SUCTION AND DISCHARGE SIZES AND ORIENTATION DIFFER BETWEEN MANUFACTURERS. CONTRACTOR SHALL SUBMIT PIPING AND PAD REQUIREMENTS FOR SELECTED AND APPROVED PUMP MANUFACTURER.



SECTION
WET WELL

A
M-84-100
M-84-101

SECTION
DRY WELL

B
M-84-100
M-84-101

DRAWING NO. 84-M-201	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT
SHEET NO. 69	MECHANICAL SECTIONS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 69 OF 118 SHEETS
APPROVED BY: FOR CITY ENGINEER	WATER WBS S-00308 SEWER WBS S-00308

WARNING

0 1/2 1

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HDR

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SCALE: HORIZONTAL 3/8" = 1'-0" VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

APPROVED BY: *Hogc-Alex* 7-26-11

FOR CITY ENGINEER

CHECKED BY:

CONSTRUCTION ENGINEER

CHECKED BY:

INSPECTOR

CONTRACTOR INSPECTOR

DATE STARTED

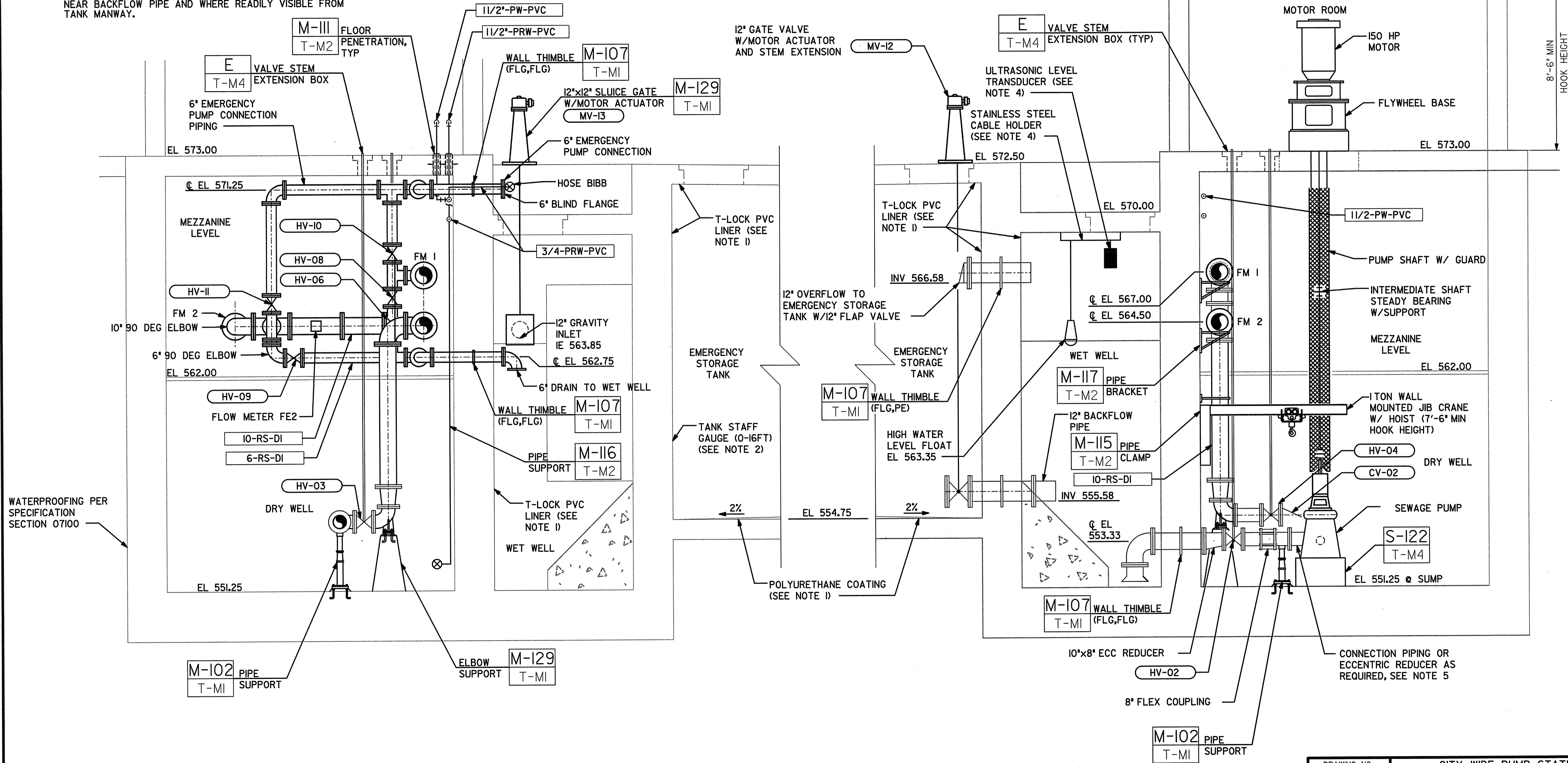
DATE COMPLETED

CONTROL CERTIFICATION
302-1737
LAMBERT COORDINATES
36196- 69 -D

7/19/2011 9:53:31 AM SPS84-M-201.DGN

NOTES:

- EMERGENCY STORAGE TANK AND WELL WET INTERIOR TOP AND VERTICAL SIDES SHALL HAVE CAST-IN-PLACE T-LOCK PVC LINER IN ACCORDANCE WITH SPECIFICATION SECTION 06650. SLOPED SIDES AND FLOOR SHALL BE COATED WITH 100 MIL OF POLYURETHANE OVER AN EPOXY PRIMER BASE IN ACCORDANCE WITH SPECIFICATION SECTION 09800.
- INSTALL NEW EMERGENCY STORAGE TANK STAFF GAUGE NEAR BACKFLOW PIPE AND WHERE READILY VISIBLE FROM TANK MANWAY.
- PROVIDE MINIMUM 12" HORIZONTAL SEPARATION FOR ULTRASONIC LEVEL TRANSDUCER FROM WALLS AND FLOAT SWITCH.
- CABLE HOLDER SHALL BE 316 STAINLESS STEEL, MINIMUM 18" LONG WITH MINIMUM 2 HOOKS. INSTALL WITH 316 STAINLESS STEEL ANCHORING BOLTS AND POSITION FOR ACCESS FROM MANHOLE OPENING.
- PUMP SUCTION AND DISCHARGE SIZES AND ORIENTATION DIFFER BETWEEN MANUFACTURERS. CONTRACTOR SHALL SUBMIT PIPING AND PAD REQUIREMENTS FOR SELECTED AND APPROVED PUMP MANUFACTURER.



SECTION C

84-M-100
84-M-101

SECTION D

84-M-100
84-M-101

DRAWING NO. 84-M-202	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 70	MECHANICAL SECTIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 70 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DATE 7-26-11	PROJECT MANAGER F. H. Lee
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CHECKED BY: INSPECTOR	CONTRACTOR	DATE STARTED
	INSPECTOR	DATE COMPLETED

DRAWING STATUS							
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

HDR

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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL 3/8" = 1'-0" VERTICAL

CITY OF SAN DIEGO PUBLIC WORKS PROJECT

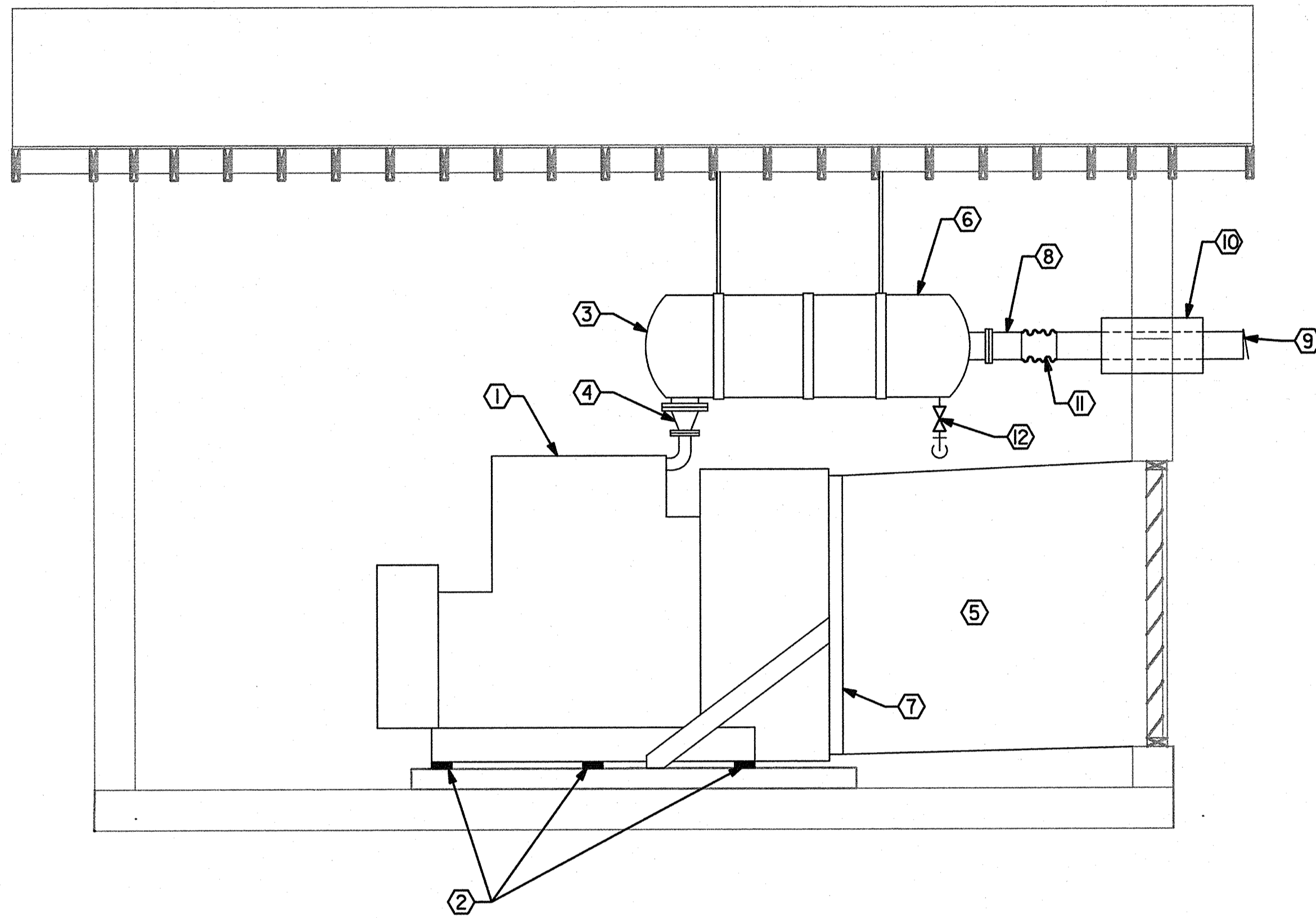
REGISTERED PROFESSIONAL ENGINEER
ADEL A. BASSYOUNI
NO. C51336
EXP. 06-30-12
CIVIL
STATE OF CALIFORNIA

CITY OF SAN DIEGO

7/19/2011 9:55:01 AM SPS84-M-202.DGN

7/19/2011 9:57:07 AM

SPS84-M-203.DGN



SECTION E
84-M-100

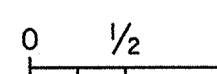
KEYNOTES:

- ① 350 KW NATURAL GAS GENERATOR.
- ② GENERATOR ISOLATION SUPPORTS.
- ③ 8" HOSPITAL GRADE GENERATOR EXHAUST SILENCER WITH INSULATION AND VALVE CONDENSATE DRAIN.
- ④ 8" x 3.5" WYE CONNECTOR WITH FLEXIBLE CONNECTORS.
- ⑤ GALVANIZED STEEL SHEET METAL EXHAUST DUCT.
- ⑥ SILENCER SUPPORT.
- ⑦ EXHAUST DUCT FLEXIBLE COLLAR.
- ⑧ 8" STAINLESS STEEL GENERATOR EXHAUST PIPE WITH INSULATION.
- ⑨ 8" RAIN CAP.
- ⑩ 8" INSULATED AND VENTED EXHAUST PIPE WALL THIMBLE.
- ⑪ 8" FLEXIBLE CONNECTOR EXHAUST PIPE.
- ⑫ 1" CONDENSATE DRAIN WITH 1" BALL VALVE.

DRAWING NO. 84-M-203	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 71	MECHANICAL SECTIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 71 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
<i>Hos C. Acor</i> 7-26-11 <small>FOR CITY ENGINEER</small>		<small>CONTROL CERTIFICATION</small> 302-1737 <small>LAMBERT COORDINATES</small>
APPROVED BY:	DESCRIPTION	BY
CHECKED BY:	APPROVED	DATE
CONSTRUCTION ENGINEER	DATE	FILMED
CHECKED BY:	CONTRACTOR	DATE STARTED
INSPECTOR	INSPECTOR	DATE COMPLETED



WARNING



IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



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SAN DIEGO, CA 92123-1502
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SCALE

HORIZONTAL 3/8" = 1'-0"
VERTICAL

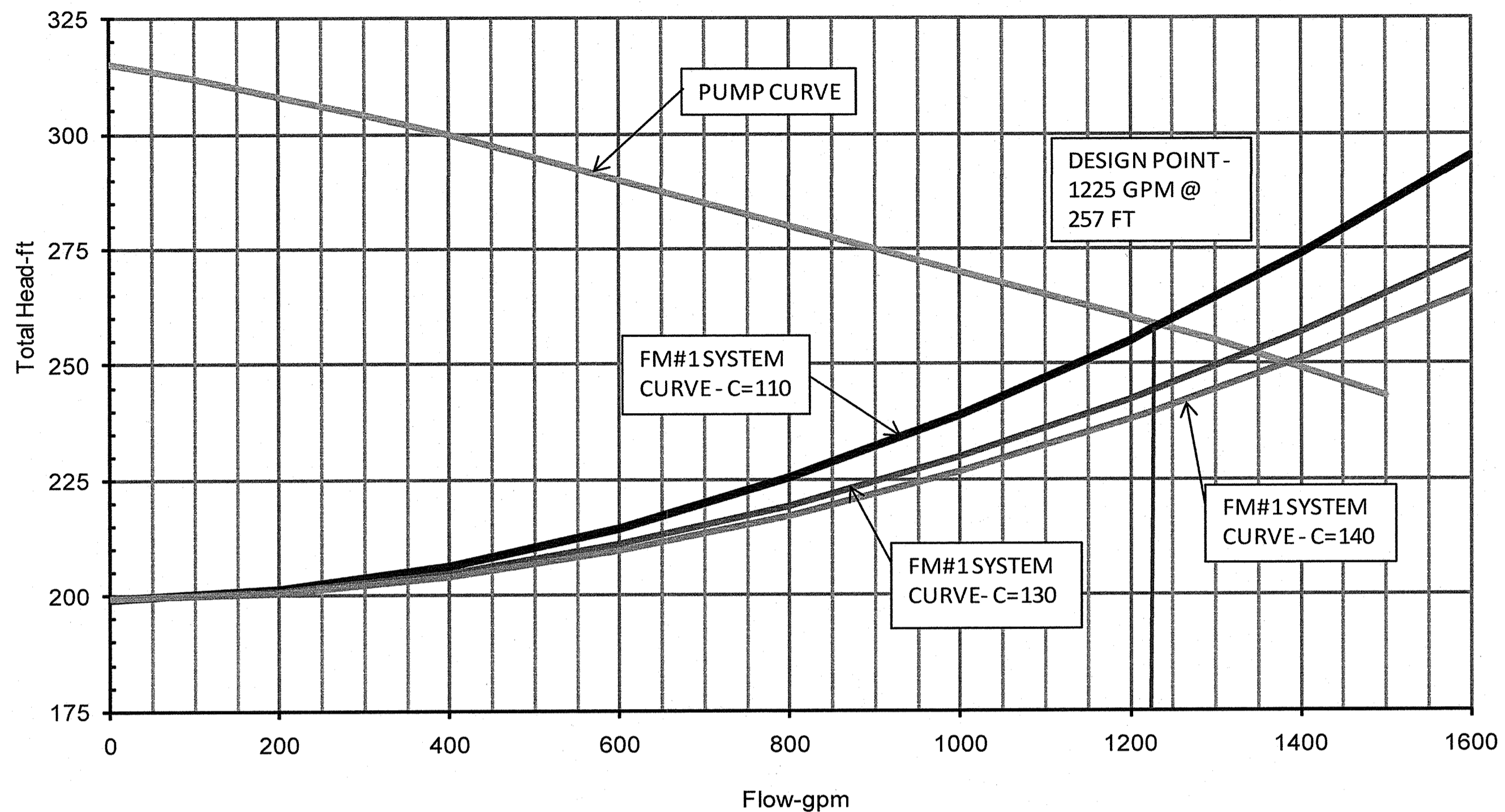
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



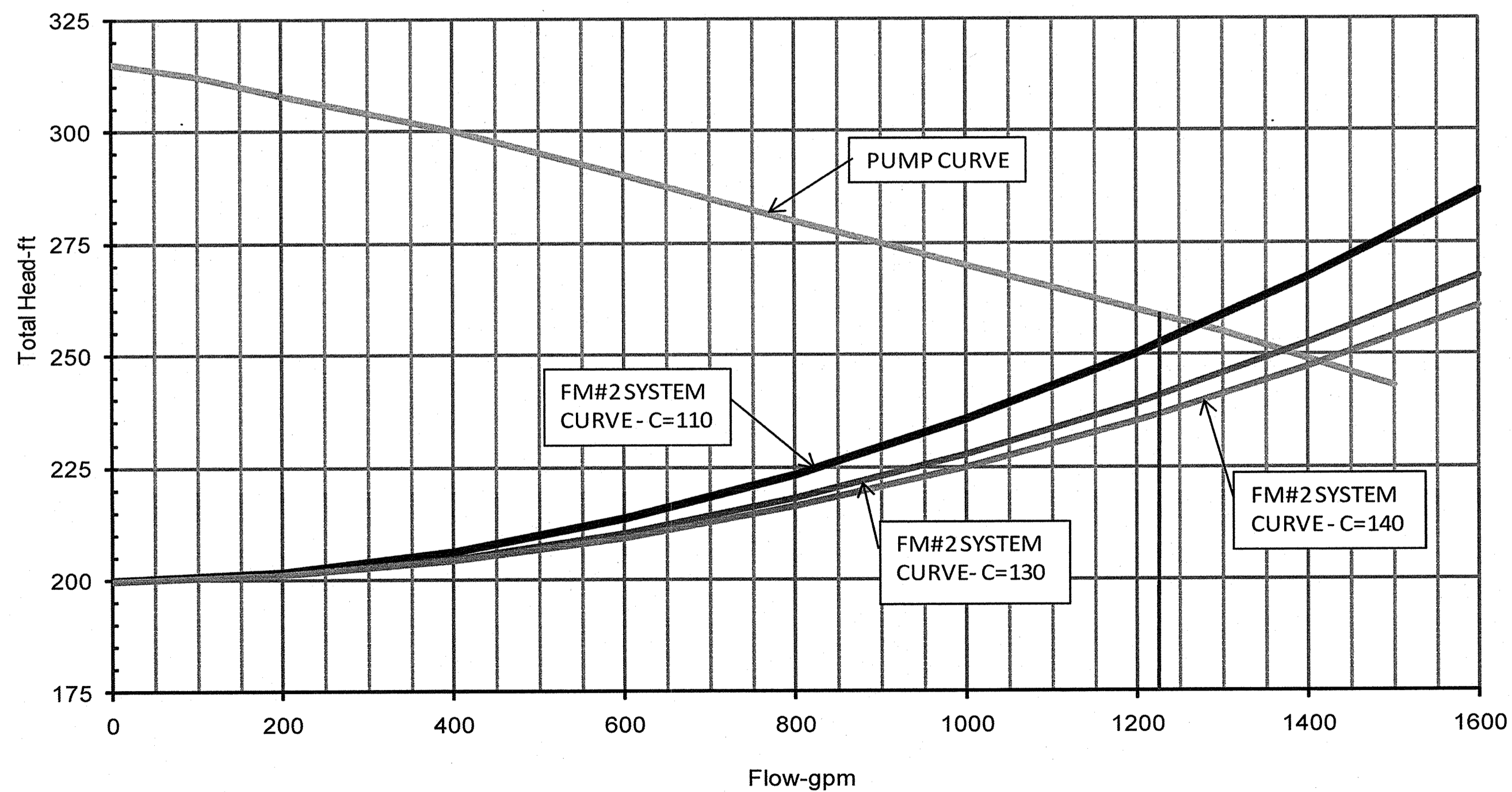
DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

36196- 71 -D

SPS 84 - FM #1 System Curves - Pump Performance Curve



SPS 84 - FM #2 System Curves - Pump Performance Curve



WETWELL CLEANING PROCEDURE:

1. CHECK TO MAKE SURE ISOLATION VALVES ASSOCIATED WITH PUMP #2 ARE FULLY OPEN.
2. OPEN MANHOLE 4IA COVER AND WETWELL MANHOLE ABOVE PUMP #2 INTAKE.
3. AFTER PUMPS HAVE STOPPED AND THE WETWELL LEVEL IS AT PUMPS-OFF LEVEL (ELEVATION 555.25); COMPLETELY CLOSE WETWELL INFLUENT SLUICE GATE MV-13.
4. PLACE PUMPS #1 AND #2 IN 'OFF' MODE AND CLOSE PUMP #1 INLET GATE VALVE HV-01.
5. MONITOR LIQUID LEVEL INSIDE MANHOLE 4IA.
6. WHEN LIQUID LEVEL REACHES ABOUT 2.2 FEET DEEP INSIDE MANHOLE 4IA (ABOUT 5.5 FEET FROM TOP OF MANHOLE), TURN PUMP #2 ON USING 'HAND' MODE.
7. IMMEDIATELY OPEN WETWELL INFLUENT SLUICE GATE MV-13 TO 1/3 OPEN.
8. MONITOR WETWELL LEVEL DURING PUMP DOWN CLEANING OPERATION. AS SOON AS PUMP #2 LOSES PRIME, IMMEDIATELY TURN THE PUMP TO 'OFF' MODE.
9. FULLY REOPEN THE WETWELL INFLUENT SLUICE GATE (MV-13).
10. REPLACE MANHOLE COVERS.
11. ALLOW THE LIQUID LEVEL IN THE WETWELL TO RISE ABOVE THE PUMPS-OFF LEVEL (ELEVATION 555.25).
12. OPEN PUMP #1 INLET GATE VALVE HV-01, RE-PRIME PUMP #1 AND PLACE IN 'AUTO' MODE.
13. RE-PRIME PUMP #2 AND PLACE IN 'AUTO' MODE.

NOTES:

1. PUMP SHALL BE VERTICAL CENTRIFUGAL NON-CLOG SHAFT DRIVEN TYPE WITH MINIMUM 150 HP, 1800 RPM, 3 PHASE MOTOR.
2. FORCEMAIN #1 AND #2 HAVE DIFFERENT SYSTEMS CURVES AS A PORTION OF FORCEMAIN #2 CONSISTS OF EXISTING 12" CLASS 150 (CLASS 235 PER NEW AWWA PIPE RATING) PVC PIPING, WHILE THE NEW FORCEMAIN PORTIONS USE 12" CLASS 305V PVC PIPING WHICH HAS A SMALLER INSIDE PIPE DIAMETER.
3. THE CONTRACTOR SHALL PROVIDE A TOTAL OF THREE PUMPS, MOTORS, SHAFTS AND APPURTENANCES, COMPLETE, CONSISTING OF TWO INSTALLED PUMPING UNITS AND ONE SPARE.

DRAWING NO. 84-M-401	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 73	PUMP CURVES		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 73 OF 118 SHEETS	WATER WBS	S-00308
FOR CITY ENGINEER Hoschi Acar 7-26-11		DATE	
APPROVED BY:	DESCRIPTION	BY	APPROVED DATE FILMED
FOR CITY ENGINEER			
CHECKED BY:			
CONSTRUCTION ENGINEER			
CHECKED BY:			
INSPECTOR			
CONTRACTOR	DATE STARTED		
INSPECTOR	DATE COMPLETED		
CONTROL CERTIFICATION			302-1737
LAMBERT COORDINATES			36196-73 -D

DRAWING STATUS							
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE EM QA/QC

WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
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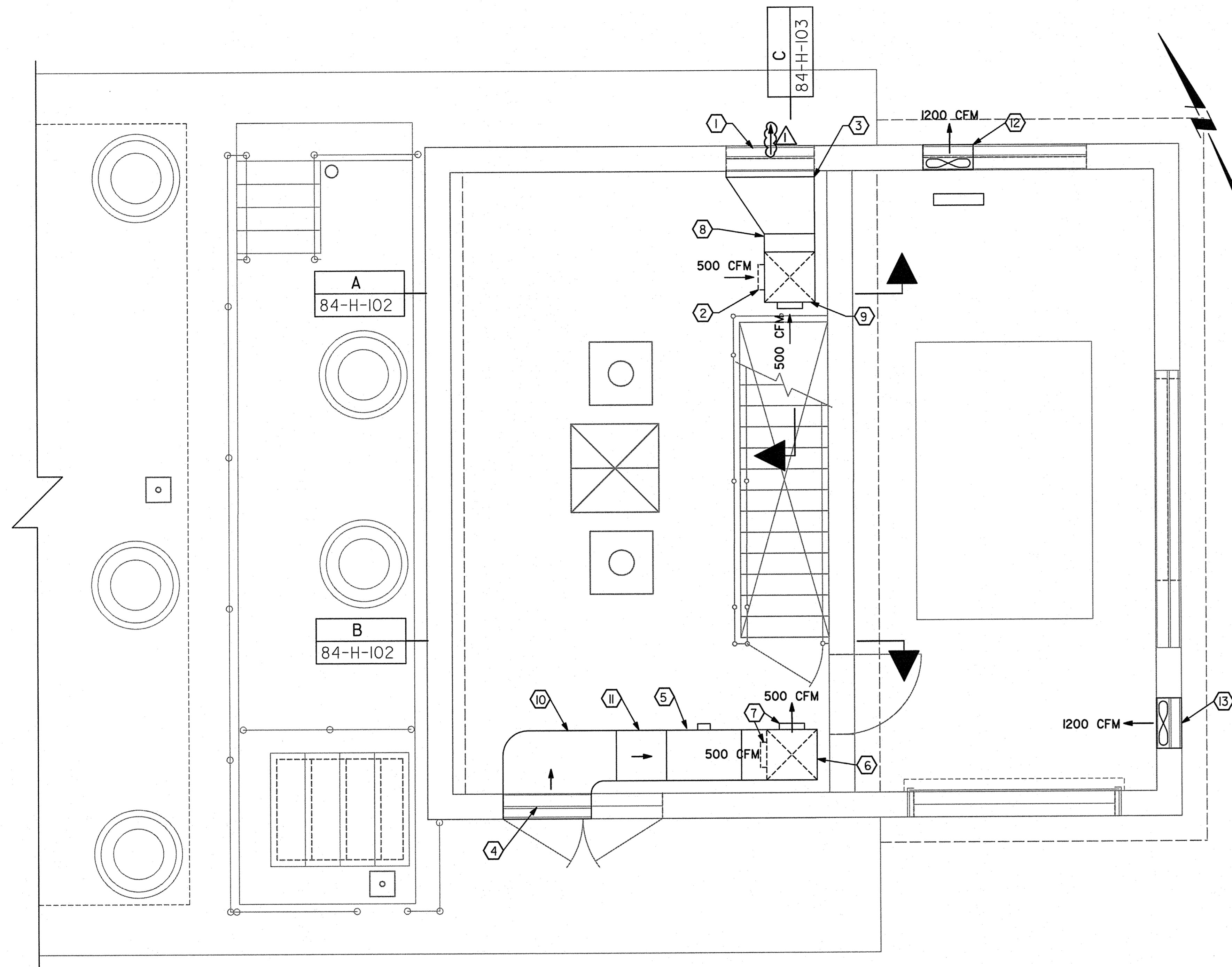
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



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10/20/2011 8:45:13 AM

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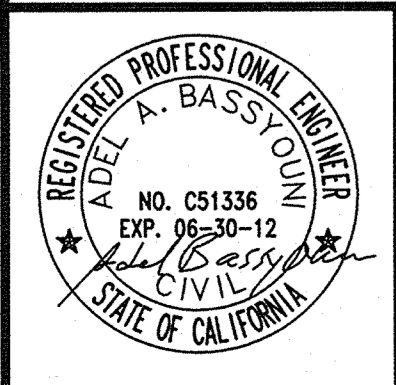
- ① 42" x 42" EXHAUST LOUVER
- ② 14" x 14" EXHAUST AIR REGISTER - 500 CFM WITH ADJUSTABLE LOUVER, TYP OF 4
- ③ 42"x42" BY 24"x24" REDUCER
- ④ 42" x 42" SUPPLY LOUVER
- ⑤ INLINE SUPPLY/AIR FAN - 4000 CFM
- ⑥ 24" x 24" SUPPLY DUCT
- ⑦ 14" x 14" SUPPLY AIR REGISTER
- ⑧ COMBINATION FIRE-SMOKE DAMPER
- ⑨ SMOKE DETECTOR WITH VISUAL LOCAL ALARM
- ⑩ 42" x 42" BY 24" x 42" REDUCING BEND
- ⑪ 24" x 42" BY 24" x 24" REDUCER
- ⑫ AXIAL EXHAUST FAN-1200 CFM
- ⑬ AXIAL SUPPLY FAN-1200 CFM

VENTILATION DESIGN CRITERIA	
DRY WELL, MEZZANINE AND MOTOR ROOM	
DRY WELL AND MEZZANINE	VENTILATED VOLUME, CU. FT 9,900
	AIR CHANGES PER HOUR 12
MOTOR ROOM	VENTILATED VOLUME, CU. FT 5,800
	AIR CHANGES PER HOUR 19
FANS	
IN-LINE SUPPLY FAN CAPACITY, CFM	4,000
STATIC PRESSURE IN W.C., INCH I.O	
IN-LINE EXHAUST FAN CAPACITY, CFM	4,000
STATIC PRESSURE IN W.C., INCH I.O	
GENERATOR ROOM	
VENTILATED VOLUME, CU. FT	4,660
AIR CHANGES PER HOUR	15
SUPPLY FAN CAPACITY, CFM	1,200
STATIC PRESSURE IN W.C., INCH	0.25
EXHAUST FAN CAPACITY, CFM	1,200
STATIC PRESSURE IN W.C., INCH	0.25

NOTES:

- 1. MOTORS FOR VENTILATION SHALL BE MOUNTED ON RUBBER MOUNTS TO REDUCE VIBRATION AND NOISE.
- ① 2. EXHAUST DUCTS SHALL BE EQUIPPED WITH BACK-DRAFT DAMPERS (SECTION 504.0 CMC).

GROUND LEVEL



WARNING
 IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE.

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SCALE: HORIZONTAL 3/8" = 1'0" VERTICAL

**CITY OF SAN DIEGO
 PUBLIC WORKS PROJECT**

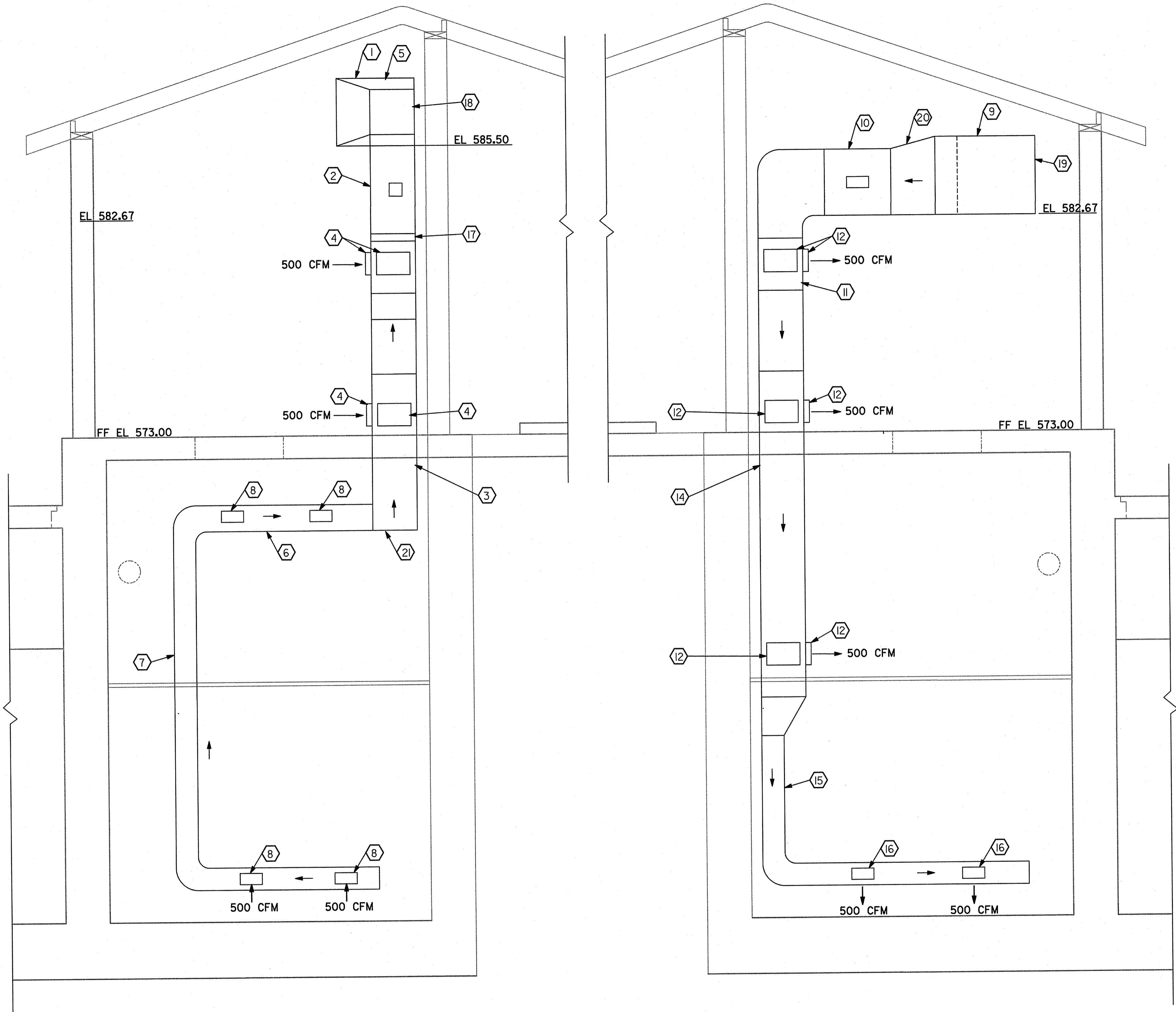


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

DRAWING NO. 84-H-100	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT			WATER WBS
SHEET NO. 74	GROUND LEVEL VENTILATION PLAN			SEWER WBS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 74 OF 118 SHEETS			S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED DATE	FILMED
CHECKED BY: CONSTRUCTION ENGINEER				
CHECKED BY: INSPECTOR				
CONTRACTOR INSPECTOR	DATE STARTED	DATE COMPLETED	CONTROL CERTIFICATION	
			302-1737 LAMBERT COORDINATES	
			36196- 74 -D	

7/18/2011 12:06:53 PM

SFS84-H-102.DGN



KEYNOTES:

- ① 42" x 42" EXHAUST LOUVER
- ② INLINE EXHAUST/AIR FAN - 4000 CFM
- ③ 24" x 24" EXHAUST DUCT
- ④ 14" x 14" EXHAUST AIR REGISTER - 500 CFM WITH ADJUSTABLE LOUVER, TYP OF 4
- ⑤ 42"X42" BY 24"X24" REDUCER
- ⑥ 14" x 18" EXHAUST DUCT
- ⑦ 10" x 12" EXHAUST DUCT
- ⑧ 12" x 8" EXHAUST AIR REGISTER - 500 CFM WITH ADJUSTABLE LOUVER, TYP OF 6
- ⑨ 42" x 42" SUPPLY LOUVER
- ⑩ INLINE SUPPLY/AIR FAN - 4000 CFM
- ⑪ 24" x 24" SUPPLY DUCT
- ⑫ 14" x 14" SUPPLY AIR REGISTER
- ⑬ NOT USED
- ⑭ 24" x 16" SUPPLY DUCT
- ⑮ 10" x 12" SUPPLY DUCT
- ⑯ 12" x 8" SUPPLY AIR REGISTER - 500 CFM WITH ADJUSTABLE LOUVER, TYP OF 4
- ⑰ COMBINATION FIRE-SMOKE DAMPER
- ⑱ SMOKE DETECTOR WITH VISUAL LOCAL ALARM
- ⑲ 42" x 42" BY 24" x 42" REDUCING BEND
- ⑳ 24" x 42" BY 24" x 24" REDUCER
- ㉑ 24" x 24" BY 14" x 18" REDUCING BEND

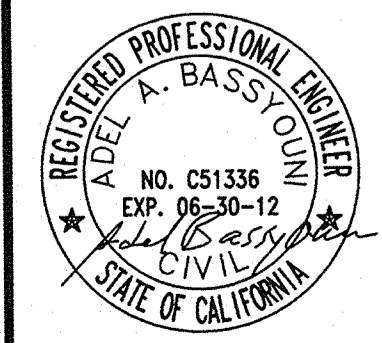
NOTES:

1. MOTORS FOR VENTILATION FANS SHALL BE MOUNTED ON RUBBER MOUNTS TO REDUCE VIBRATION AND NOISE.
2. PROVIDE HANGERS PER DETAIL M-510 ON DRAWING NO T-M3.

SECTION	A	A
	84-H-100	84-H-101

SECTION	B	B
	84-H-100	84-H-101

DRAWING NO. 84-H-102	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 76	VENTILATION SECTIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 76 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	<i>Hosea</i> 7-26-11 FOR CITY ENGINEER	DATE
CHECKED BY: CONSTRUCTION ENGINEER		DATE
CHECKED BY: INSPECTOR		DATE
CONTRACTOR	DATE STARTED	DATE COMPLETED
INSPECTOR		



WARNING
0 1/2 1
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DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

CONTROL CERTIFICATION
302-1737
LAMBERT COORDINATES
36196- 76 -D

10/20/2011 8:46:58 AM

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CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION	CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION	CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION	UTILITY COMPANY
			CIRCUIT BREAKER.				JUNCTION BOX OR CONDUIT FITTING AS NOTED OR REQUIRED. (SHOWN WITH CONDUIT TURNING UP)				DISCONNECT SWITCHES = FUSED NF = NON-FUSED XX = AMP RATING	SAN DIEGO GAS & ELECTRIC PROJECT MANAGEMENT 571 ENTERPRISE ST. ESCONDIDO, CA 92029 CONTACT: AMY HAYASHI (760) 480-7647 CONTRACTOR SHALL REFER TO SDG&E PROJECT NUMBER (151)408-010 WHEN APPLYING FOR SDG&E SERVICE. AT&T 950 WEST WASHINGTON AVE. ESCONDIDO, CA. 92025 CONTACT: DAVE BENNETT (760) 489-3135
■			THREE POSITION SWITCH. MAINTAINED CONTACT FUNCTION MAY VARY AS NOTED ON DIAGRAMS. CENTER POSITION IS OFF	⊙			LEVEL SWITCH, CONTACT ACTION AS NOTED ON DRAWINGS				TELEMETRY INPUT POINT	
■			TWO POSITION SWITCH. MAINTAINED CONTACT FUNCTION MAY VARY AS NOTED ON DIAGRAMS				CONTROL PANEL OR EQUIPMENT AS NOTED				PLC INPUT POINT	
■			MOMENTARY CONTACT PUSHBUTTON. FUNCTION MAY VARY AS NOTED ON DIAGRAMS	■			FLOW SWITCH, CONTACT ACTION AS NOTED ON DRAWINGS				SPECIAL RECEPTACLE AS NOTED ON PLAN	
■			MOMENTARY CONTACT PUSHBUTTON WITH PROVISION FOR LOCKOUT.	■			FLUSH TOGGLE SWITCH, SINGLE POLE, SINGLE THROW				ALARM BEACON AND HORN LOCATION	
■			LOCKABLE DISCONNECT SWITCH. RATING AND DETAILS AS NOTED ON DRAWINGS.	\$			FLUSH TOGGLE SWITCH, THREE WAY					
■			LIMIT SWITCH. NORMALLY OPEN	\$ ³			FLUORESCENT FIXTURE. SEE LIGHTING SCHEDULE.					
■			LIMIT SWITCH. NORMALLY CLOSED				LIGHTING FIXTURE, WALL MOUNTED SEE LIGHTING SCHEDULE					
■			TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY OPEN, TIME OPEN				MH-MANHOLE PB-PULLBOX HH-HANDHOLE OR AS NOTED ON DRAWINGS					
■			TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY CLOSED, TIME CLOSED				TELEPHONE CONDUIT. SIZE AS NOTED					

CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION	CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION	CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION
■			LOCKABLE DISCONNECT SWITCH. RATING AND DETAILS AS NOTED ON DRAWINGS.				GROUNDING GRID OR GROUNDING CONDUCTOR SIZE AS REQUIRED OR AS NOTED ON DRAWINGS				
■			LIMIT SWITCH. NORMALLY OPEN				GROUND PIGTAIL. SIZE AS NOTED ON DRAWINGS				
■			LIMIT SWITCH. NORMALLY CLOSED				EXOTHERMIC GROUND CONNECTION				
■			TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY OPEN, TIME OPEN				BOLTED GROUND CONNECTION				
■			TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY CLOSED, TIME CLOSED				CONDUIT BENDING UP				
■			TIME DELAY RELAY CONTACT. ON DELAY, NORMALLY OPEN, TIME CLOSED				CONDUIT BENDING DOWN				
■			TIME DELAY RELAY CONTACT. ON DELAY, NORMALLY CLOSED, TIME OPEN				UNDERGROUND OR CONCEALED CONDUIT				
■			SOLENOID OPERATED VALVE				EXPOSED CONDUIT.				
■			MOTOR CONTROL CENTER DRAWOUT STABS				HOMERUN CONDUIT WITH 3 CONDUCTORS. NEUTRAL(S) AND GROUND. PANEL 'PB1'-CIRCUITS 1,3,5. MIN CONDUIT SIZE SHALL BE 3/4" UON. NO HASH MARKS INDICATES 3/4"C (2)#12 +(1)#12G				
■			MOTOR STARTER WITH THERMAL OVERLOADS. NUMBER INDICATES NEMA SIZE				DRIVEN GROUND ROD/TEST WELL 3/4" X 10' CU CLAD STEEL				
■			MOTOR OVERLOAD CONTACT				PANELBOARD OR AS NOTED ON DRAWING				
■			MOTOR, NUMBER INDICATES HORSEPOWER				LIQUIDTIGHT FLEXIBLE CONDUIT				
■			INDICATING LIGHT, PUSH-TO-TEST. LETTER INDICATES COLOR. R=RED B=BLUE G=GREEN A=AMBER W=WHITE				CONDUIT NUMBER 'XXX'. REFER TO CONDUIT SCHEDULE FOR DESCRIPTION				
■			CONTACTOR OR RELAY COIL. LETTER OR NUMBER IS DESIGNATION				MANUAL MOTOR STARTER				
■			NORMALLY CLOSED CONTACT. LETTER OR NUMBER IS DESIGNATION				GROUND				
■			NORMALLY OPEN CONTACT. LETTER OR NUMBER IS DESIGNATION				HEATER, RATING AS NOTED ON DRAWING				
■			RUNNING TIME METER, NON-RESETTABLE				HORN OR AUDIBLE SIGNAL				
■			FUSE, NUMBER INDICATES RATING				PHASE				
■			CONTROL TRANSFORMER. RATING AS NOTED ON DRAWINGS OR AS REQUIRED BASED ON LOAD SERVED.				TERMINAL, INTERNAL WIRING				
■			KILOWATT HOUR METER				TERMINAL, FIELD WIRING				
■			PRESSURE SWITCH. CONTACT ACTION AS NOTED ON DRAWINGS				MAGNETIC DOOR SWITCH				
■			POWER TRANSFORMER. RATINGS AS NOTED ON DRAWINGS				CONDUIT STUB OUT				
■			DUPLEX RECEPTACLE. 20A. SPEC GRADE GROUNDING TYPE. UNLESS OTHERWISE NOTED ON DRAWINGS.								
■			TELEPHONE OUTLET								

STANDARD ABBREVIATIONS			
A	AMPERES	INTLK	INTERLOCK
AC	ALTERNATING CURRENT	JB OR J	JUNCTION BOX, CONDULET OR FITTING AS REQUIRED BY NEC. UNLESS OTHERWISE NOTED
AF	AMPERE FRAME	KW	KILOWATTS
AFC	ABOVE FINISHED CONCRETE	LCL	LONG CONTINUOUS LOAD
AFF	ABOVE FINISHED FLOOR	LCP	LOCAL CONTROL PANEL
AFG	ABOVE FINISHED GRADE	LEV	LEVEL
AT	AMPERE TRIP	LIM	LIMIT
ATS	AUTOMATIC TRANSFER SWITCH	LOS	LOCKOUT STOP STATION
AUTO	AUTOMATIC	LR	LOCAL/REMOTE
AUX	AUXILIARY	LS	LEVEL OR LIMIT SWITCH
AWG	AMERICAN WIRE GAUGE	LT	LIGHT
BC	BARE COPPER	LTG	LIGHTING
BD	BOARD	LV	LOW VOLTAGE
BKR	BREAKER	MA	MILLIAMPERE
C	CONDUIT	MAINT	MAINTAINED
C.O.	CONDUIT ONLY	MAN	MANUAL
CAB	CABINET	MAX	MAXIMUM
CB	CIRCUIT BREAKER	MC	MAINTAINED CONTACT
CLG	CEILING	MCC	MOTOR CONTROL CENTER
COMPT	COMPARTMENT	MCP	MAIN CONTROL PANEL
COND	CONDUCTOR	MH	MANHOLE
CONT	CONTINUED	MIN	MINIMUM OR MINUTE
CP	CONTROL PANEL	MLO	MAIN LUGS ONLY
CPT	CONTROL POWER TRANSFORMER	MOV	MOTOR OPERATED VALVE ACTUATOR
CR	CONTROL RELAY	MOG	MOTOR OPERATED GATE VALVE
CRT	CIRCUIT	MTG	MOUNTING
CT	CURRENT TRANSFORMER	MTR	MOTOR
CTRL	CONTROL	N	NEUTRAL
CU	COPPER	NA	NON-AUTOMATIC
DC	DIRECT CURRENT	NC	NORMALLY CLOSED
DISC	DISCONNECT	NCIO	NORMALLY CLOSED, INSTANTANEOUS OPEN
DISC SW	DISCONNECT SWITCH	NCTC	NORMALLY CLOSED, TIME CLOSE
DPDT	DOUBLE POLE DOUBLE THROW	NCTO	NORMALLY CLOSED, TIME OPEN
DPST	DOUBLE POLE SINGLE THROW	NEC	NATIONAL ELECTRIC CODE
DS	DOOR SWITCH	NIC	NOT IN CONTRACT
DWG	DRAWING	NO	NUMBER
EBA	EMERGENCY BREATHING APPARATUS	NO	NORMALLY OPEN
EL, ELEV	ELEVATION	NOIC	NORMALLY OPEN, INSTANTANEOUS CLOSE
EO	ELECTRICALLY OPERATED	NOTC	NORMALLY OPEN, TIME CLOSE
EP	EXPLOSION PROOF	NOTO	NORMALLY OPEN, TIME OPEN
ES	EMERGENCY STOP	NP	NAMEPLATE
EXST	EXISTING	NTS	NOT TO SCALE
FBO	FURNISHED BY OWNER	OL	OVERLOAD
FDR	FEEDER	OTT	OVERTEMP SWITCH
FE	FLOW ELEMENT	PB	PULLBOX
FIN	FINISHED	PB	PUSHBUTTON
FLA	FULL LOAD AMPS	PC	PHOTOCELL
FLEX	FLEXIBLE	PCP	PUMP CONTROL PANEL
FM	FLOW METER	PCV	PUMP CONTROL VALVE
FS	FLOW SWITCH	PFR	POWER FAIL RELAY
FT	FLOW TRANSMITTER		
FT OR	FEET OR FOOT		
FUT	FUTURE		
FVNR	FULL VOLTAGE NON REVERSING		
GALV	GALVANIZED		
GD	GAS DETECTORS		
GFI	GROUND FAULT INTERRUPTER		
GFP	GROUND FAULT PROTECTION		
GND	GROUND		
HH	HANDHOLE		
HOA	HAND/OFF/AUTO		
HTR	HEATER		
IC	INTERRUPTING CURRENT		
IN OR	INCHES OR INCH		
IND	INDICATING		
INST	INSTANTANEOUS		
INSTR	INSTRUMENT		

WARNING
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CONSULTING ELECTRICAL & MECHANICAL ENGINEERS
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL, VERTICAL

CITY OF SAN DIEGO PUBLIC WORKS PROJECT

REGISTRATION SEAL: JOSEPH M. MORABES, REGISTERED PROFESSIONAL ENGINEER, NO. 411823, EXP. 6/30/13, STATE OF CALIFORNIA

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

DRAWING NO. 84-E-1
SHEET NO. 78
SPECIFICATION NO. 5525

CITY WIDE PUMP STATION UPGRADES
SPS 84 UPGRADE/SPS 62 ABANDONMENT
STANDARD ELECTRICAL SYMBOLS AND ABBREVIATIONS

CITY OF SAN DIEGO, CALIFORNIA
SHEET 78 OF 118 SHEETS

WATER WBS S-00308
SEWER WBS S-00308

APPROVED BY: *HogC Agay* 10-25-11
FOR CITY ENGINEER

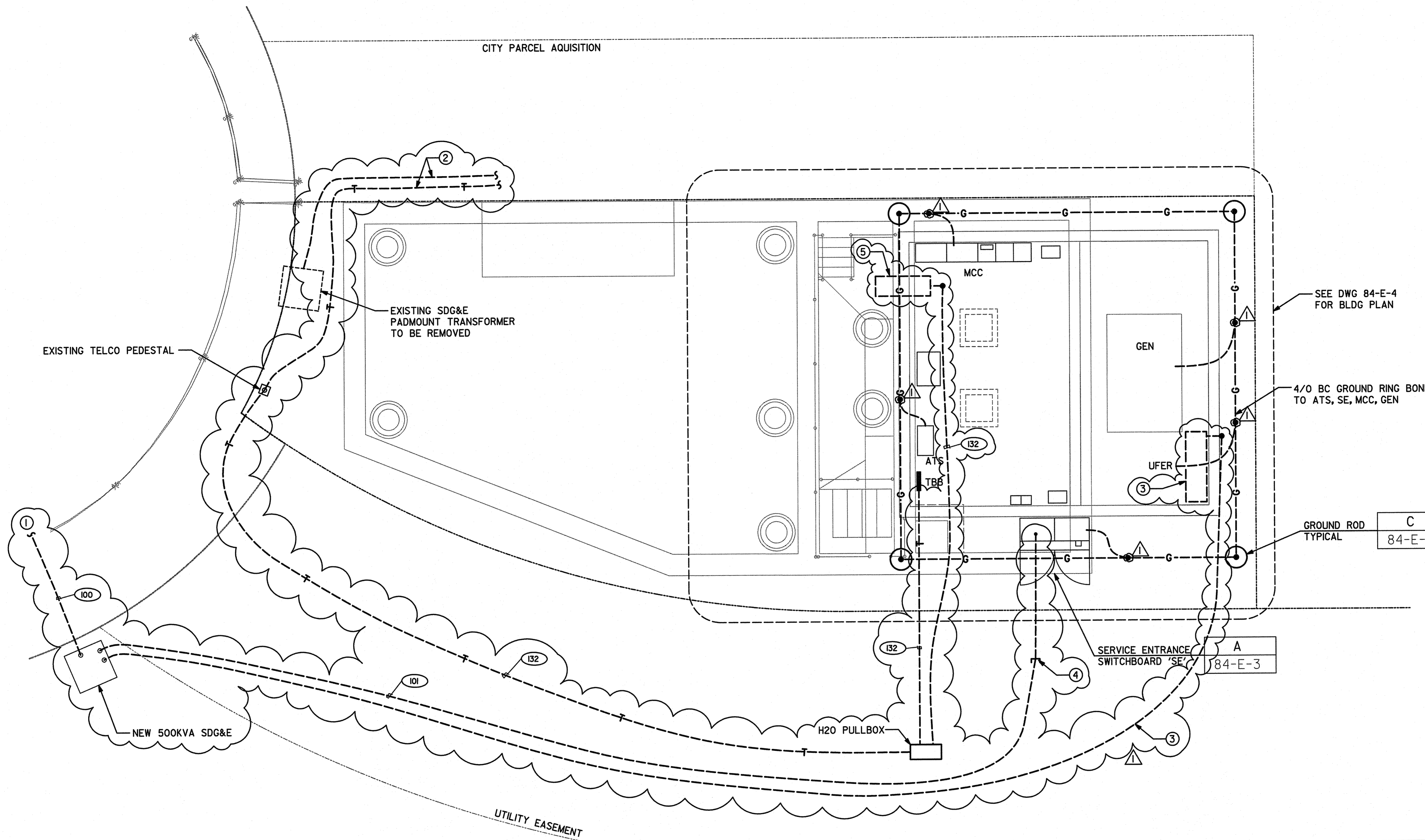
CONSTRUCTION ENGINEER CHECKED BY: _____
INSPECTOR: _____

DATE STARTED: _____
DATE COMPLETED: _____

PROJECT MANAGER: *Paul Lee*
CONTROL CERTIFICATION: 302-1737
LAMBERT COORDINATES: 36196-78-D

10/20/2011 8:48:04 AM

SPS84-E-2.dgn



- NOTES:**
- ① REFER TO SDG&E PROJECT NO. 151408-010 CONSTRUCTION ORDER NO. 2950690 FOR SCOPE.
 - ② EXISTING TELCO & SDG&E CONDUITS. REFER TO 84-D-100 FOR DEMOLITION.
 - ③ EXISTING PUMP STATION METER SWITCHBOARD AND TEMP FEEDER.
 - ④ STUB CONDUIT FOR ULTIMATE CONTINUATION TO 'SE'.
 - ⑤ EXISTING CONTROL PANELS WITH PLC TELCO CONNECTION. PROVIDE TEMP TELCO CONNECTION DURING PHASING.

DRAWING NO. 84-E-2	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT SPS 84 ELECTRICAL SITE PLAN	
SHEET NO. 79	CITY OF SAN DIEGO, CALIFORNIA SHEET 79 OF 118 SHEETS	
SPECIFICATION NO. 5525	WATER WBS SEWER WBS S-00308	
APPROVED BY: <i>Hoschi Acer</i> FOR CITY ENGINEER	DATE 10-25-11	PROJECT MANAGER <i>Bob Lee</i>
FOR CITY ENGINEER	DESCRIPTION	BY
CHECKED BY:	APPROVED	DATE
CONSTRUCTION ENGINEER	FILED	
CHECKED BY:		CONTROL CERTIFICATION 302-1737
INSPECTOR	CONTRACTOR	LAMBERT COORDINATES 36196-79-D
INSPECTOR	DATE STARTED	DATE COMPLETED

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
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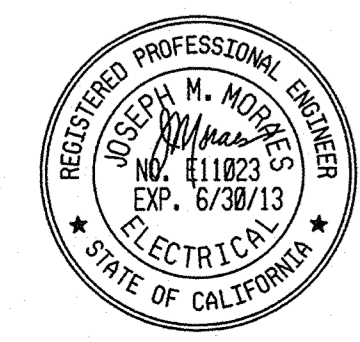
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

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SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

MPA MORABS/PHAM & ASSOCIATES
CONSULTING ELECTRICAL & MECHANICAL ENGINEERS
2151 PALOMAR AIRPORT RD., STE. 120
CARLSBAD, CA 92001 (760) 431-7177

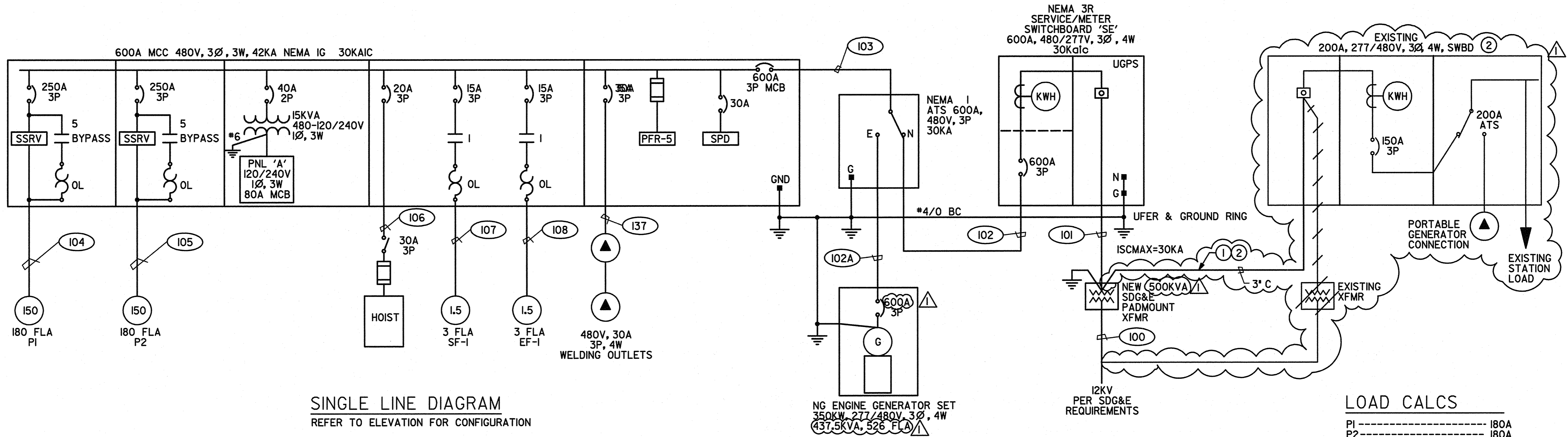
SCALE
HORIZONTAL SCALE: 1" = 5'-0"
VERTICAL

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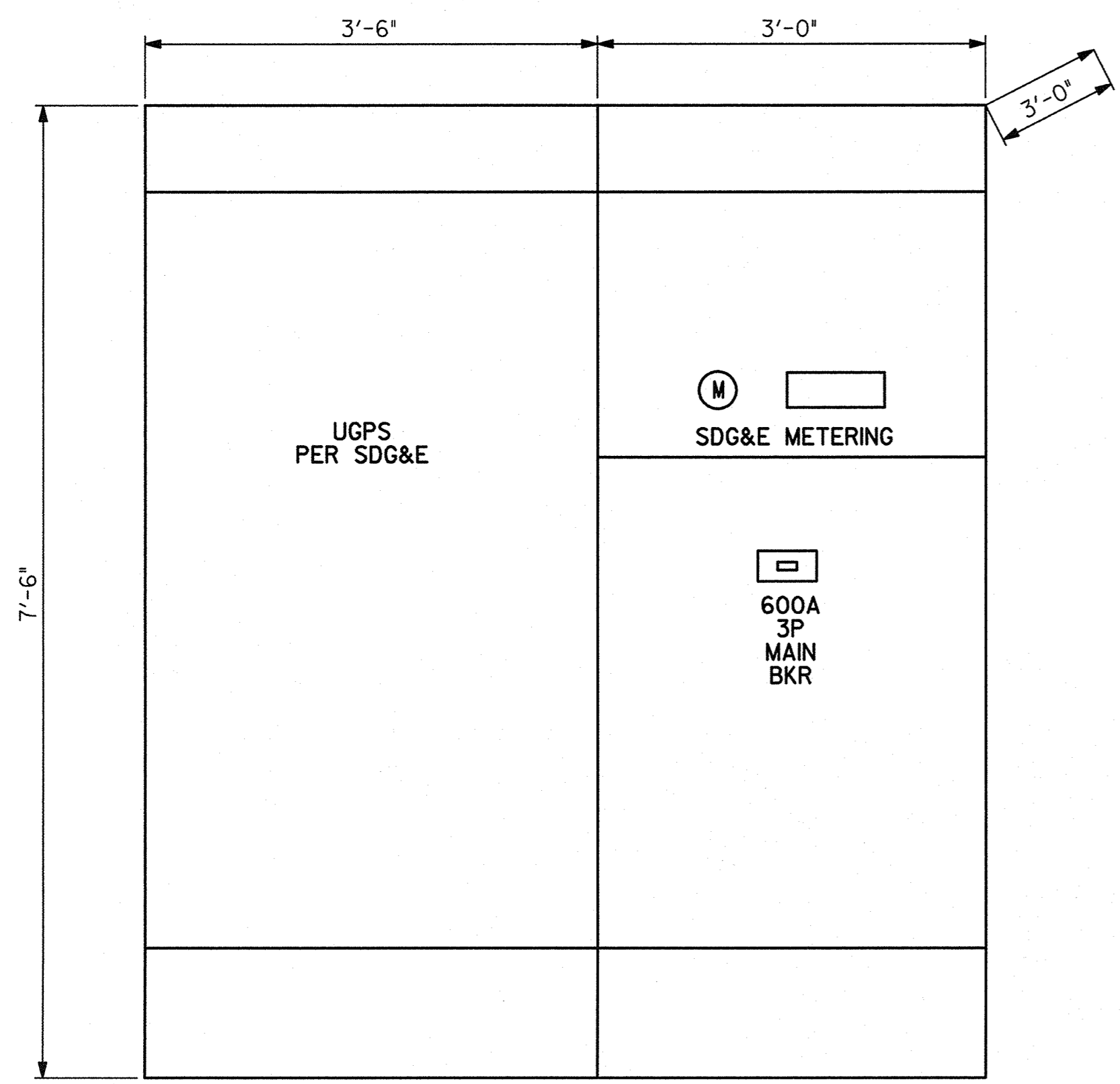
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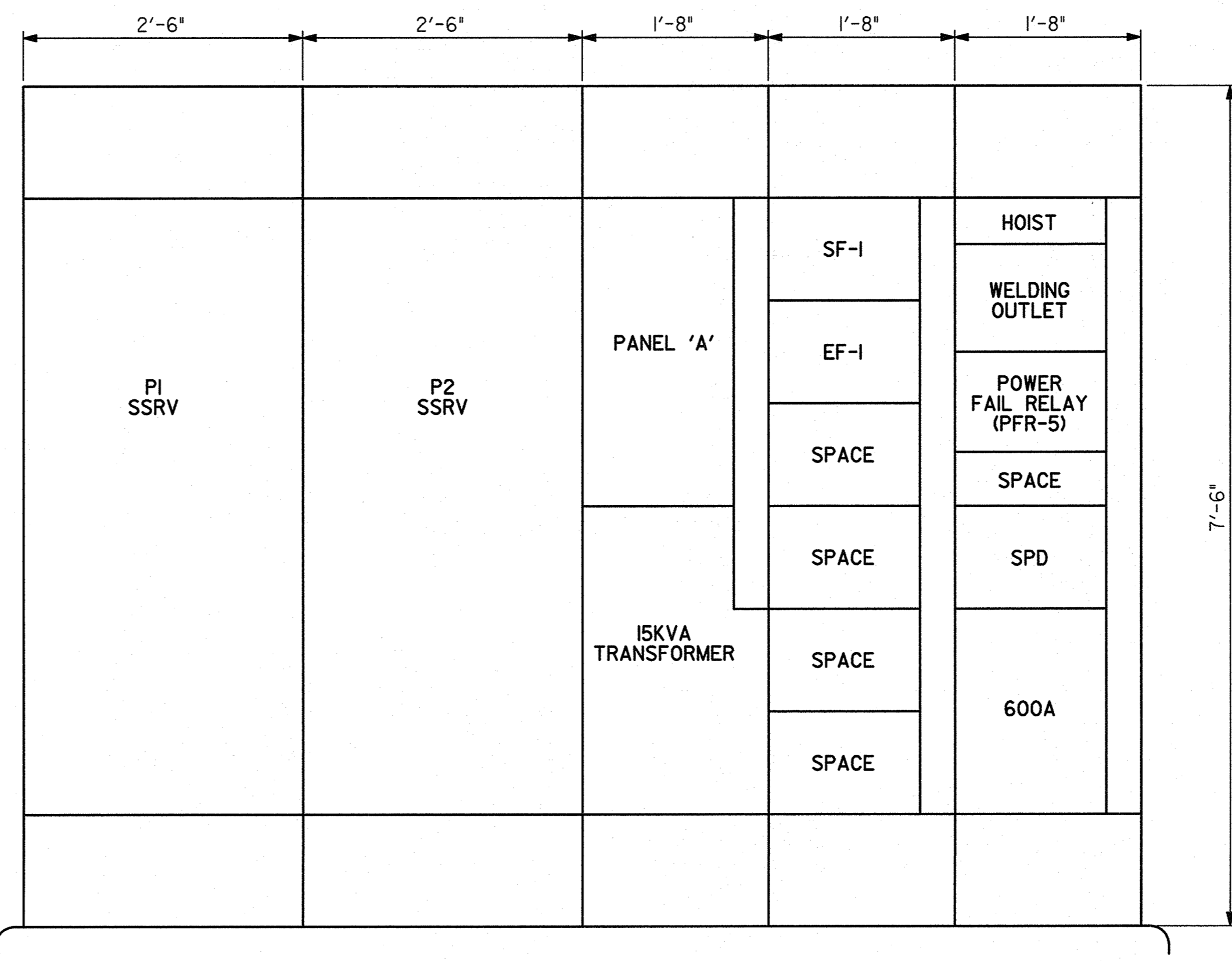
SINGLE LINE DIAGRAM
REFER TO ELEVATION FOR CONFIGURATION

LOAD CALCS

PI	180A
P2	180A
FANS	6A
HOIST	5A
PANEL 'A'	20A
25% LARGEST MOTOR	45A
	436A @480V, 3Ø



NEMA 3R SERVICE ENTRANCE SWITCHBOARD 'SE'
NTS
A
VAR



MCC ELEVATION
NEMA GASKETED
NTS
B
VAR

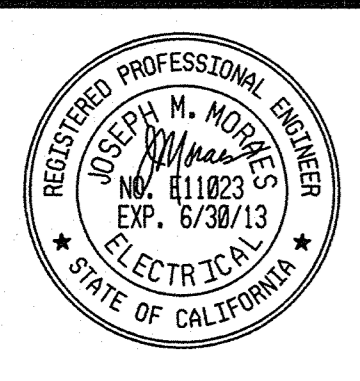
NOTES:

- TEMP FEEDER TO EXISTING SWITCHBOARD.
- DEMO AFTER NEW SWBD IS INSTALLED.

LEGEND:

- NEW
- EXISTING
- DEMO

DRAWING NO. 84-E-3	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 80	SINGLE LINE DIAGRAM AND ELEVATIONS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 80 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	10-25-11	DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY
CHECKED BY: INSPECTOR	APPROVED	DATE
INSPECTOR	DATE STARTED	DATE COMPLETED



WARNING
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HDR
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CARLSBAD, CA 92011 (760) 431-7177

SCALE: HORIZONTAL, VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

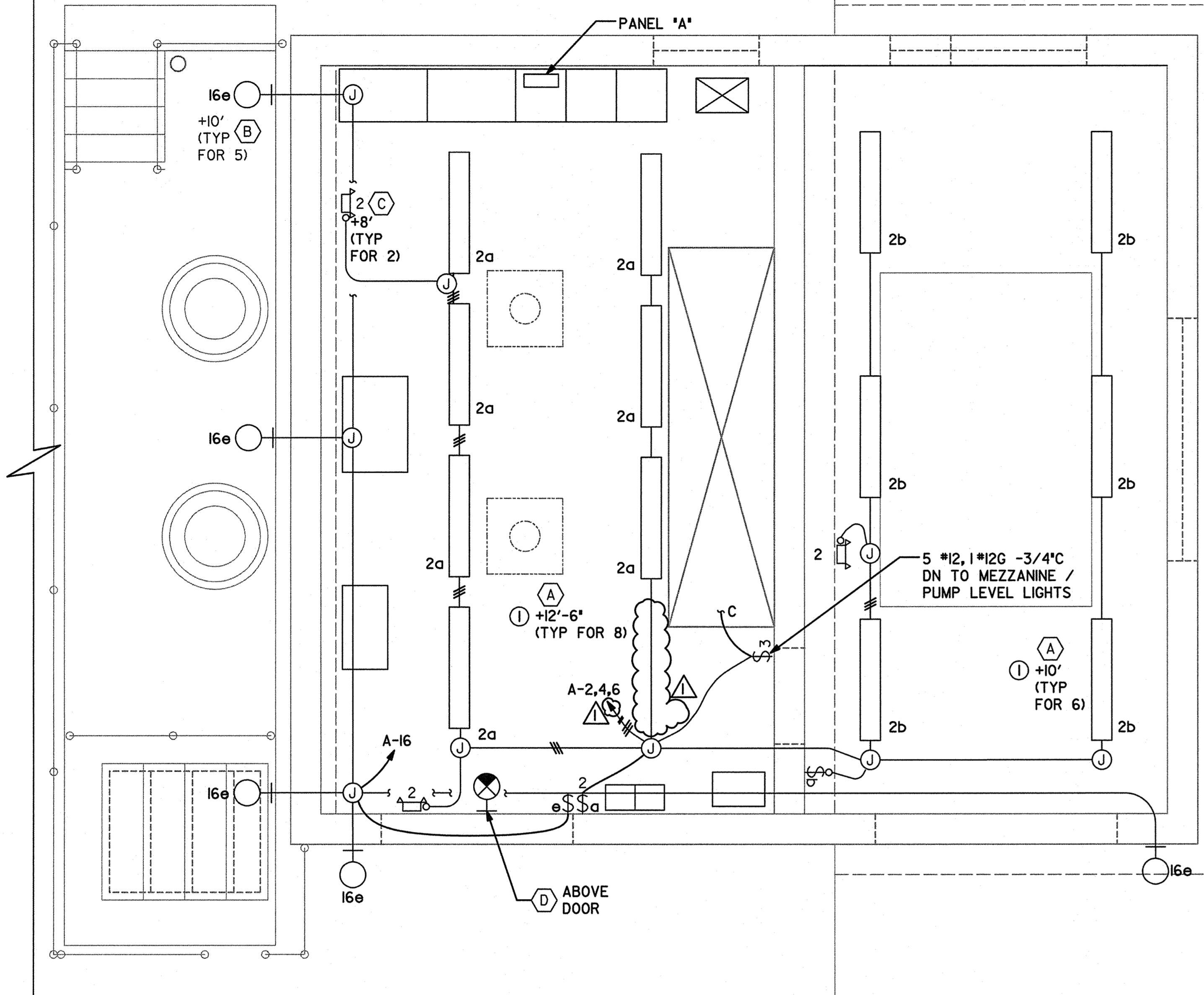


DRAWING STATUS

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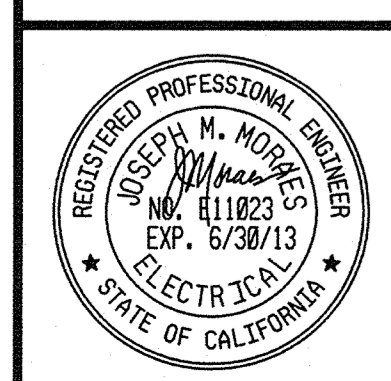
SPS84-E-6.dgn



NOTES:
 ① CONTRACTOR SHALL PROVIDE MOUNTING HARDWARE AND ALL NECESSARY APPURTENANCES TO PENDANT MOUNT FIXTURES FROM ROOF FRAMING

TITLE 24 NOTES:
 1. AUTOMATIC LIGHTING SHUTOFF AND OVERRIDE CONTROLS ARE NOT APPLICABLE DUE TO SAFETY.
 2. ALL FLUORESCENT BALLASTS AND FIXTURES SHALL BE T24 CERTIFIED.
 3. INDIVIDUAL ROOMS ARE SWITCHED. BI-LEVEL SWITCHING IS NOT APPLICABLE. ALL SPACES MEET MINIMUM LIGHTING LEVELS TO MEET SAFETY.
 4. NO WINDOWS OR SKYLIGHTS ON THIS PROJECT.
 5. INSTALLED INDOOR LIGHTING IS 1500W (0.98 W/SF).

INDOOR LIGHTING POWER ALLOWANCE				LTG-5-C
PROJECT NAME		CITY WIDE PUMP STATION UPGRADES - SPS 84		DATE 9-6-2011
ALLOWED LIGHTING POWER (Choose One Method)				
COMPLETE BUILDING METHOD - CONDITIONED SPACES				
BUILDING CATEGORY (FROM § 146 Table 146-B)	WATTS PER (SF)	COMPLETE BLDG. AREA	ALLOWED WATTS	
AREA CATEGORY METHOD - CONDITIONED SPACES				
A	B	C	D	
AREA CATEGORY (FROM § 146 Table 146-C)	WATTS PER (SF)	AREA (SF)	ALLOWED WATTS	
TOTALS				
TOTAL ALLOWED WATTS (FROM LTG-6-C)				
UNCONDITIONED SPACES				
Complete Building and Area Category Methods CATEGORY (FROM § 146 Table 146-B & C)		B	C	D
LOW BAY INDUSTRIAL		WATTS PER (SF)	AREA (SF)	ALLOWED WATTS
		1.0	1532	1532
TOTALS			1532	1532
TOTAL UNCONDITIONED SPACES ALLOWED WATTS (FROM LTG-5-C AND LTG-6-C)				
2005 NONRESIDENTIAL COMPLIANCE FORMS January 2006				



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SCALE: HORIZONTAL 3/8" = 1'-0" VERTICAL

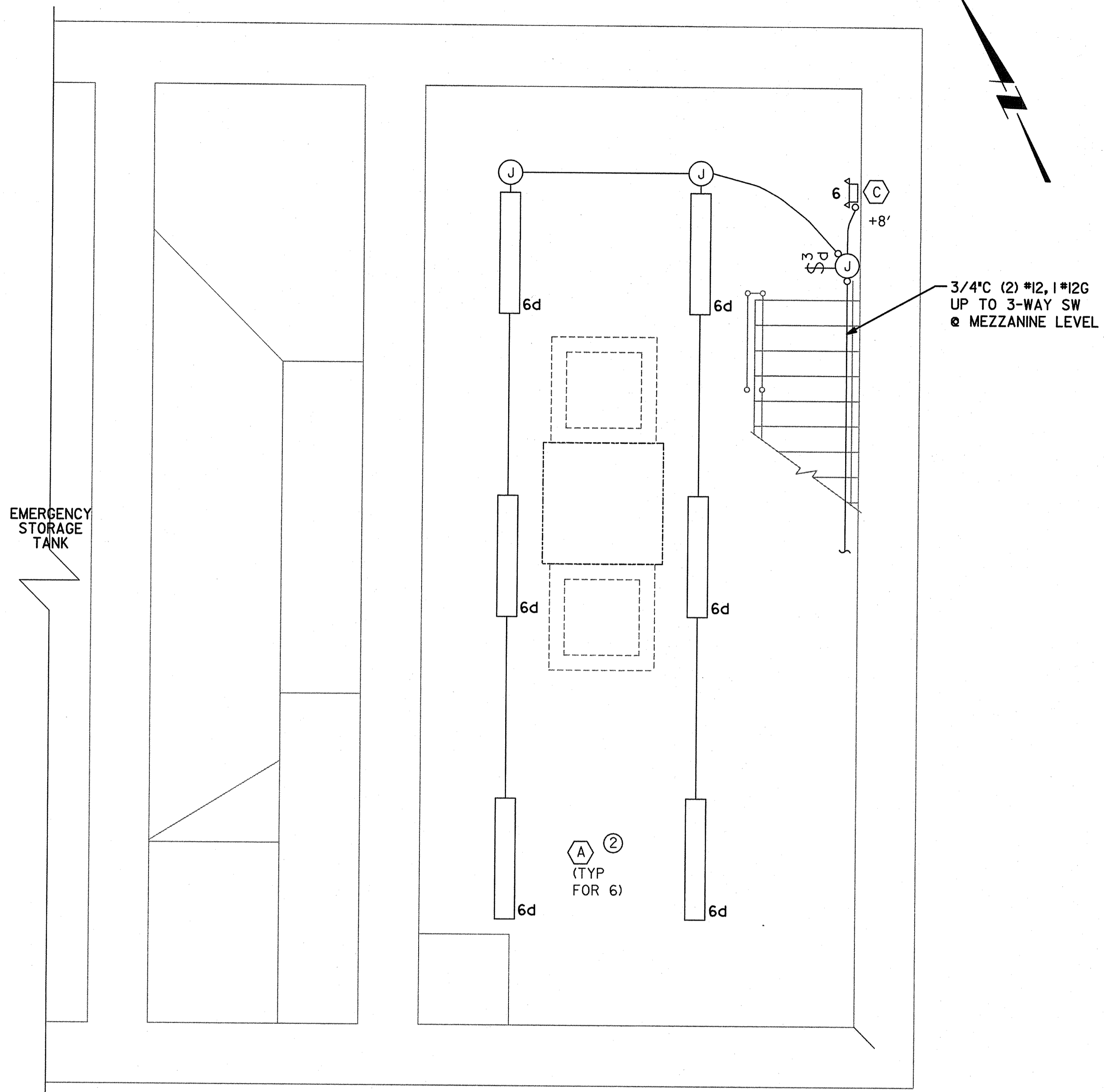
CITY OF SAN DIEGO PUBLIC WORKS PROJECT

DRAWING STATUS									
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1	10/11		BLDG PERMIT	DG	SB	AB			

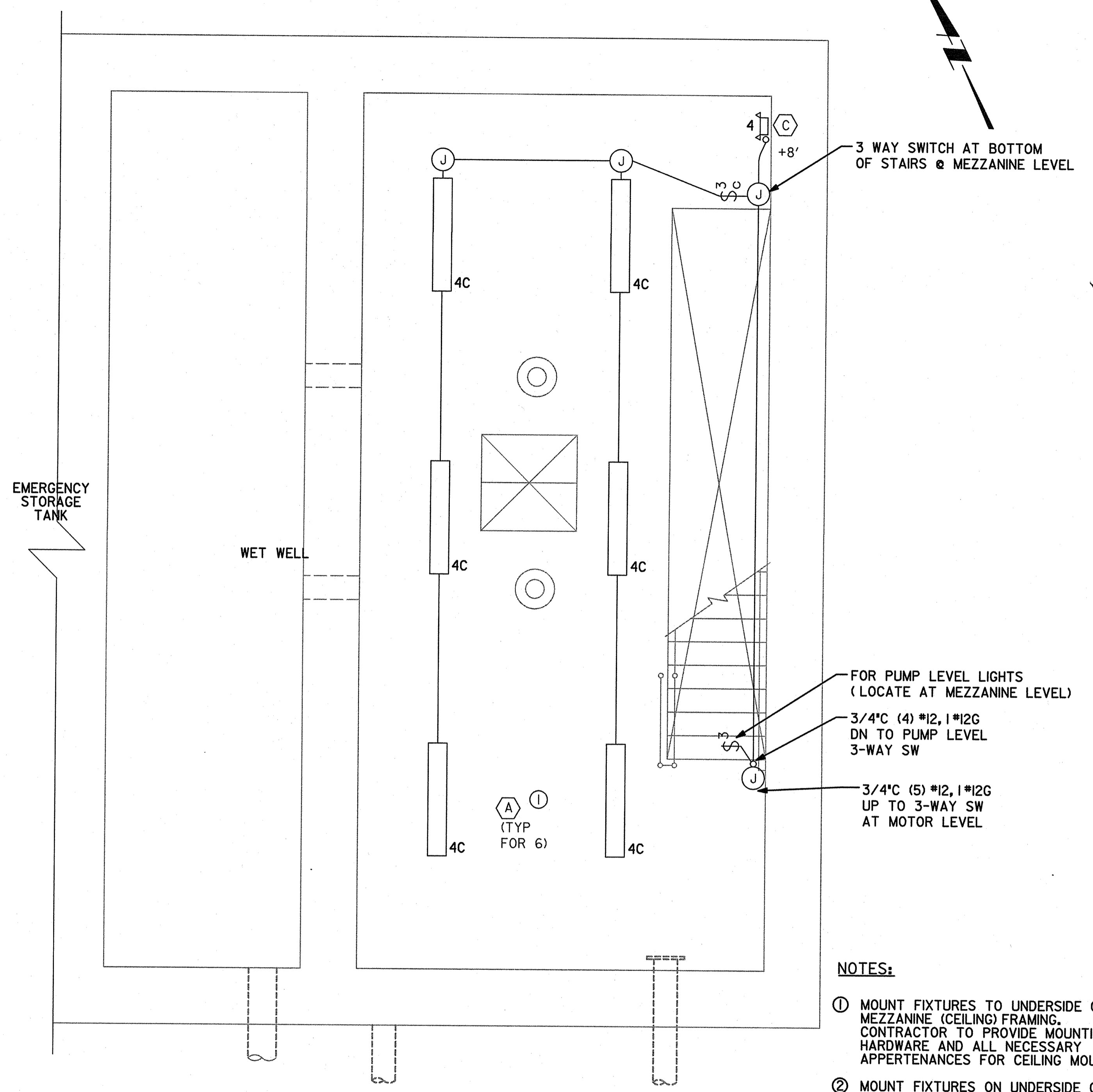
DRAWING NO. 84-E-6	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 83	MOTOR LEVEL LIGHTING PLAN		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 83 OF 118 SHEETS		WATER WBS S-00308
APPROVED BY: <i>Hoti Agar</i>	DATE: 10-25-11	FOR CITY ENGINEER	
CHECKED BY:	DESCRIPTION:	BY:	APPROVED DATE FILMED
CONSTRUCTION ENGINEER CHECKED BY:	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES		
INSPECTOR:	CONTRACTOR:	DATE STARTED:	DATE COMPLETED:

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SPS84-E-7.DGN



LOWER LEVEL



MEZZANINE LEVEL

3 WAY SWITCH AT BOTTOM OF STAIRS @ MEZZANINE LEVEL

FOR PUMP LEVEL LIGHTS (LOCATE AT MEZZANINE LEVEL)

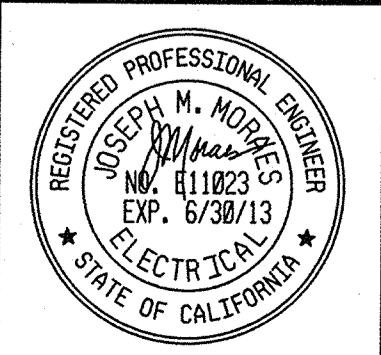
3/4" (4) #12, 1#12G DN TO PUMP LEVEL 3-WAY SW

3/4" (5) #12, 1#12G UP TO 3-WAY SW AT MOTOR LEVEL

NOTES:

- ① MOUNT FIXTURES TO UNDERSIDE OF MEZZANINE (CEILING) FRAMING. CONTRACTOR TO PROVIDE MOUNTING HARDWARE AND ALL NECESSARY APPURTENANCES FOR CEILING MOUNTING.
- ② MOUNT FIXTURES ON UNDERSIDE OF MEZZANINE FLOOR FRAMING. CONTRACTOR SHALL PROVIDE ALL NECESSARY MOUNTING HARDWARE AND NECESSARY APPURTENANCES FOR MOUNTING TO UNDERSIDE OF MEZZANINE.

DRAWING NO. 84-E-7	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 84	MEZZANINE AND PUMP LEVELS LIGHTING PLANS	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 84 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	HogC-Acy 7-26-11 FOR CITY ENGINEER	DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY
CHECKED BY: INSPECTOR	APPROVED	DATE
	FILED	
	CONTROL CERTIFICATION	
	302-1737	
	LAMBERT COORDINATES	
CONTRACTOR	DATE STARTED	
INSPECTOR	DATE COMPLETED	



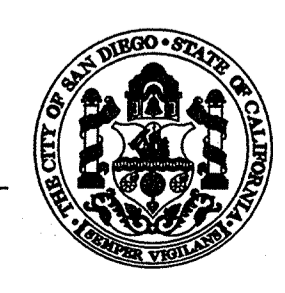
WARNING
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SCALE
HORIZONTAL 3/8" = 1'-0"
VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS							
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD

10/20/2011 8:51:55 AM

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CONDUIT NO.	SIZE	FROM	TO	CABLE			VOLTAGE	REMARKS
				QTY.	SIZE	GND. x		
100	4"	SDG&E	SDG&E PADMOUNT TRANSFORMER				12KV POWER	C.O. PER SDG&E REQUIREMENTS
101	(2)4"	SDG&E PADMOUNT TRANSFORMER	SERVICE/METER SWITCHBOARD 'SE'				POWER	C.O. PER SDG&E REQUIREMENTS
102	(2)3"	SERVICE/METER SWITCHBOARD 'SEATS		6	*350 KCMIL	*1	480 POWER	
102A	(2)3"	GENERATOR	ATS	6	*350 KCMIL	*1	480 POWER	
103	(2)3"	ATS	MCC	6	*350 KCMIL	*1	480 POWER	
104	2"	MCC	P1 MOTOR	3	*4/0	*4	480 POWER	
				4	*14	-	120 CONTROL	TEMP SW, WINDING HTR
105	2"	MCC	P2 MOTOR	3	*4/0	*4	480 POWER	
				4	*14	-	120 CONTROL	TEMP SW, WINDING HTR
106	2"	PCP	RF ANTENNA	1	COAX	-	- SIGNAL	RADIO LINK
107	1"	MCC	SUPPLY FAN	3	*12	*12	480 POWER	SF-1
108	1"	MCC	EXHAUST FAN	3	*12	*12	480 POWER	EF-1
109	3/4"	MCC	SUMP PUMP CP		*12	*12	POWER	
110	1"	PCP	ULTRASONIC SENSOR	1	MFR CORD	-	- SIGNAL	
110A	1"	PCP	WETWELL FLOAT	2	*14	*14	120 CONTROL	
111	1"	GAS DETECTOR	'GD'	1	*18STT	-	24 SIGNAL	GAS DETECTOR
112	3/4"	CHECK VALVES	PCP	4	*14	*14	120 CONTROL	VALVE POSITION
113	3/4"	CHECK VALVES	J-BOX	2	*14	*14	120 CONTROL	VALVE POSITION
114	1"	VENTILATION MONITOR 'VM'	PCP	4	*14	*14	120 SIGNAL	GAS & VENTILATION ALARMS
114A	1"	VENTILATION MONITOR 'VM'	MCC	4	*14	*14	120 CONTROL	UCR 1 & 2
115								
116	1"	SCADA	FLOW TRANSMITTER ENCLOSURE	1	*18 STP	-	24 SIGNAL	FLOW SIGNAL
116A	1"	FLOW TRANSMITTER ENCLOSURE	FLOW TRANSMITTER FE-2	2	COAX	-	- SIGNAL	FLOW SIGNAL
116B	1"	FLOW TRANSMITTER ENCLOSURE	FLOW TRANSMITTER FE-1	2	COAX	-	- SIGNAL	FLOW SIGNAL
117	1	GEN CP	PCP	6	*14	*14	120 CONTROL	GEN STATUS/COMMON ALARM/SPARE
118	1	GENERATOR	PANEL 'A'	2	*10	*10	120 POWER	A-18, BATT CHGR/WINDING HTR/CP
				2	*10	*10	120 POWER	A-20, BLOCK HTR
119	2"	GEN CP	ATS	2	*14	*14	120 CONTROL	GEN. START/STOP
120	1"	GEN GAS DETECTORS	'GD'	2	*18 STT	-	24 SIGNAL	GAS DETECTORS
121	1"	MCC	BIOXIDE CP	2	*12	*12	120 POWER	A-24
122	1"	MCC	BIOXIDE CP	-	-	-	- SPARE	
123								
124	2"	MCC	SCADA	35	*14	*14	120 CONTROL	CONTROL/STATUS/SPARES
125	3/4"	MCC	SCADA	4	*12	*12	120 POWER	A-12,14
126	1"	MCC	LOS-1, LOS-2	4	*14	*14	120 CONTROL	LOCK-OUT-STOP
127								
128	3/4"	SCADA	MOTOR ROOM FLOOD SWITCH	2	*14	*14	12 SIGNAL	LSHH-5
128A	3/4"	SCADA	PUMP ROOM FLOOD SWITCH	2	*14	*14	12 SIGNAL	LSHH-4
129	3/4"	VENTILATION MONITOR 'VM'	ALARM HORN/BEACON	4	*14	*14	120 SIGNAL	ALARM

x - ONE GROUND CONDUCTOR PER CONDUIT

CONDUIT TABLE (CONTINUED)

CONDUIT NO.	SIZE	FROM	TO	CABLE			VOLTAGE	REMARKS
				QTY.	SIZE	GND. x		
130	1"	VENTILATION MONITOR 'VM'	GENERATOR SV	2	*14	*14	24 CONTROL	GAS SHUTDOWN
131	3/4"	PCP	INTRUSION SWITCHES	2	*14	*14	120 SIGNAL	
132	2"	TELCO PEDESTAL	TBB	1	CAT 5	-	- SIGNAL	C.O. TELCO
133	1"	PCP	TBB	1	CAT 5	-	- SIGNAL	TELCO

x - ONE GROUND CONDUCTOR PER CONDUIT

LIGHTING FIXTURE SCHEDULE

SYMBOL	TAG	DESCRIPTION	FIXTURE WATTS	LAMP TYPE NO. OF LAMPS	MOUNTING	MANUFACTURER CATALOG NO.
	A	4' FLUORESCENT DUST/MOISTURE WET LOCATION FIXTURE. POLYESTER HOUSING WITH GASKETED ACRYLIC DIFFUSER. SOUND RATING A BALLAST OCTRON ELECTRONIC BALLAST	60W 120V	FLUOR CW 2 F32T8	CEILING/ PENDANT	LITHONIA DMW248120
	B	WALL MOUNTED FLUORESCENT FIXTURE. FULLY GASKETED, DIE-CAST ALUMINUM HOUSING. HIGH POWER FACTOR BALLAST. 120V, WET LOCATION, UL LISTED.	30W 120V	FLUORESCENT 1 26W	SURFACE/ WALL	LUMINAIRE LIGHTING CORP. DWL 512-IPLC26-120-WET-PC
	C	EMERGENCY LIGHTING UNIT, 6 VOLT SELF CONTAINED NI-CAD BATTERY, NEMA 4X. 120V, WET LOCATION, UL LISTED.	20W 120VAC	INCANDESCENT (2) 7.2W, PAR36	WALL	LITHONIA *ELU-2XN SURE-LITES *UMB-4 OR EQUAL
	D	SELF LUMINOUS EXIT SIGN, GREEN FACE, BLACK ABS FRAME, DAMP LOCATION, 20 YEAR LIFE, ONE PIECE INTEGRAL DOWNLIGHT LENS, UL LISTED	NA	NA	CEILING/ WALL	ISOLITE 2040-50G20BK OR EQUAL

MOUNTING MCC PANEL 'A' 10,000 A.I.C. SYM.
120/240 VOLT 1 PHASE 3 WIRE MAIN 150A BUS 225A CU

LOCATION	WATTAGE		REC	LTG	POLE	BKR	CKT NO.	ØA	ØB	CKT NO.	BKR	POLE	LTG	REC	WATTAGE		LOCATION	
	ØA	ØB													ØA	ØB		
EBA RECEPT	2400		1	2	30	1	2	15	1	9					648		LTS MOTOR LEVEL	
-		2400				3	4	20	1	7					504		LTS INTERM. LEVEL	
EBA RECEPT	2400		1	2	30	5	6	20	1	5					360		LTS PUMP LEVEL	
-		2400				7	8	20	1						500		VM & GD	
RECP- MOTOR LEVEL	900		5	1	20	9	10	20	1	1					300		SCADA RECEPT	
RECP - INTERM LEVEL	540		3	1	20	11	12	20	1						600		SCADA UPS	
RECP - PUMP LEVEL	540		3	1	20	13	14	20	1						100		FLOW TRANSMITTER	
TELCO RECEPT	180					15	16	20	1	4					280		EXTERIOR LTS	
GEN RM RECEPT	540		3	1	20	17	18	20	1						55		GENERATOR CHGR	
INLET MOV	300					19	20	30	1						2400		GENERATOR BLOCK HTR	
RETURN MOG	300		1	20	21	22	20	20	1						300		SWBD 'SE'	
						23	24	20	1						1000		BIOXIDE	
						25	26											
						27	28	20	1						500		EF-2	
						29	30	20	1								SF-2	
	7000	5820													500			
															2263	5784		
ØA- 9343																	ØB- 11604	
TOTAL WATTS- 28947																	AMPS/LINE- 88	
																	LCL AMPS- 30*	

* DENOTES GFCI BREAKER

DRAWING NO. 84-E-8	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 85	SCHEDULES	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 85 OF 118 SHEETS	
DATE 10-25-11	DATE	
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	DATE
CHECKED BY: CONSTRUCTION ENGINEER	BY	APPROVED
CHECKED BY: INSPECTOR	DATE STARTED	DATE COMPLETED
CONTRACTOR	DATE STARTED	DATE COMPLETED
INSPECTOR	DATE STARTED	DATE COMPLETED
PROJECT MANAGER	CONTROL CERTIFICATION	302-1737
PROJECT MANAGER	LAMBERT COORDINATES	36196- 85 -D

WARNING
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SCALE
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VERTICAL

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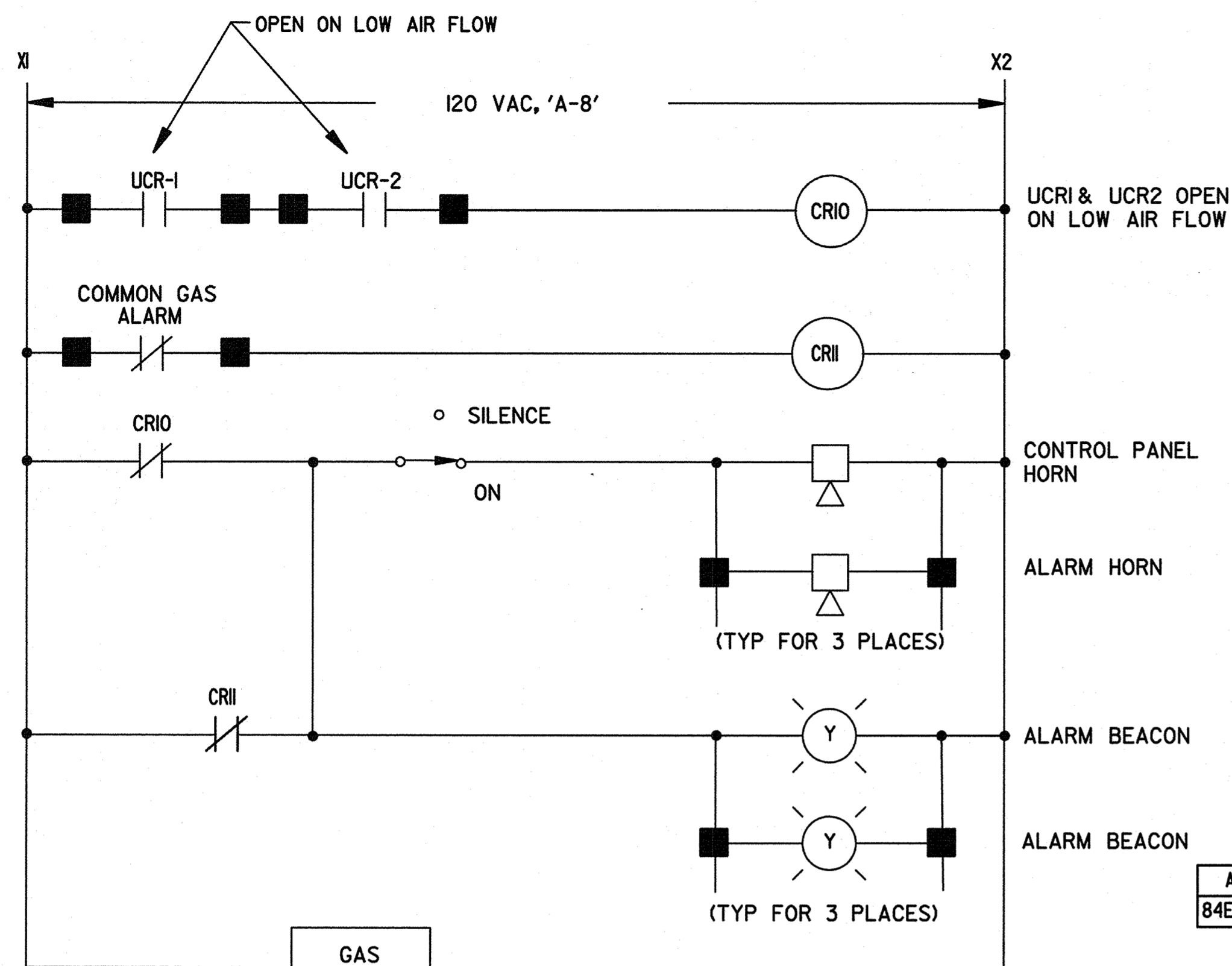


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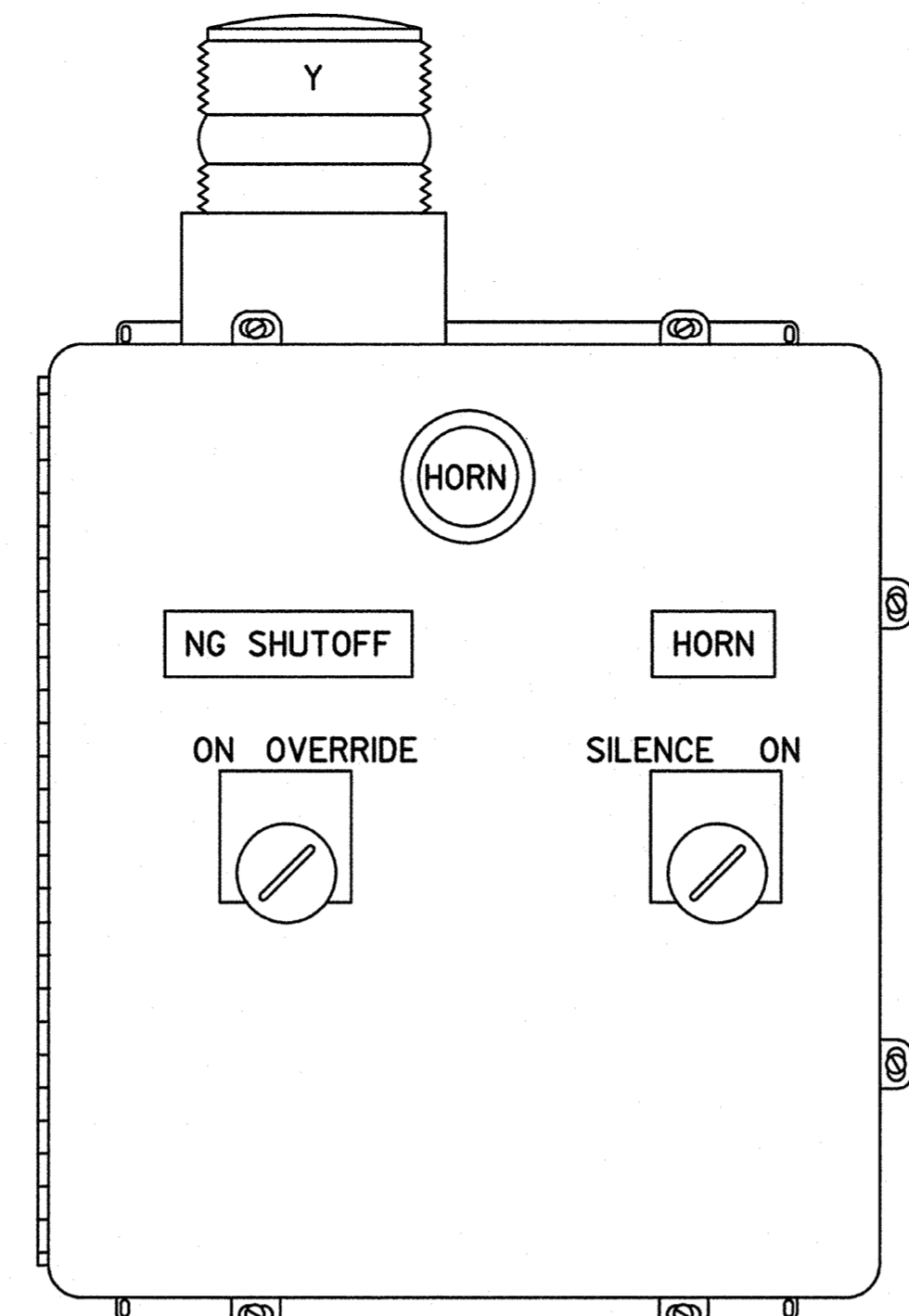
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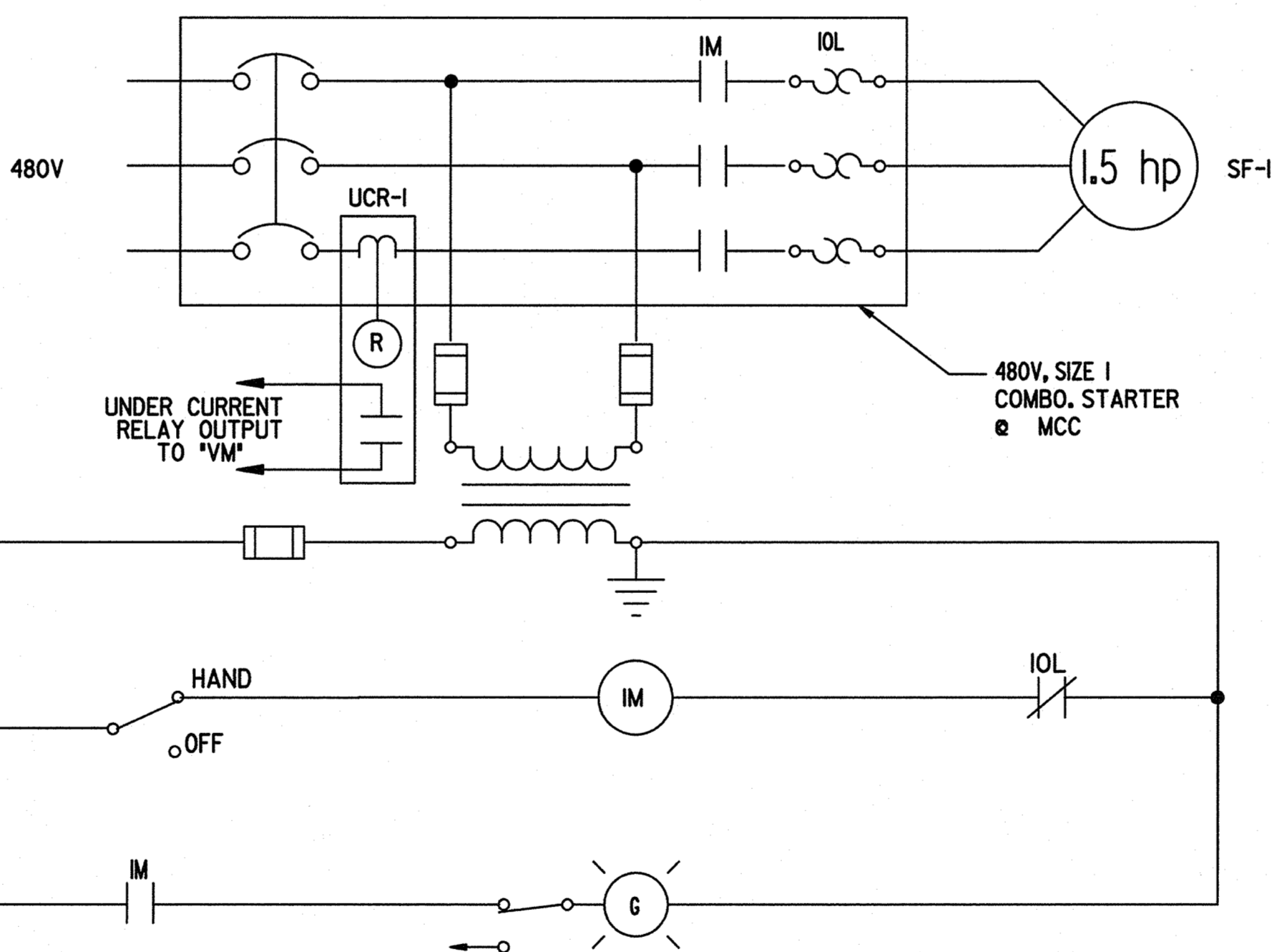


PUMP STATION VENTILATION/GAS
ALARM CONTROL PANEL 'VM'



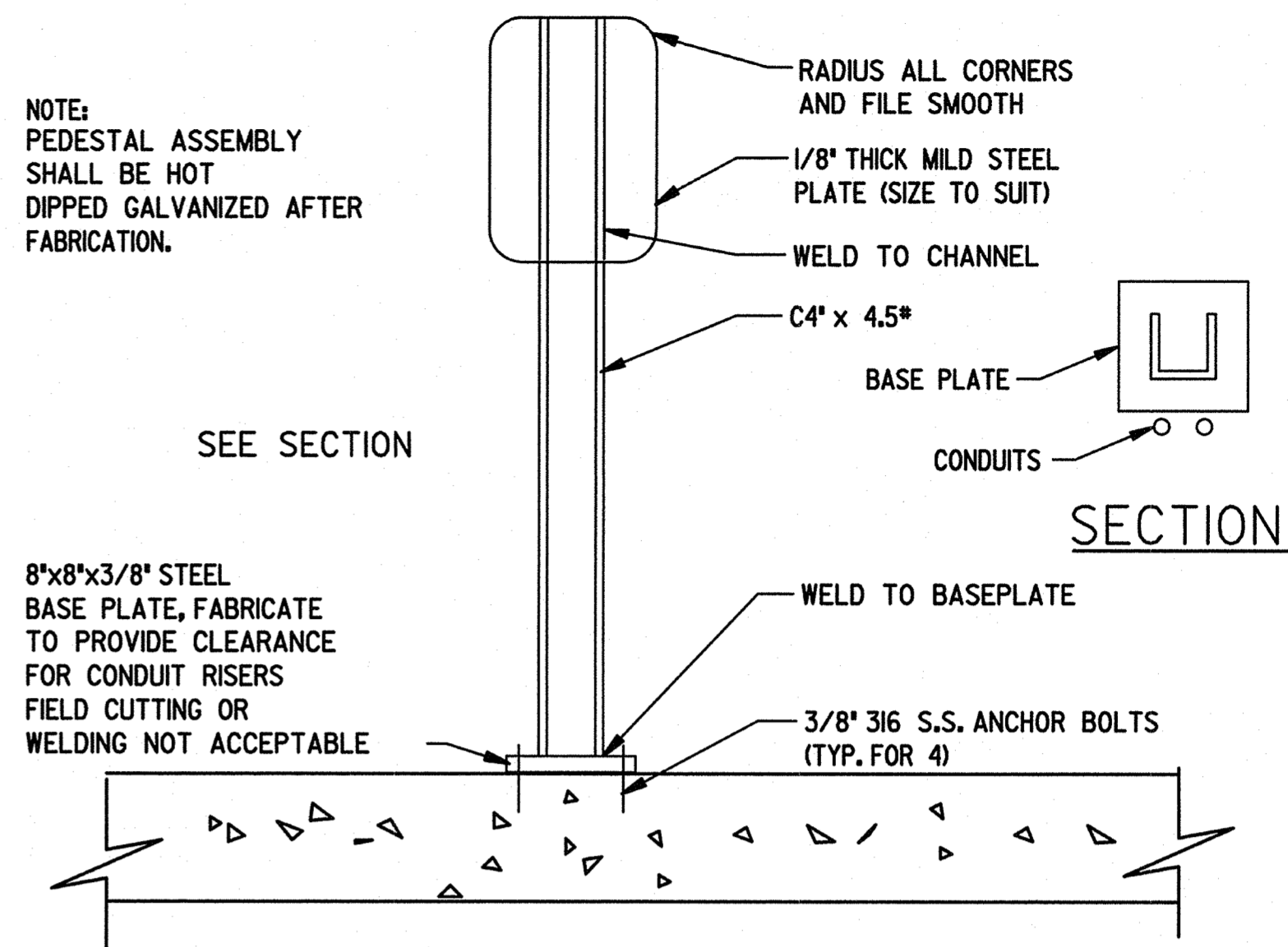
VENTILATION/GAS MONITOR ALARM CP 'VM'

ENCLOSURE MATERIAL: NEMA 4X STAINLESS STEEL OR FIBERGLASS

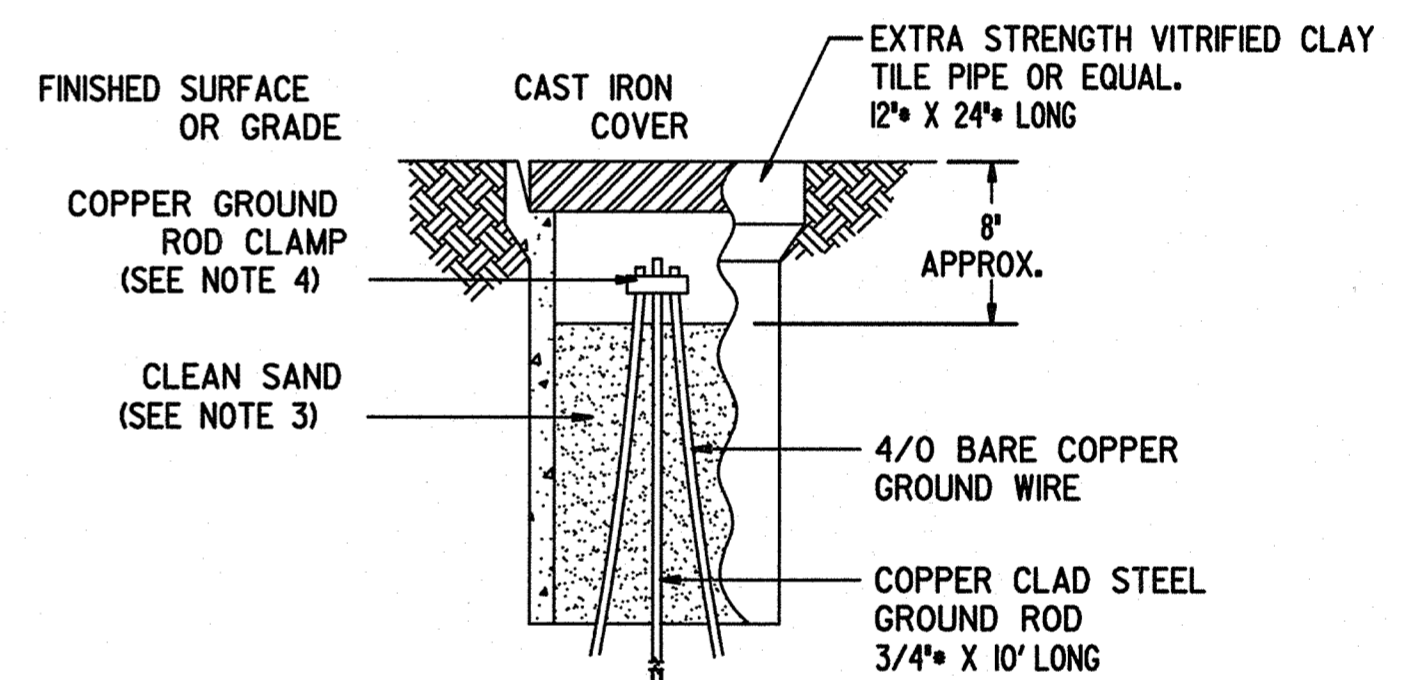


SUPPLY FAN SF-1 & EXHAUST FAN EF-1

NOTE:
PEDESTAL ASSEMBLY
SHALL BE HOT
DIPPED GALVANIZED AFTER
FABRICATION.

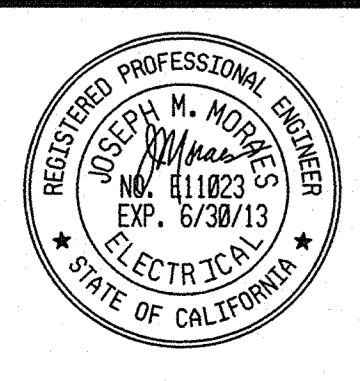


POWER/CONTROL
STATION PEDESTAL



GROUND ROD TEST WELL DETAIL

- NOTES
- TYPICAL FOR ALL DRIVEN GROUND RODS.
 - CORROSION/OXIDATION INHIBITING COMPOUND SHALL BE USED THROUGHOUT ON JOINTS AND TERMINATIONS. THOMAS AND BETTS COPPER SHIELD OR APPROVED EQUAL.
 - TEST WELL SHALL BE ARRANGED AND CONSTRUCTED TO FREELY DRAIN RAINWATER. PEA GRAVEL SHALL BE GENEROUSLY ADDED BELOW SAND TO INCREASE PERCOLATION.
 - ALL CLAMPS, FITTINGS AND MATERIALS SHALL BE OF THE HIGHEST GRADE. HARDWARE SHALL BE 316 STAINLESS STEEL. 'STAMPED' COPPER GROUND ROD CLAMPS SHALL NOT BE USED.



WARNING
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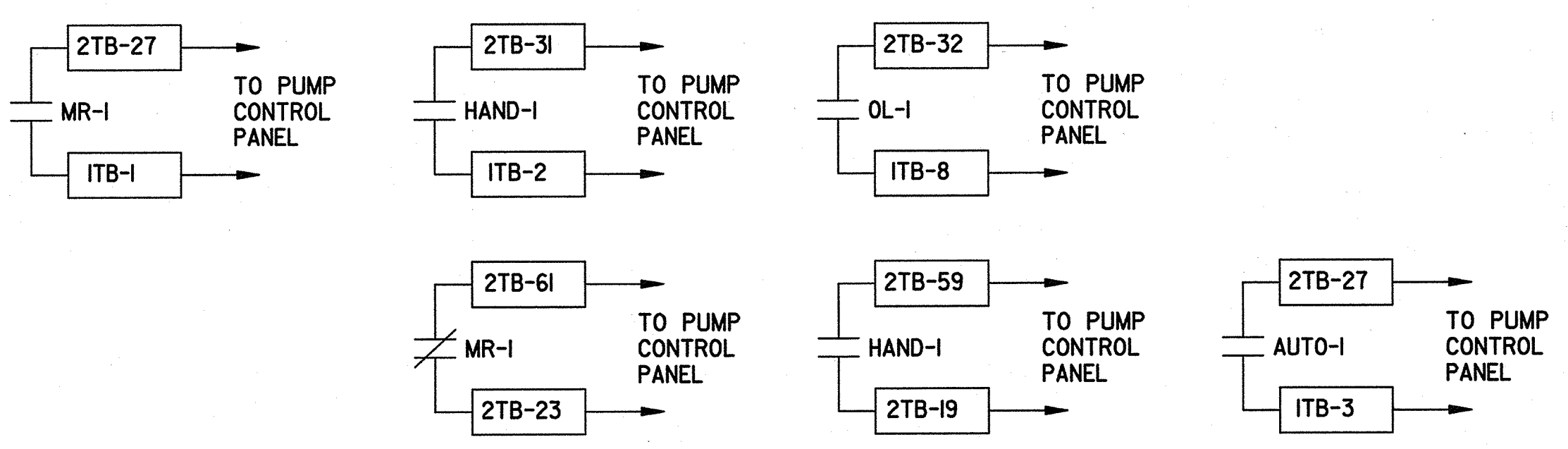
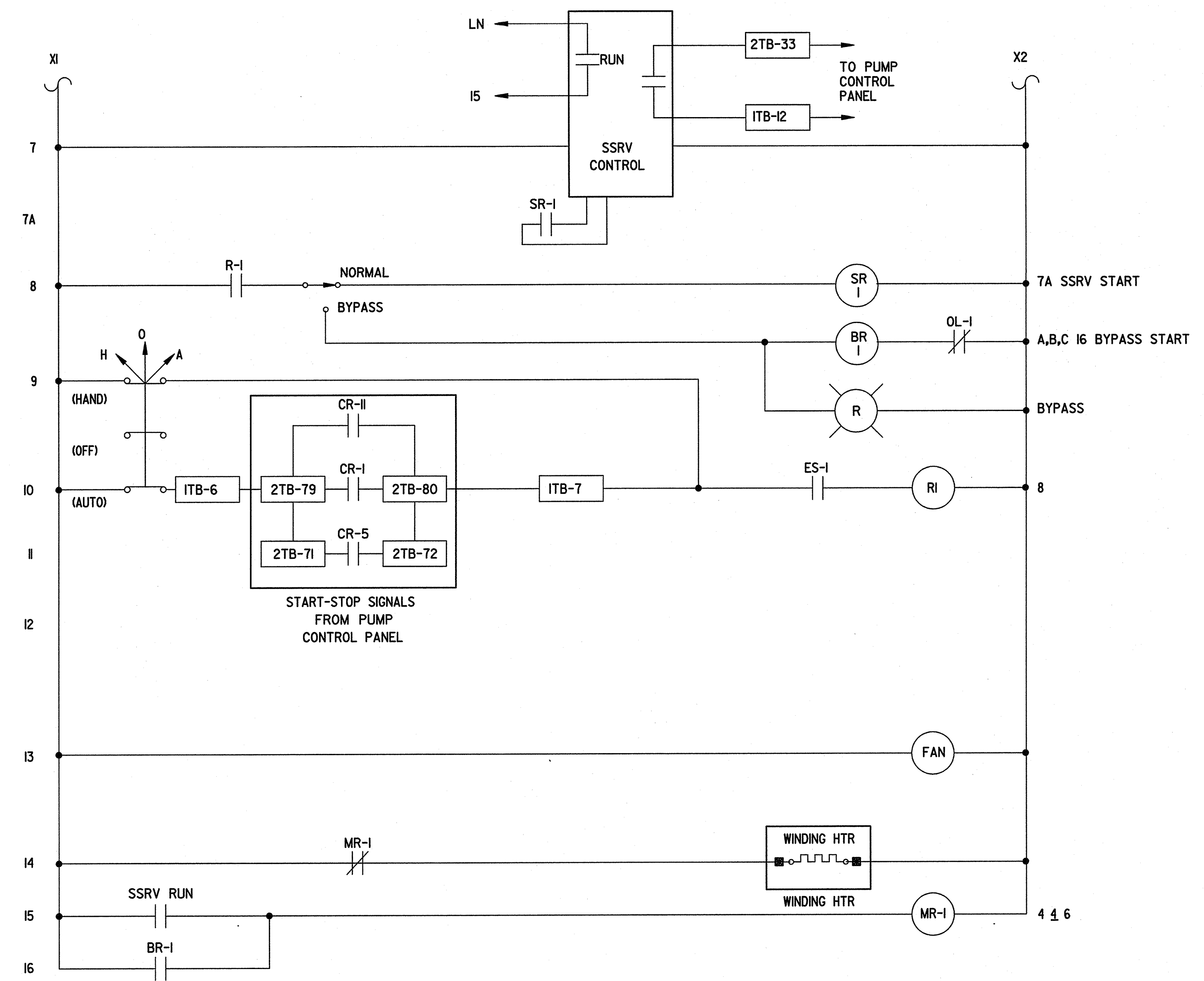
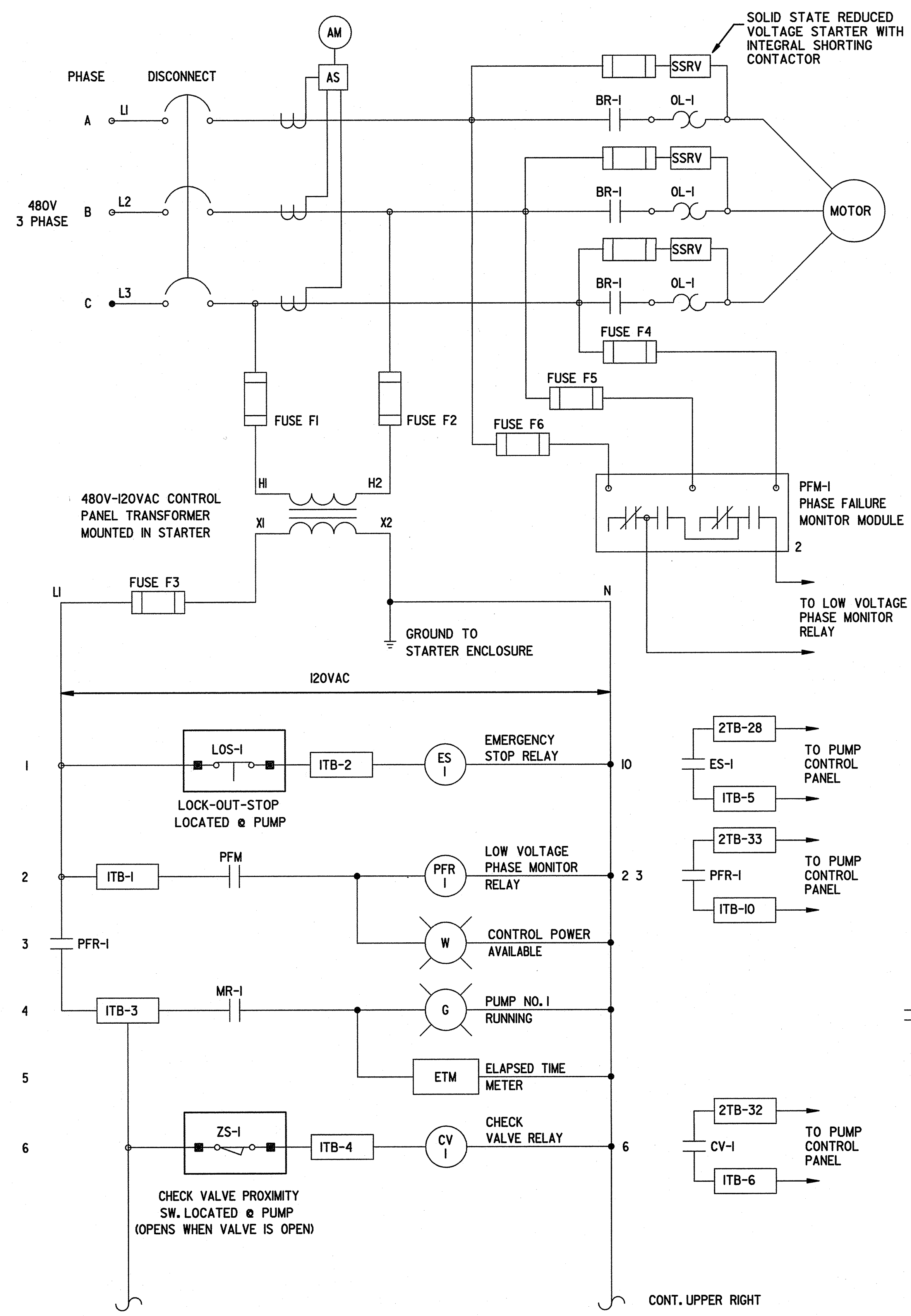


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC
1	10/11		BLDG PERMIT	DG	SB	AB			

DRAWING NO. 84-E-9	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 86	CONTROL DIAGRAMS AND DETAILS		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 86 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Howe Acen FOR CITY ENGINEER		DATE 10-25-11
CHECKED BY: CONSTRUCTION ENGINEER			PROJECT MANAGER 302-1737
CHECKED BY: INSPECTOR			CONTROL CERTIFICATION LAMBERT COORDINATES 36196- 86 -D
CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED		

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DRAWING NO. 84-E-10	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 87	PI MOTOR CONTROL DIAGRAM	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 87 OF 118 SHEETS	WATER SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION BY APPROVED DATE FILMED	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CHECKED BY: CONSTRUCTION ENGINEER		
CHECKED BY: INSPECTOR		
CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED	36196- 87 -D

WARNING

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CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

SCALE

HORIZONTAL

VERTICAL

DRAWING STATUS

NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

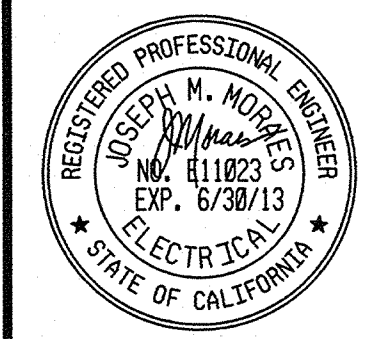
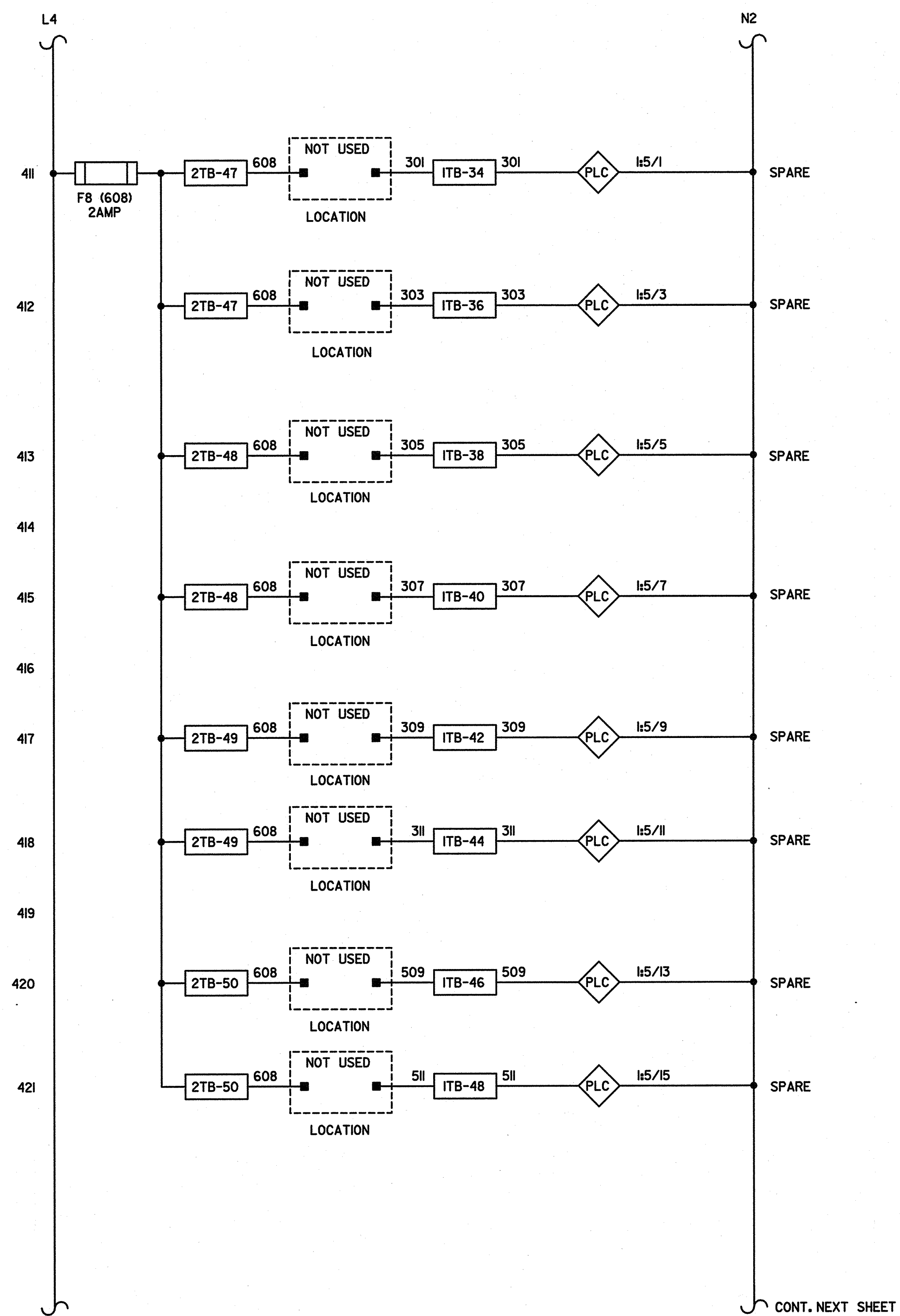
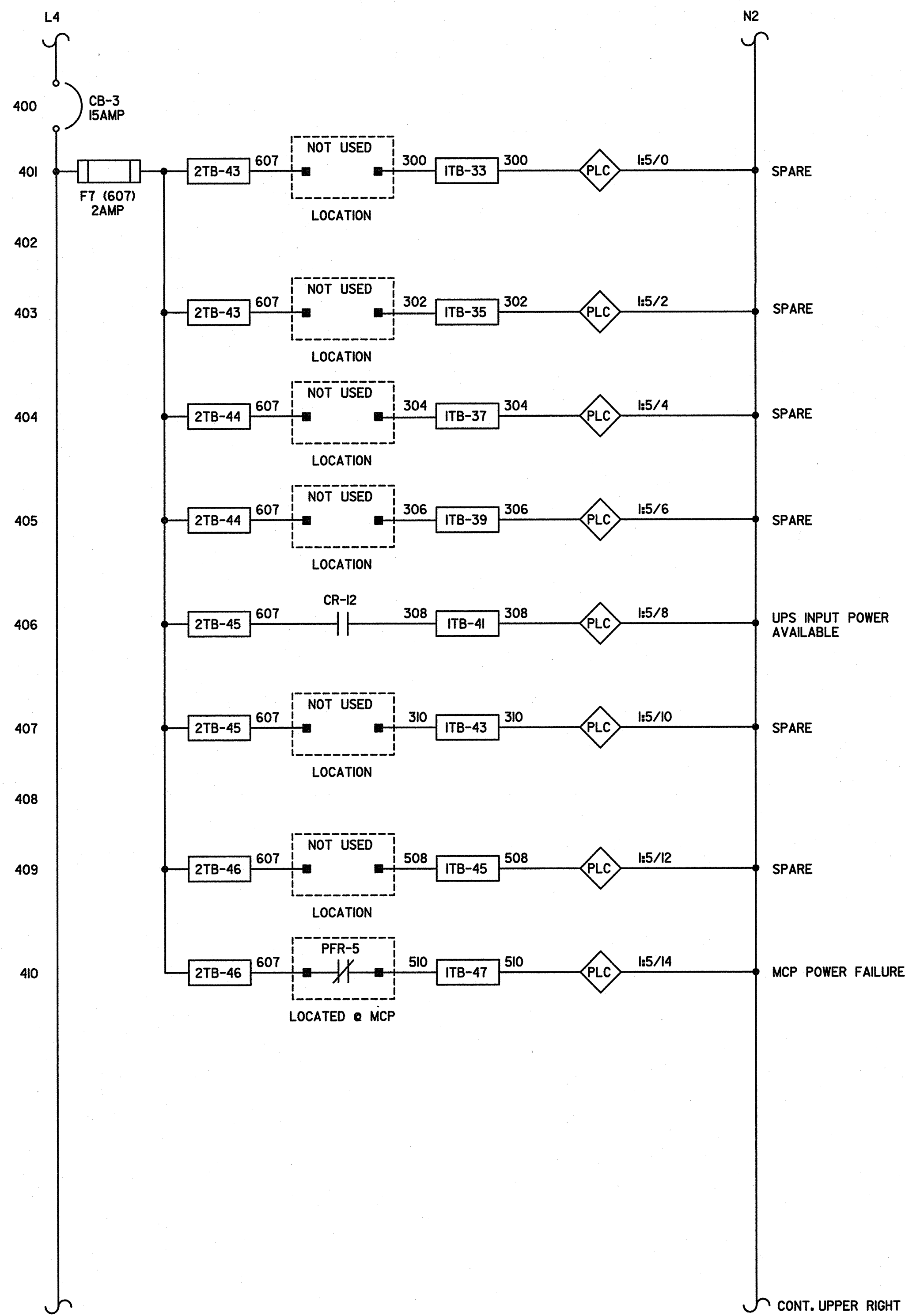
CONTRACTOR

DATE STARTED

DATE COMPLETED

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WARNING
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**CITY OF SAN DIEGO
 PUBLIC WORKS PROJECT**

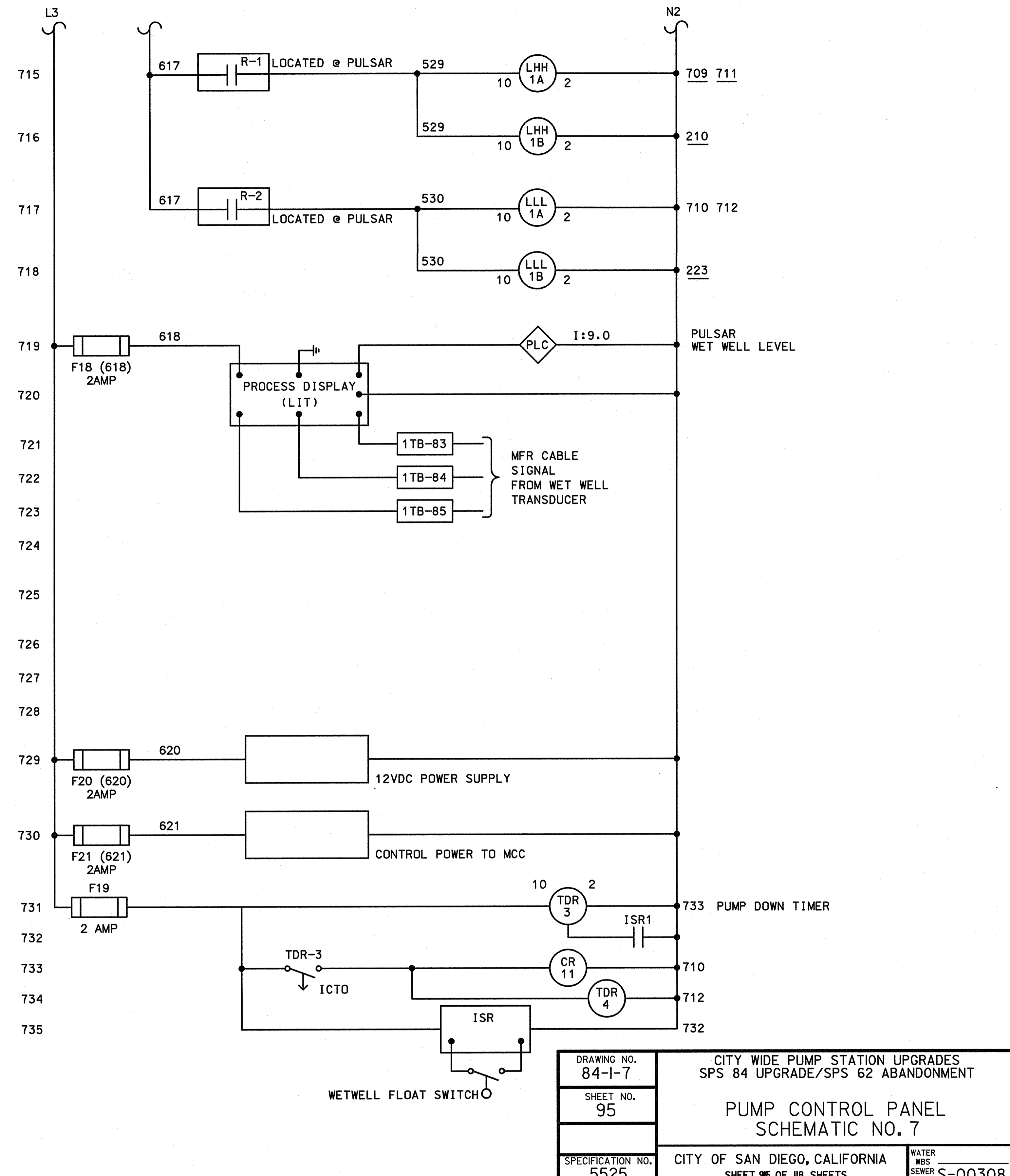
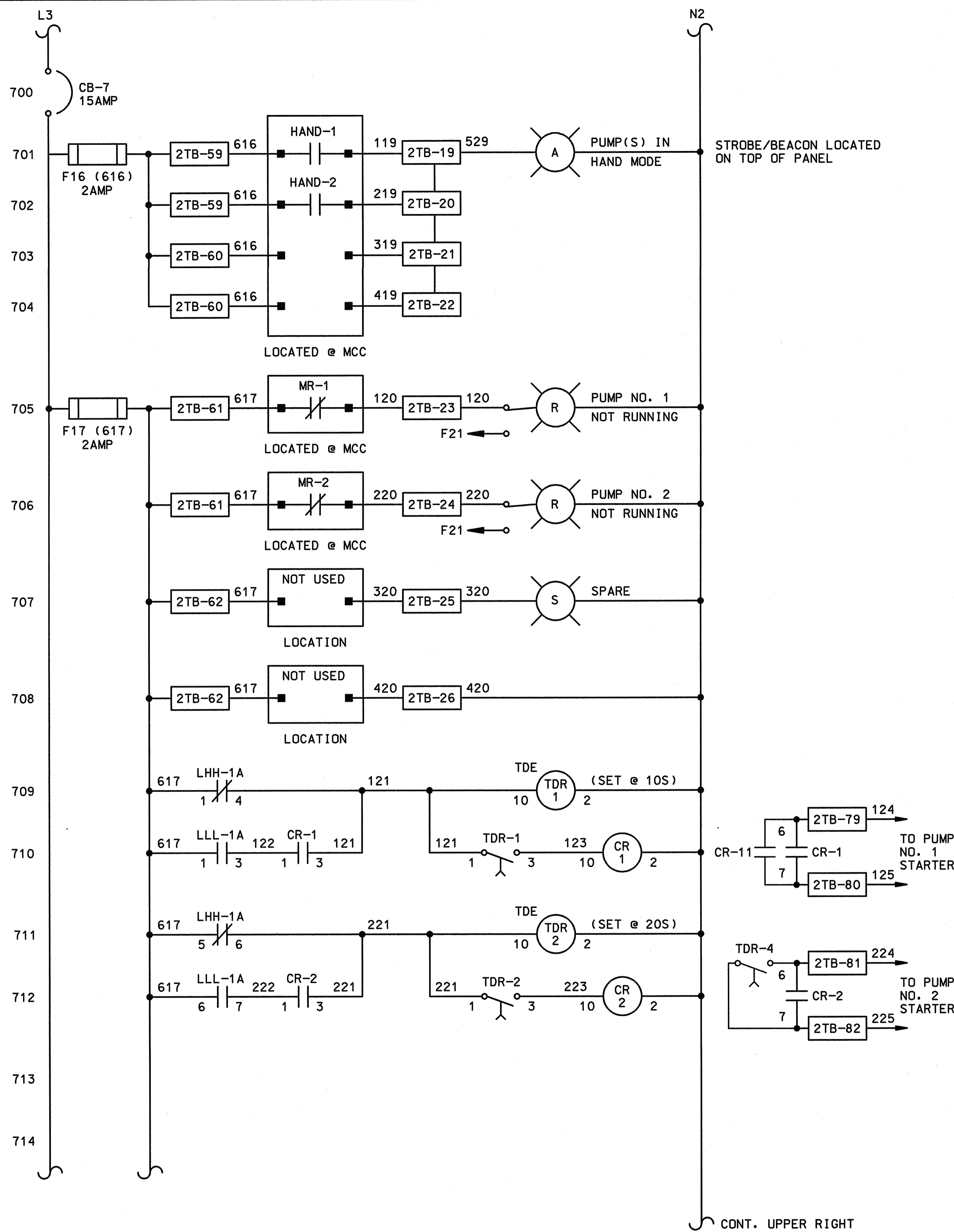


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-1-4	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 92	PUMP CONTROL PANEL SCHEMATIC NO. 4	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 92 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION Hogc-Acar	DATE 7-26-11
CHECKED BY: CONSTRUCTION ENGINEER	BY	APPROVED
CHECKED BY: INSPECTOR	DATE	FILED
CONTRACTOR	DATE STARTED	DATE COMPLETED
INSPECTOR	DATE STARTED	DATE COMPLETED
CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES		36196- 92 -D

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WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

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SCALE: HORIZONTAL, VERTICAL

DRAWING STATUS

NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

CITY OF SAN DIEGO, CALIFORNIA
SHEET 95 OF 118 SHEETS
SPECIFICATION NO. 5525

PUMP CONTROL PANEL SCHEMATIC NO. 7

CITY WIDE PUMP STATION UPGRADES
SPS 84 UPGRADE/SPS 62 ABANDONMENT

WATER WBS S-00308
SEWER WBS S-00308

APPROVED BY: *Joseph M. Morais* 7-26-11
FOR CITY ENGINEER

CHECKED BY: *Paul A. Lee*
CONSTRUCTION ENGINEER

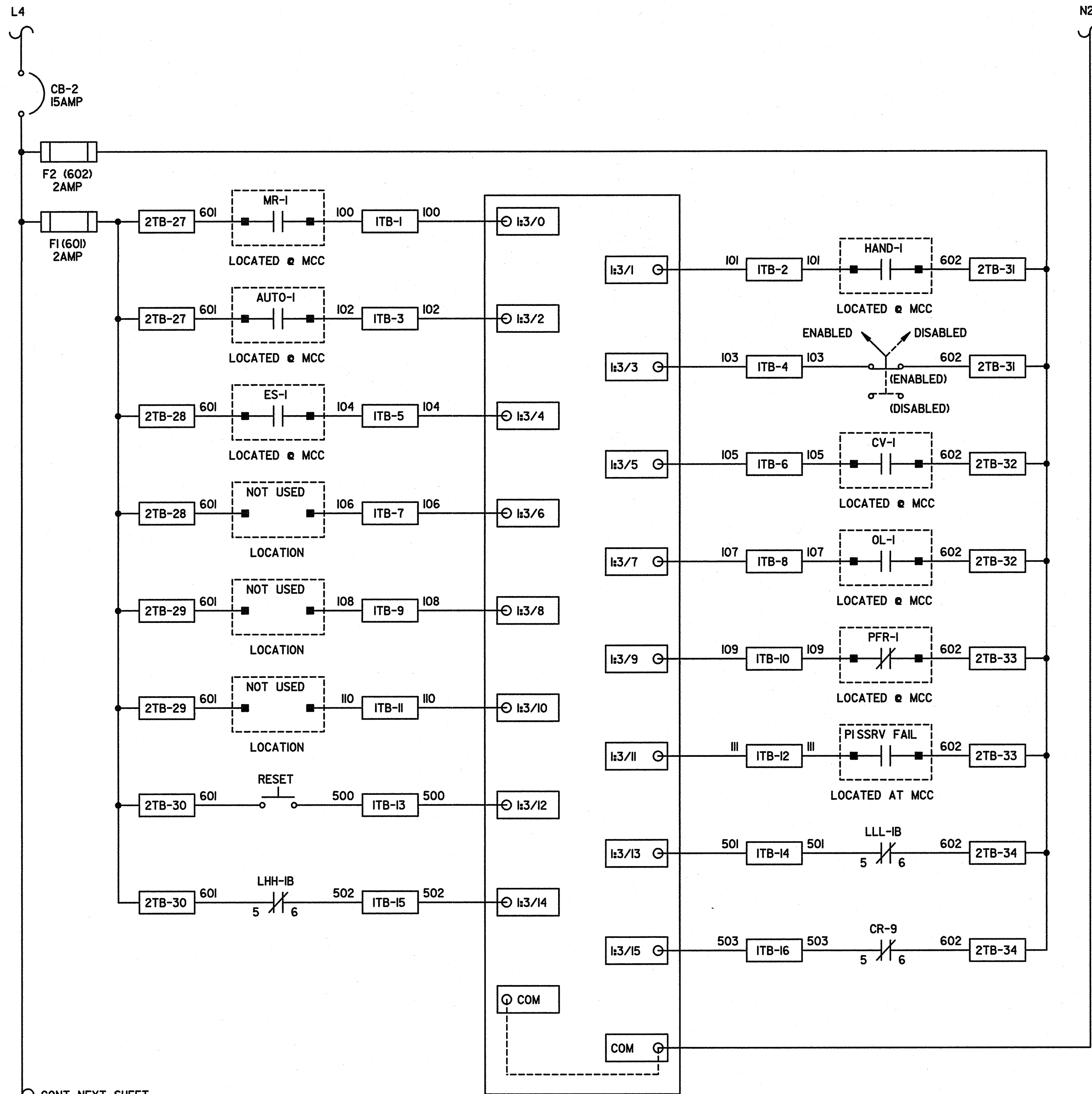
INSPECTOR: _____

CONTRACTOR: _____ DATE STARTED: _____
INSPECTOR: _____ DATE COMPLETED: _____

CONTROL CERTIFICATION
302-1737
LAMBERT COORDINATES
36196- 95 -D

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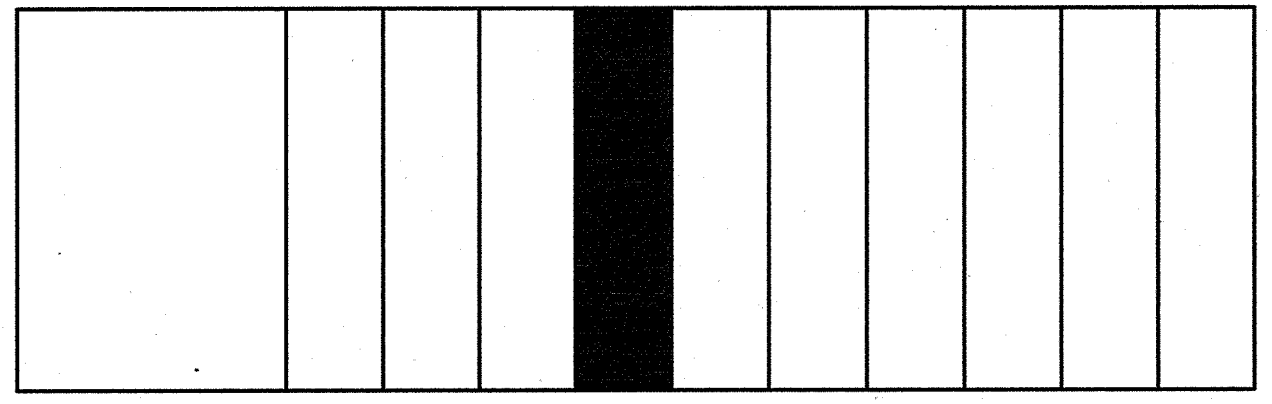
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DISCRETE INPUT CARD NO. 1
ALLEN-BRADLEY PART NO. 1746-1A16

DISCRETE INPUT CARD NO. 1 SCHEDULE

SLOT NO.	DEVICE	DESCRIPTION
I3/0	MR-1	PUMP NO. 1 STATUS
I3/1	HAND-1	PUMP NO. 1 IN 'HAND' MODE
I3/2	AUTO-1	PUMP NO. 1 IN 'AUTO' MODE
I3/3	AB-1	PUMP NO. 1 PLC CONTROL SWITCH POSITION
I3/4	ES-1	PUMP NO. 1 EMERGENCY STOP
I3/5	CV-1	PUMP NO. 1 CHECK VALVE CLOSED
I3/6	-	SPARE
I3/7	OL-1	PUMP NO. 1 MOTOR OVERLOAD
I3/8	-	SPARE
I3/9	PFR-1	PUMP NO. 1 PHASE FAILURE
I3/10	-	SPARE
I3/11	SSRV	PUMP NO. 1 SSRV FAIL
I3/12	RESET	RESET SIGNAL FROM PANEL PUSHBUTTON
I3/13	LLL-IB	LOW-LOW WET WELL LEVEL
I3/14	LHH-IB	HIGH-HIGH WET WELL LEVEL
I3/15	CR-9	STATION INTRUSION



ALLEN-BRADLEY SLC 5/03
INPUT/OUTPUT CARD LOCATION SHADED

CONT. NEXT SHEET

WARNING

0 1/2 1

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CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

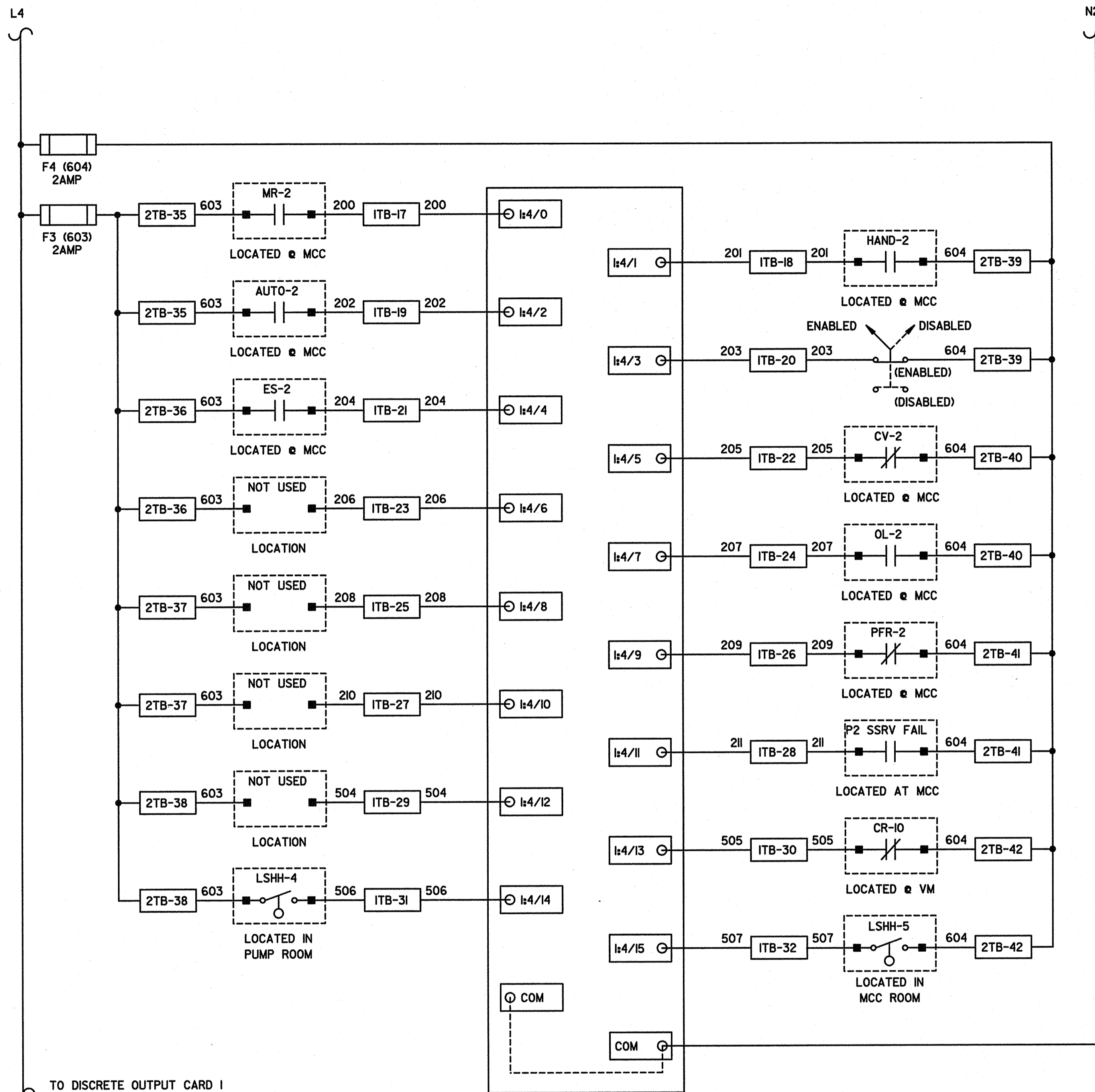


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-1-8	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 96	SLC 5/03 DISCRETE INPUT MODULE NO. 1	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 96 OF 118 SHEETS	
APPROVED BY: FOR CITY ENGINEER	DATE 7-26-11	WATER WBS SEWER WBS S-00308
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	PROJECT MANAGER
CHECKED BY: INSPECTOR	BY	CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
INSPECTOR	DATE STARTED	36196-96-D
INSPECTOR	DATE COMPLETED	

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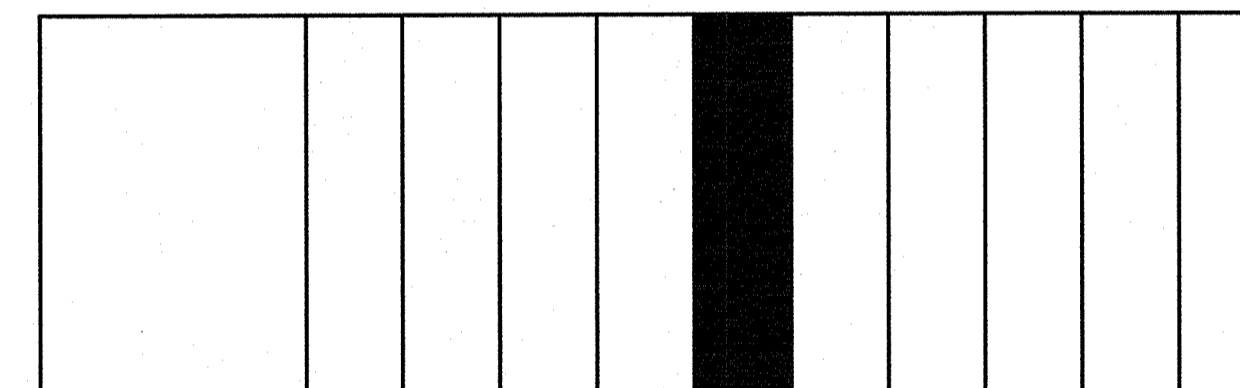


TO DISCRETE OUTPUT CARD 1
(REFER TO SHEET 73 I-12)

DISCRETE INPUT CARD NO. 2
ALLEN-BRADLEY PART NO. I746-1A16

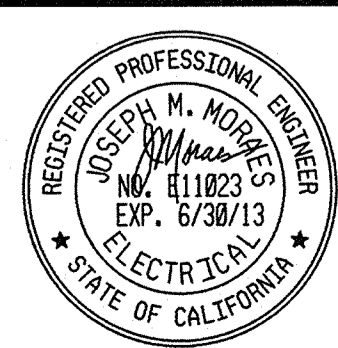
DISCRETE INPUT CARD NO. 2 SCHEDULE

SLOT NO.	DEVICE	DESCRIPTION
I4/0	MR-2	PUMP NO. 2 STATUS
I4/1	HAND-2	PUMP NO. 2 IN 'HAND' MODE
I4/2	AUTO-2	PUMP NO. 2 IN 'AUTO' MODE
I4/3	AB-2	PUMP NO. 2 PLC CONTROL SWITCH POSITION
I4/4	ES-2	PUMP NO. 2 EMERGENCY STOP
I4/5	CV-2	PUMP NO. 2 CHECK VALVE CLOSED
I4/6	-	SPARE
I4/7	OL-2	PUMP NO. 2 MOTOR OVERLOAD
I4/8	-	SPARE
I4/9	PFR-2	PUMP NO. 2 PHASE FAILURE
I4/10	-	SPARE
I4/11	-	SPARE
I4/12	SSRV	PUMP NO. 2 SSRV FAIL
I4/13	CR-10	VENTILATION STATUS
I4/14	LSHH-4	PUMP ROOM FLOODED
I4/15	LSHH-5	MCC ROOM FLOODED



ALLEN-BRADLEY SLC 5/03

INPUT/OUTPUT CARD LOCATION SHADED
NO SCALE



WARNING
0 1/2 1
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(858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL, VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

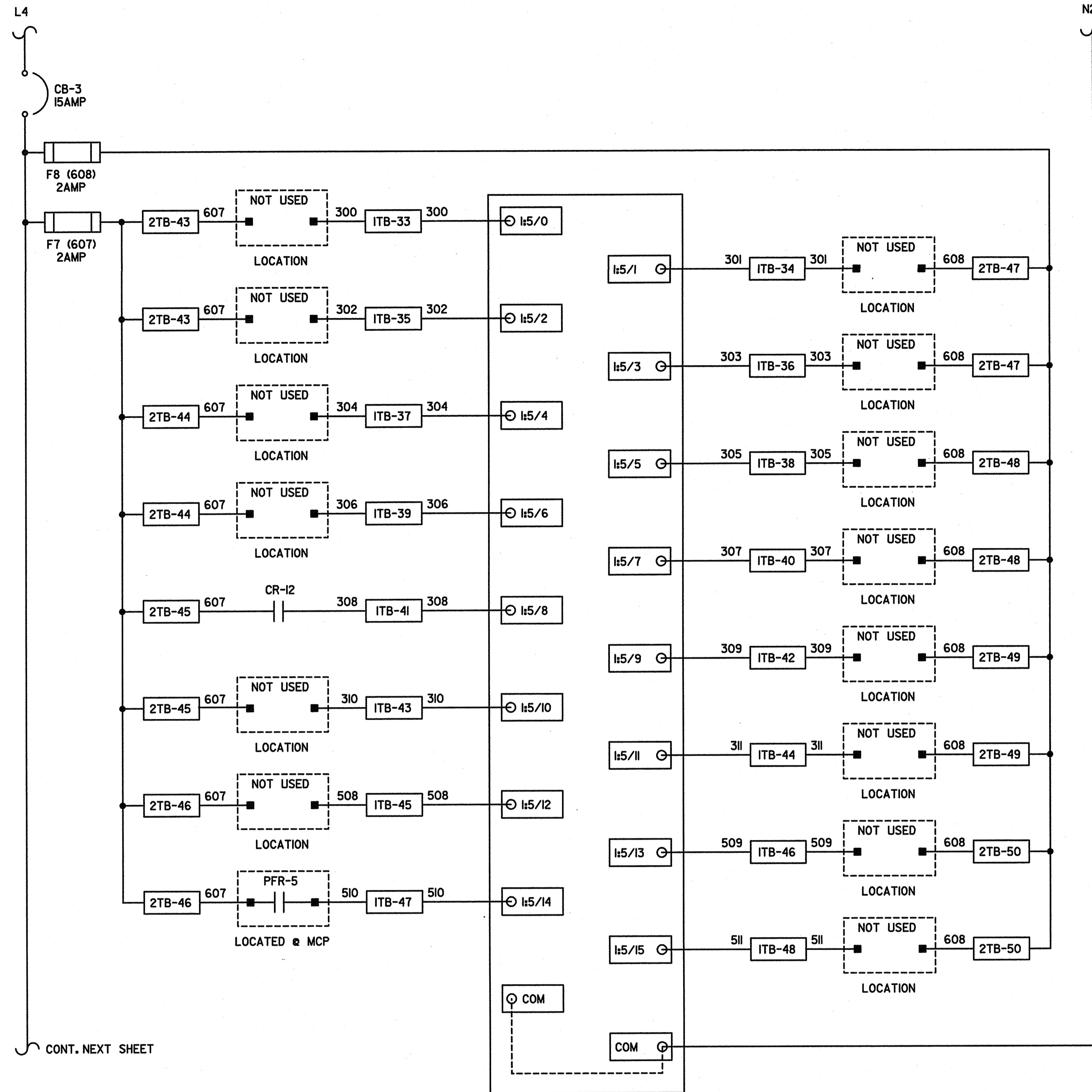


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-1-9	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 97	SLC 5/03 DISCRETE INPUT MODULE NO. 2	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 97 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	DATE
CHECKED BY: CONSTRUCTION ENGINEER	BY	APPROVED
CHECKED BY: INSPECTOR	DATE	FILED
DATE STARTED	DATE COMPLETED	36196- 97 -D

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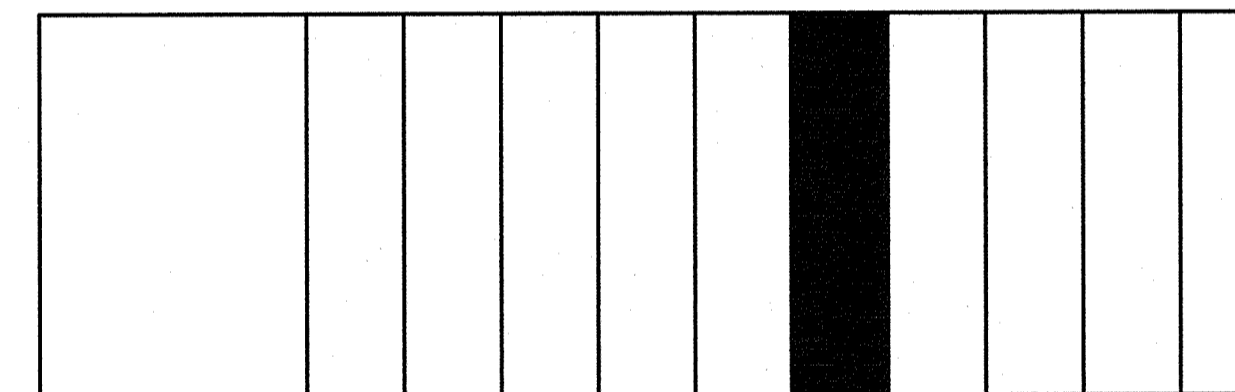
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DISCRETE INPUT CARD NO. 3
ALLEN-BRADLEY PART NO. I746-IAI6

DISCRETE INPUT CARD NO. 3 SCHEDULE

SLOT NO.	DEVICE	DESCRIPTION
I5/0	-	SPARE
I5/1	-	SPARE
I5/2	-	SPARE
I5/3	-	SPARE
I5/4	-	SPARE
I5/5	-	SPARE
I5/6	-	SPARE
I5/7	-	SPARE
I5/8	CR-12	UPS INPUT POWER AVAILABLE
I5/9	-	SPARE
I5/10	-	SPARE
I5/11	-	SPARE
I5/12	-	SPARE
I5/13	-	SPARE
I5/14	PFR-5	MCC POWER AVAILABLE
I5/15	-	SPARE



ALLEN-BRADLEY SLC 5/03
INPUT/OUTPUT CARD LOCATION SHADED

REGISTERED PROFESSIONAL ENGINEER
JOSEPH M. MORALES
NO. 111823
EXP. 6/30/13
ELECTRICAL
STATE OF CALIFORNIA

WARNING

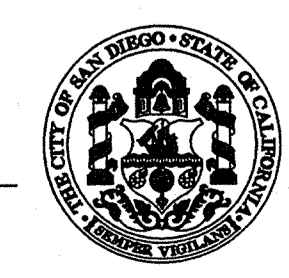
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PUBLIC WORKS PROJECT**

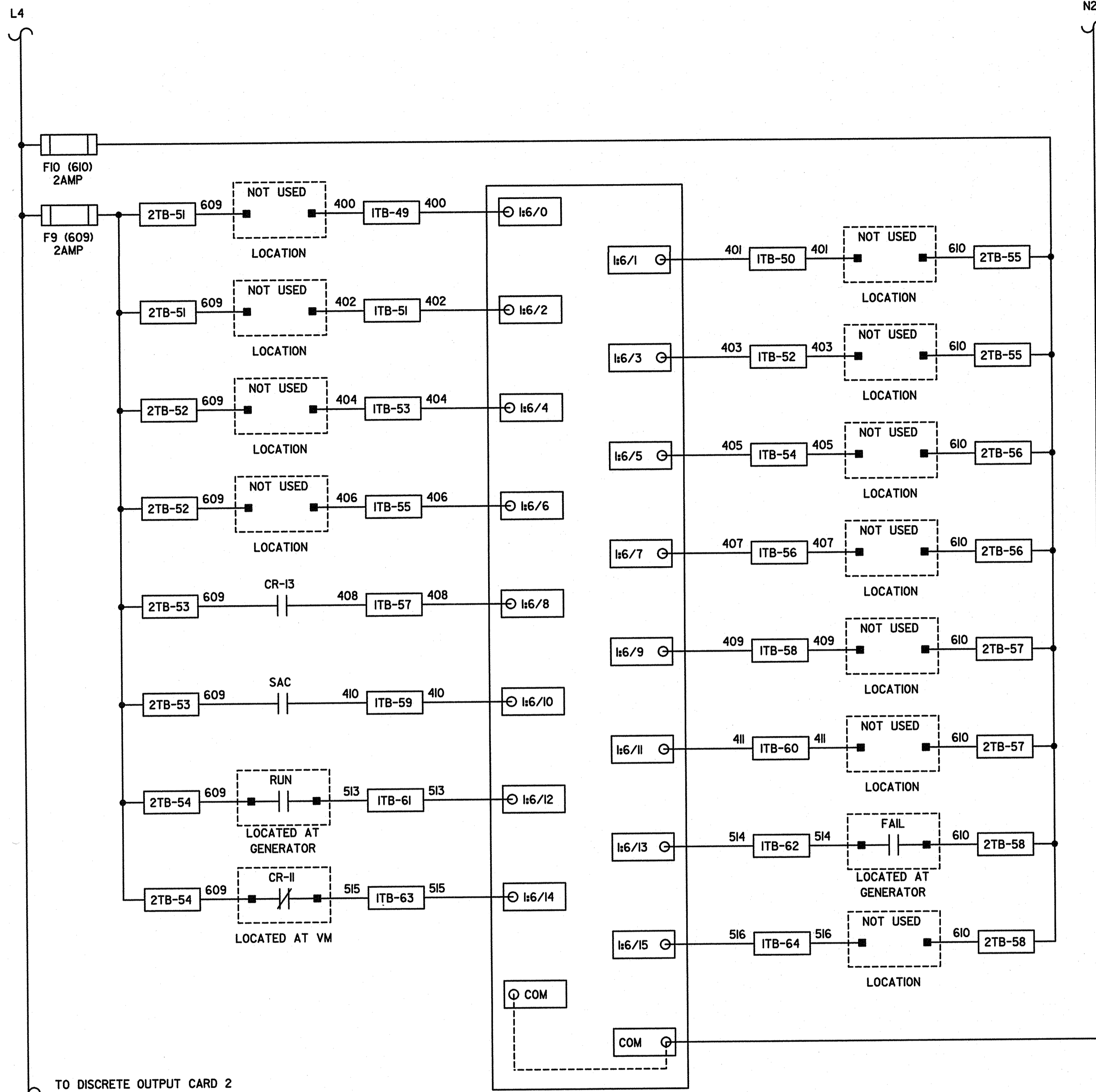


DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-1-10	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 98	SLC 5/03 DISCRETE INPUT MODULE NO. 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 98 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	 DATE: 7-26-11		PROJECT MANAGER
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION: _____ BY: _____ APPROVED: _____ DATE: _____ FILMED: _____		CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CHECKED BY: INSPECTOR	CONTRACTOR: _____ DATE STARTED: _____ INSPECTOR: _____ DATE COMPLETED: _____		36196- 98 -D

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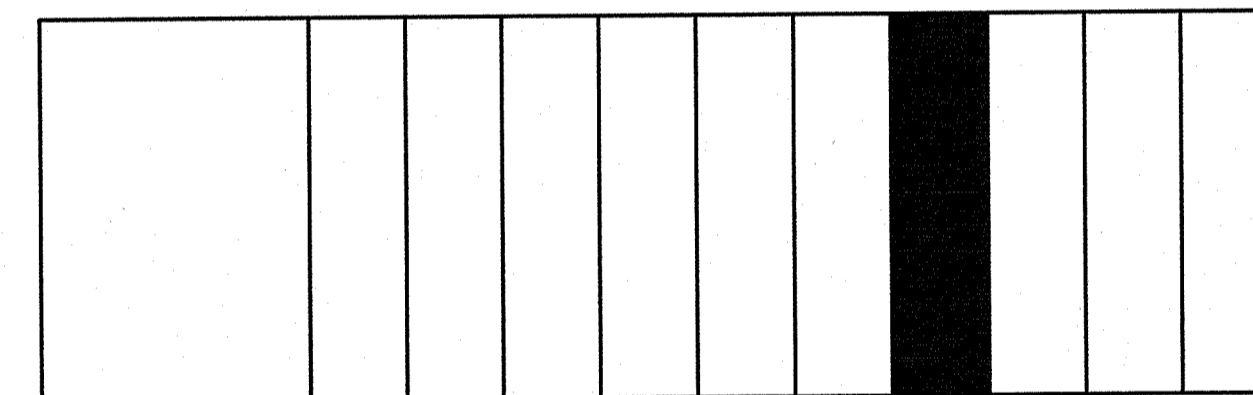
TO DISCRETE OUTPUT CARD 2
(REFER TO SHEET 84 I-13)

DISCRETE INPUT CARD NO. 4

ALLEN-BRADLEY PART NO. I746-1A16

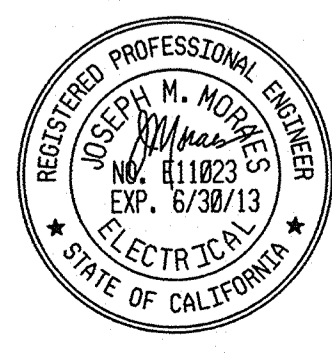
DISCRETE INPUT CARD NO. 4 SCHEDULE

SLOT NO.	DEVICE	DESCRIPTION
I6/0	-	SPARE
I6/1	-	SPARE
I6/2	-	SPARE
I6/3	-	SPARE
I6/4	-	SPARE
I6/5	-	SPARE
I6/6	-	SPARE
I6/7	-	SPARE
I6/8	CR-13	UPS FAILURE
I6/9	-	SPARE
I6/10	SAC	ACCESS CODE INPUT
I6/11	-	SPARE
I6/12	RUN	GENERATOR RUN
I6/13	FAIL	GENERATOR COMMON FAIL
I6/14	CR-II	HAZARDOUS GAS DETECTED
I6/15	-	SPARE



ALLEN-BRADLEY SLC 5/03

INPUT/OUTPUT CARD LOCATION SHADED



WARNING
0 1/2 1
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SCALE: HORIZONTAL, VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

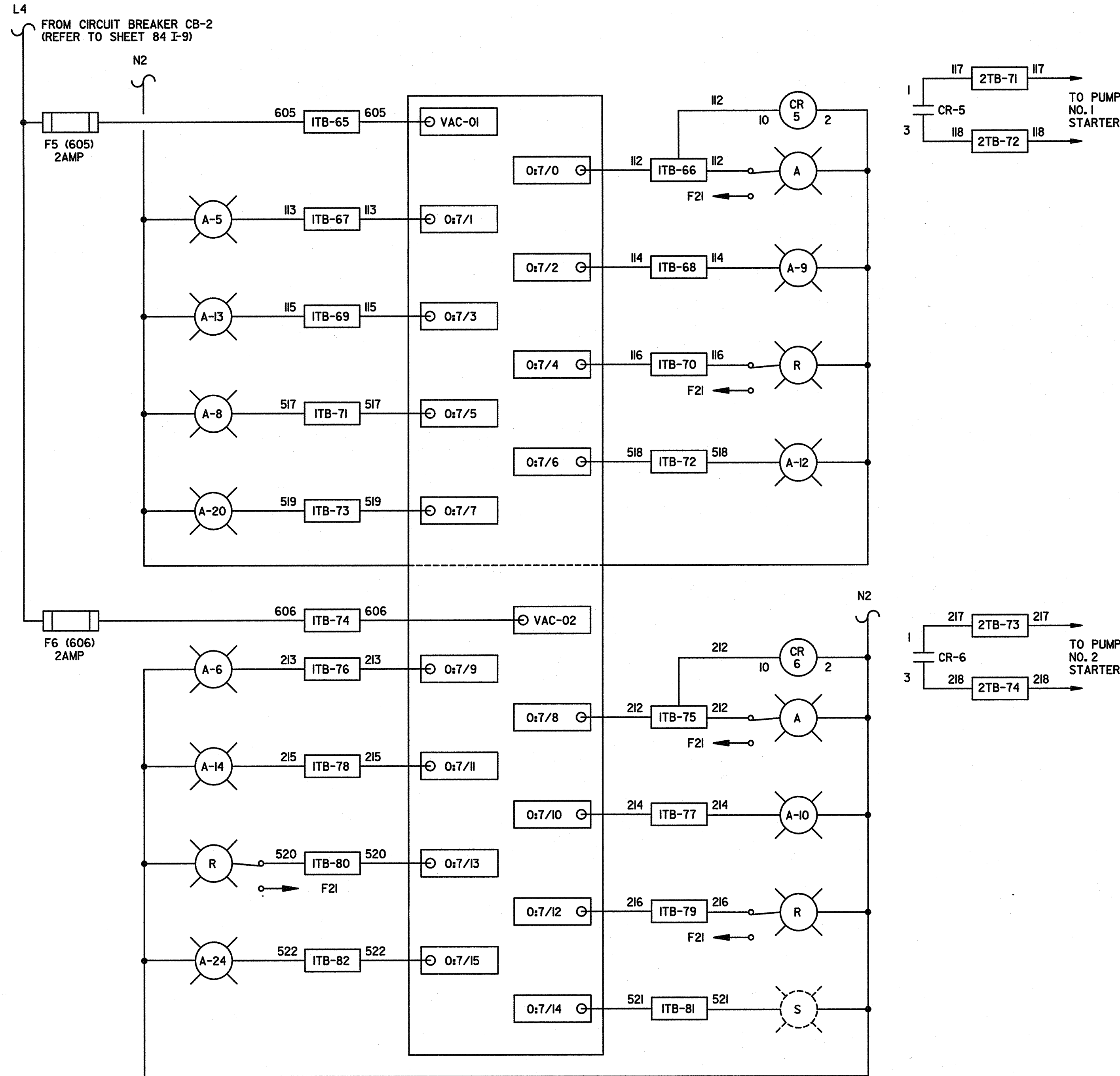


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-I-II	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 99	SLC 5/03 DISCRETE INPUT MODULE NO. 4		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 99 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DATE 7-26-11	BY	PROJECT MANAGER
CHECKED BY: CONSTRUCTION ENGINEER	DATE	DATE	CONTROL CERTIFICATION
CHECKED BY: INSPECTOR	DATE	DATE	302-1737 LAMBERT COORDINATES
INSPECTOR	DATE STARTED	DATE COMPLETED	36196- 99 -D

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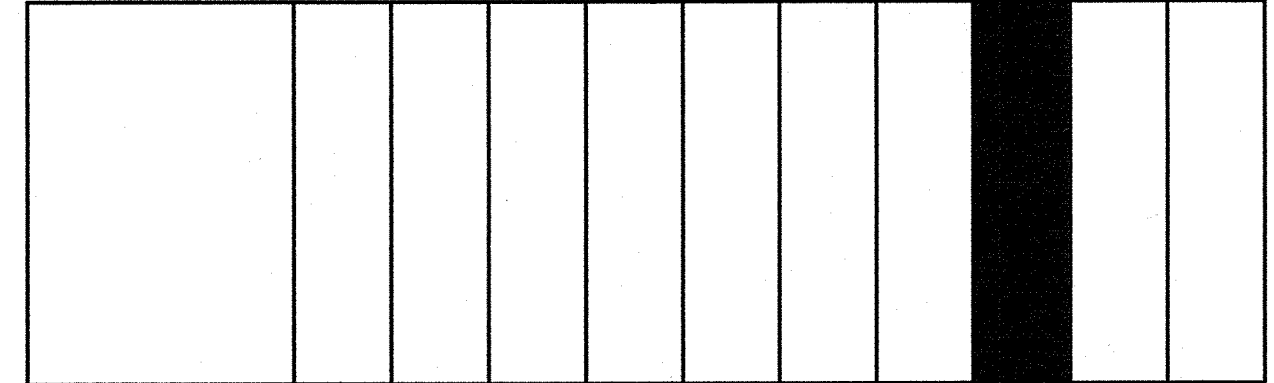
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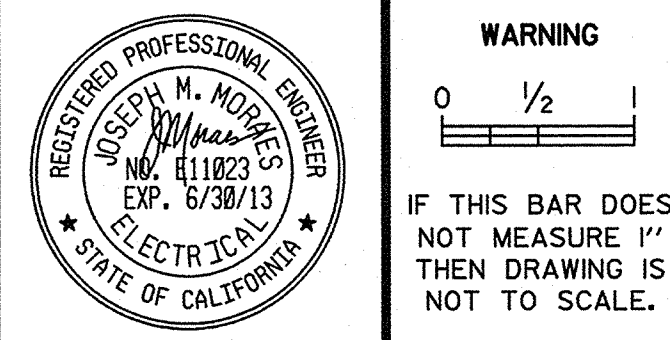
DISCRETE OUTPUT CARD NO. 1
ALLEN-BRADLEY PART NO. 1746-OW16

DISCRETE OUTPUT CARD NO. 1 SCHEDULE

SLOT NO.	DEVICE	DESCRIPTION
O:7/0	CR-5, PILOT	PUMP NO. 1 START-STOP, CALLED TO START
O:7/1	A-5	PUMP NO. 1 FAILURE
O:7/2	A-9	PUMP NO. 1 SEQUENCE FAILURE
O:7/3	A-13	PUMP NO. 1 CHECK VALVE FAILURE
O:7/4	PILOT LIGHT	PUMP NO. 1 NOT AVAILABLE
O:7/5	A-8	LOW WET WELL LEVEL
O:7/6	A-12	HIGH WET WELL LEVEL
O:7/7	A-20	PUMP ROOM FLOODED
O:7/8	CR-6, PILOT	PUMP NO. 2 START-STOP, CALLED TO START
O:7/9	A-6	PUMP NO. 2 FAILURE
O:7/10	A-10	PUMP NO. 2 SEQUENCE FAILURE
O:7/11	A-14	PUMP NO. 2 CHECK VALVE FAILURE
O:7/12	PILOT LIGHT	PUMP NO. 2 NOT AVAILABLE
O:7/13	PILOT LIGHT	SECURITY SYSTEM ARMED
O:7/14	-	SPARE
O:7/15	A-24	MCC ROOM FLOODED



ALLEN-BRADLEY SLC 5/03
INPUT/OUTPUT CARD LOCATION SHADED



WARNING
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CARLSBAD, CA 92011 (760) 431-7177

SCALE: HORIZONTAL, VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

DRAWING NO. 84-1-12	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 100	SLC 5/03 DISCRETE OUTPUT MODULE NO. 1		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 100 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY: CONSTRUCTION ENGINEER			
CHECKED BY: INSPECTOR			
CONTRACTOR		DATE STARTED	CONTROL CERTIFICATION
INSPECTOR		DATE COMPLETED	302-1737 LAMBERT COORDINATES
			36196-100-D

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ISA - S5.1 TABLE 1 IDENTIFICATION LETTERS

Table with columns: FIRST LETTER(S), SUCCEEDING LETTERS, MEASURED OR INITIATING VARIABLE, MODIFIER, READOUT OR PASSIVE FUNCTION, OUTPUT FUNCTION, MODIFIER. Lists various instrument types like ANALYSIS, BURNER, CONDUCTIVITY, etc.

GENERAL INSTRUMENTATION AND CONTROL FUNCTION SYMBOLS

Table with columns: DISCRETE INSTRUMENTS, LOCATION, EQUIPMENT/FIELD MOUNTED, INSTRUMENTS SHARING A COMMON HOUSING, LOCAL PANEL OR MCC MOUNTED, AUXILIARY LOCATION, PANEL OR MCC MOUNTED, INSTRUMENTS SHARING COMMON HOUSING, EXISTING DEVICE, FIELD DEVICE, INTERPOSE RELAY TO TONE TELEMETRY AND/OR PLC.

INSTRUMENT LINE SYMBOLS

Table with columns: PRIMARY PROCESSING PIPING OR FLOW CHANNEL, PROCESS FLOW DIRECTION ARROW, PROCESS LINES CROSSING (NOT CONNECTED), SECONDARY PROCESS PIPING, AUXILIARY PROCESS PIPING, ELECTRICAL SIGNAL, ELECTRICAL SIGNAL DIRECTION ARROW, INTERNAL SYSTEM SIGNAL LINK, PANEL/PANEL OR PANEL/FIELD SEPARATION LINE, PROCESS FLOW LINE CONTINUED, AUXILIARY SYSTEM FLOW.

INPUT/OUTPUT SIGNALS

Table with columns: ANALOG INPUT, ANALOG OUTPUT, DIGITAL INPUT, DIGITAL OUTPUT, DATA LINK, TERMINATION POINT FOR ANALOG INPUT TO PLC, TERMINATION POINT FOR ANALOG OUTPUT FROM PLC, TERMINATION POINT FOR DISCRETE INPUT TO PLC, TERMINATION POINT FOR DISCRETE OUTPUT FROM PLC.

STANDARD SYMBOLS

MISCELLANEOUS ABBREVIATIONS

Table with columns: BUTTERFLY VALVE, ANNUNCIATOR, ELECTRIC MOTOR, QUICK-CONNECT, DRAIN, BALL VALVE, MANUAL GATE VALVE, BYPASS VALVE, PUMP CONTROL VALVE OR RELIEF VALVE, PUMP, AIR VALVE. Includes abbreviations like AIR, ATMOSPHERE, DRAWING, etc.

PROCESS CONTROL FUNCTION DESIGNATIONS

Table with columns: FUNCTION DESIGNATION, FUNCTION. Lists mathematical functions like SUMMING, AVERAGING, DIFFERENCE, INTEGRAL, DERIVATIVE, etc.

ANALYSIS PARAMETERS

Table with columns: ANALYSIS PARAMETER, PARAMETER. Lists parameters like CHLORINE, CARBON DIOXIDE, DEW POINT HUMIDSTAT, etc.

HAND SWITCH CONTROL FUNCTIONS

Table with columns: HAND SWITCH LIGHT ILLUMINATED BY HAND SWITCH CONTACT, SELECTOR SWITCH OR PUSHBUTTON. Lists designations like HIGH/LOW, IN SERVICE/OUT OF SERVICE, etc.

INDICATING LIGHTS

Table with columns: DESIGNATION. Lists designations like AUTO, AREA CONTROL CENTER, CLOSED, EMERGENCY, etc.

TRANSDUCER & CONVERTER DESIGNATION

Table with columns: ANALOG, BINARY, BINARY CODED DECIMAL, DIGITAL, VOLTAGE, FREQUENCY, HYDRAULIC, CURRENT, PNEUMATIC, PULSE FREQUENCY, RESISTANCE (ELEC.), SPEED, RESISTANCE TEMPERATURE DETECTOR.

POWER SUPPLY ABBREVIATIONS

Table with columns: ELECTRIC SUPPLY, WATER SUPPLY. Lists abbreviations like ES, WS.

GENERAL NOTE:

THESE PROCESS AND MECHANICAL EQUIPMENT SYMBOLS ARE INTENDED TO BE IN ACCORDANCE WITH THE MOST RECENT ISSUES OF: 1. ANSI/ISA - S5.1 'INSTRUMENTATION SYMBOLS AND IDENTIFICATION', 2. ANSI/ISA - S5.5 'GRAPHIC SYMBOLS FOR PROCESS DISPLAYS', 3. ANSI/ISA - Y32.11 'GRAPHIC SYMBOLS FOR PROCESS FLOW DIAGRAMS', 4. ANSI - Y32.10 'GRAPHIC SYMBOLS FOR FLUID POWER DIAGRAMS'. THE FOLLOWING ADDITIONAL DESIGNATIONS MAY BE UTILIZED ADJACENT TO SOME VALVE OR GATE SYMBOLS. = NORMALLY CLOSED NC = NORMALLY OPEN NO

Professional Engineer seal for Joseph M. Hodges, State of California, No. 611023, Exp. 6/30/13.

HDR logo and address: 8690 BALBOA AVENUE, SUITE 200, SAN DIEGO, CA 92123-1502. (858)712-8400 FAX (858)712-8333.

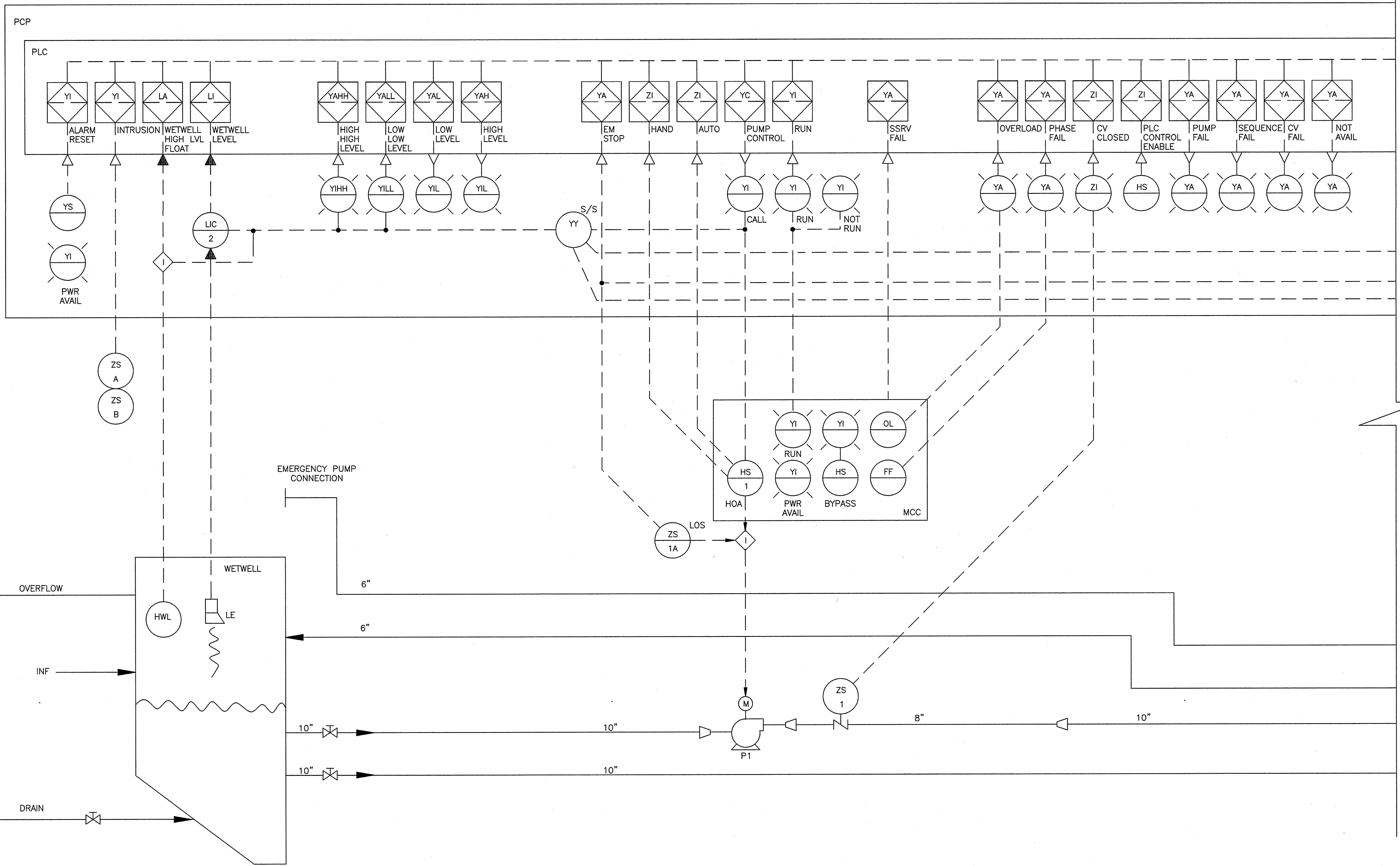
CITY OF SAN DIEGO PUBLIC WORKS PROJECT logo and seal.

DRAWING STATUS table with columns: NO., DATE, REQ., REVISION DESCRIPTION, DRAWN, CKD, APD, PE, EM, QA/QC.

DRAWING NO. 84-1-17, SHEET NO. 105, SPECIFICATION NO. 5525. CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT. INSTRUMENTATION LEGEND. CITY OF SAN DIEGO, CALIFORNIA SHEET 105 OF 118 SHEETS. WATER WBS SEWER WBS S-00308. APPROVED BY: [Signature] DATE: 7-26-11. PROJECT MANAGER: [Signature]. CONTRACTOR: [Signature] DATE STARTED: [Blank] DATE COMPLETED: [Blank]. 302-1737 LAMBERT COORDINATES 36196-105-D

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LEVEL SETPOINTS
 ANALOG RANGE:
 LAG PUMPS ON - 562.85
 LEAD PUMPS ON - 562.35
 PUMPS OFF - 555.25

FOR CONTINUATION SEE SHEET 84-I-19

DRAWING NO. 84-I-18	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		WATER WBS
SHEET NO. 106	P&ID - 1		SEWER WBS
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 106 OF 118 SHEETS		S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION	BY	DATE
CHECKED BY: CONSTRUCTION ENGINEER			
CHECKED BY: INSPECTOR			
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
PROJECT MANAGER Fall 11			CONTROL CERTIFICATION 302-1737 LAMBERT COORDINATES
CONTRACTOR			36196-106-D

DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

CITY OF SAN DIEGO
 PUBLIC WORKS PROJECT

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 (858)712-8400 FAX (858)712-8333

SCALE: HORIZONTAL, VERTICAL

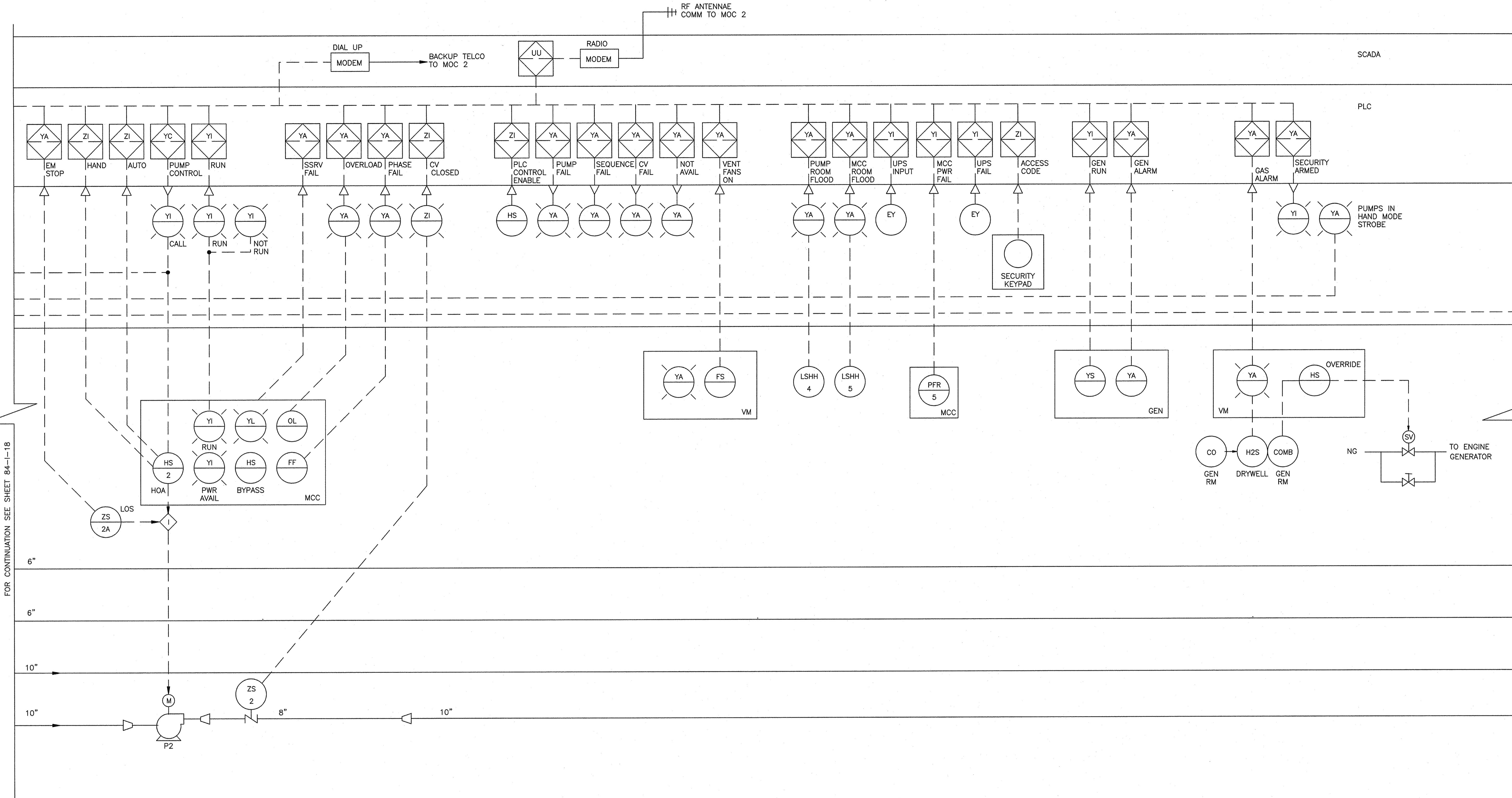
REGISTERED PROFESSIONAL ENGINEER
 JOSEPH M. MORAN
 NO. 411023
 EXP. 6/30/13
 ELECTRICAL
 STATE OF CALIFORNIA

WARNING
 0 1/2 1
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



7/15/2011 2:06:47 PM

ps84-1-19.dgn



FOR CONTINUATION SEE SHEET 84-1-18

FOR CONTINUATION SEE SHEET 84-1-20

DRAWING NO. 84-1-19	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 107	P&ID - 2	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 107 OF 118 SHEETS	WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	DESCRIPTION Hoo Alee	DATE 7-26-11
CHECKED BY: CONSTRUCTION ENGINEER	BY	APPROVED
CHECKED BY: INSPECTOR	DATE STARTED	DATE COMPLETED
CONTRACTOR		36196-107-D

DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**

HDR
2131 PALOMAR AIRPORT RD., STE. 120
CARLSBAD CA. 92011 (760) 431-7177
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858) 712-8400 FAX (858) 712-8333



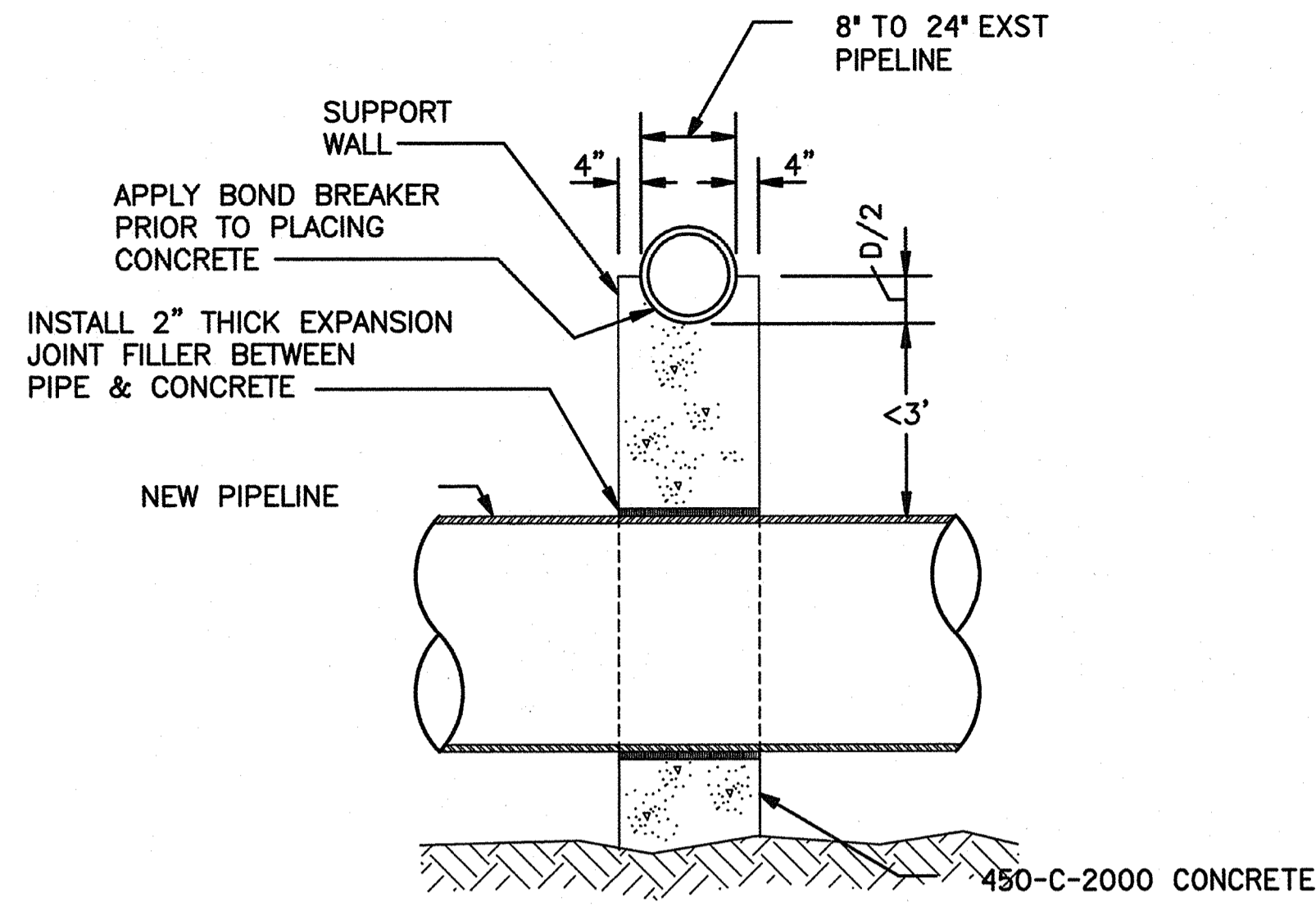
WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

SCALE: HORIZONTAL VERTICAL



7/18/2011 10:04:19 AM

sps84-T-C2.dgn

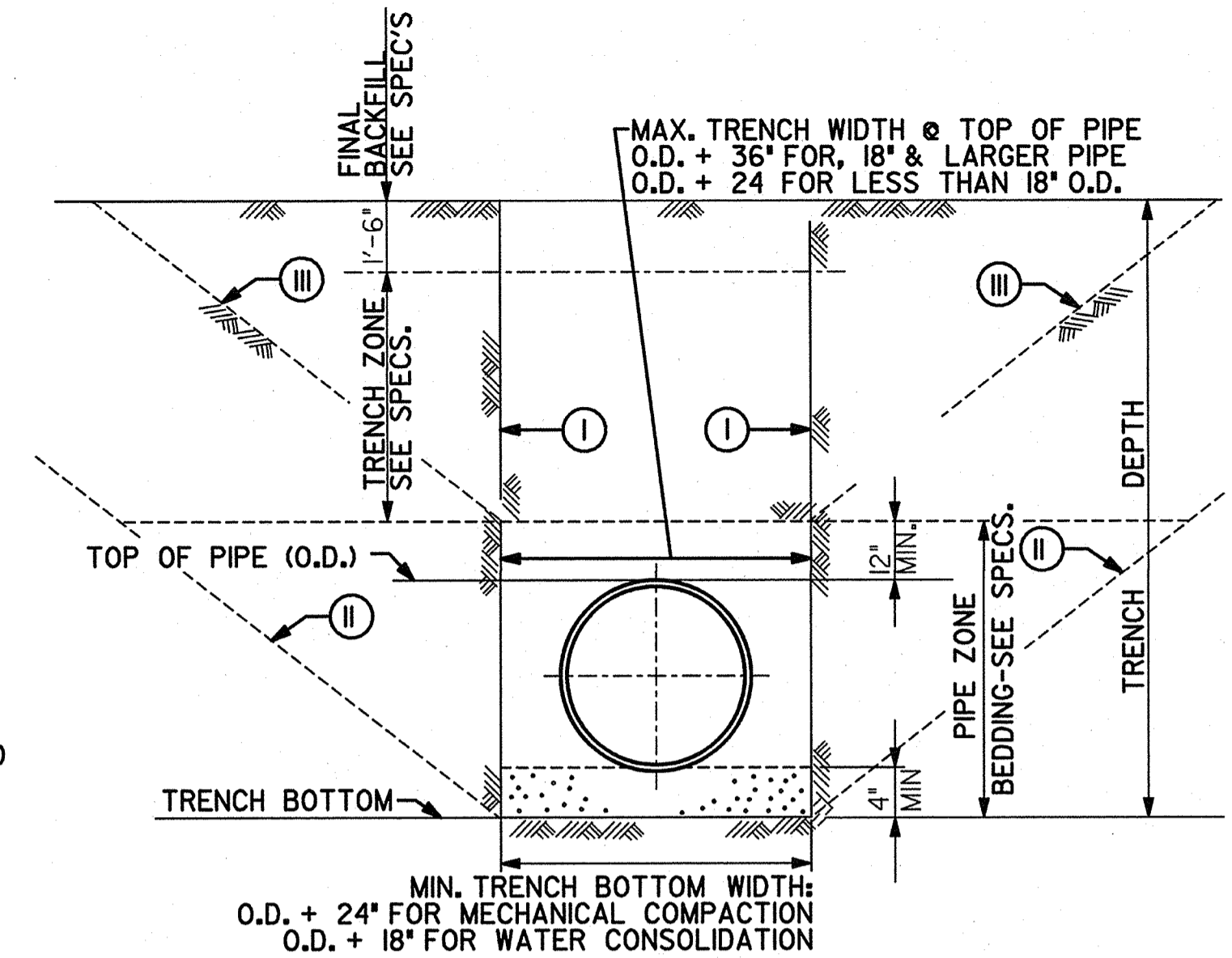


UTILITY CROSSING
SUPPORT WALL
NTS

C-002
VAR

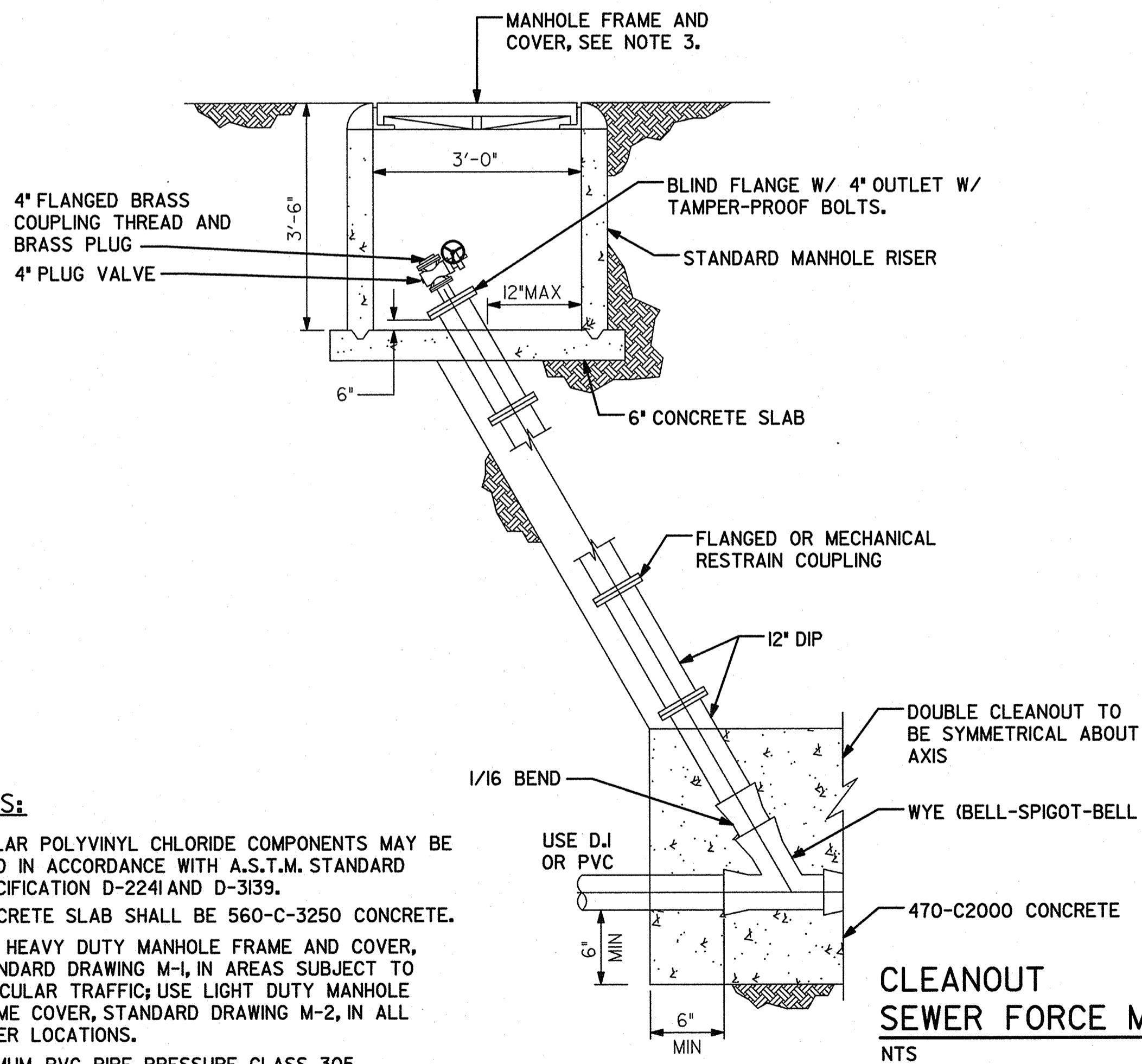
FLEXIBLE PIPE TYPICAL TRENCH SECTIONS

- A. FLEXIBLE PIPE REFERS TO ALL STEEL, DUCTILE-IRON AND PLASTIC PIPES.
- B. TYPICAL TRENCH SECTIONS (I, II AND III) SHALL BE USED ONLY WHERE STABLE, COMPACT SOIL CONDITIONS EXIST. IF BOULDERS OR LARGE OBSTRUCTIONS ARE ENCOUNTERED, TRENCH SECTIONS MAY BE DEEPER OR WIDER THAN SHOWN.
- C. THE NEED FOR PROTECTIVE SYSTEMS, AND EXCAVATION SLOPES SHALL BE DETERMINED IN ACCORDANCE WITH CAL OSHA SAFETY STANDARDS AND REGULATIONS AND GEOTECHNICAL CONSULTANTS' RECOMMENDATIONS.
- D. PROTECTIVE SYSTEMS SHALL BE DESIGNED AND BUILT IN ACCORDANCE WITH CAL OSHA SAFETY STANDARDS AND REGULATIONS.
- E. UNSUPPORTED VERTICAL AND/OR SLOPING TRENCH WALL SLOPES SHALL NOT BE STEEPER THAN ALLOWED BY CAL OSHA SAFETY STANDARDS AND REGULATIONS, UNLESS SUPPORTING DOCUMENTATION IS SUBMITTED, ACCORDING TO AFOREMENTIONED SAFETY STANDARDS.
- F. TRENCH SECTIONS OTHER THAN THE TYPICAL SECTIONS SHOWN MAY BE UTILIZED PROVIDED THEY COMPLY WITH CAL OSHA SAFETY STANDARDS AND REGULATIONS. DOCUMENTATION SUPPORTING COMPLIANCE AND PIPE DESIGN CALCULATIONS SHALL BE SUBMITTED.
- G. BACKFILL MATERIAL FOR OVEREXCAVATION SHALL BE ACCORDING TO THE EARTHWORK SECTION OF THE SPECIFICATIONS.
- H. IF DURING CONSTRUCTION, THE WATER TABLE IS DISCOVERED TO BE ABOVE THE TRENCH BOTTOM, THE CONSTRUCTION MANAGER SHALL BE NOTIFIED, AND APPROPRIATE DEWATERING SHALL BE IMPLEMENTED. THE BACKFILL MATERIAL SHALL BE ACCORDING TO THE EARTHWORK SECTIONS OF THE SPECIFICATIONS, OR AS ORDERED BY THE CONSTRUCTION MANAGER.



FLEXIBLE PIPE TYPICAL TRENCH SECTION
NTS

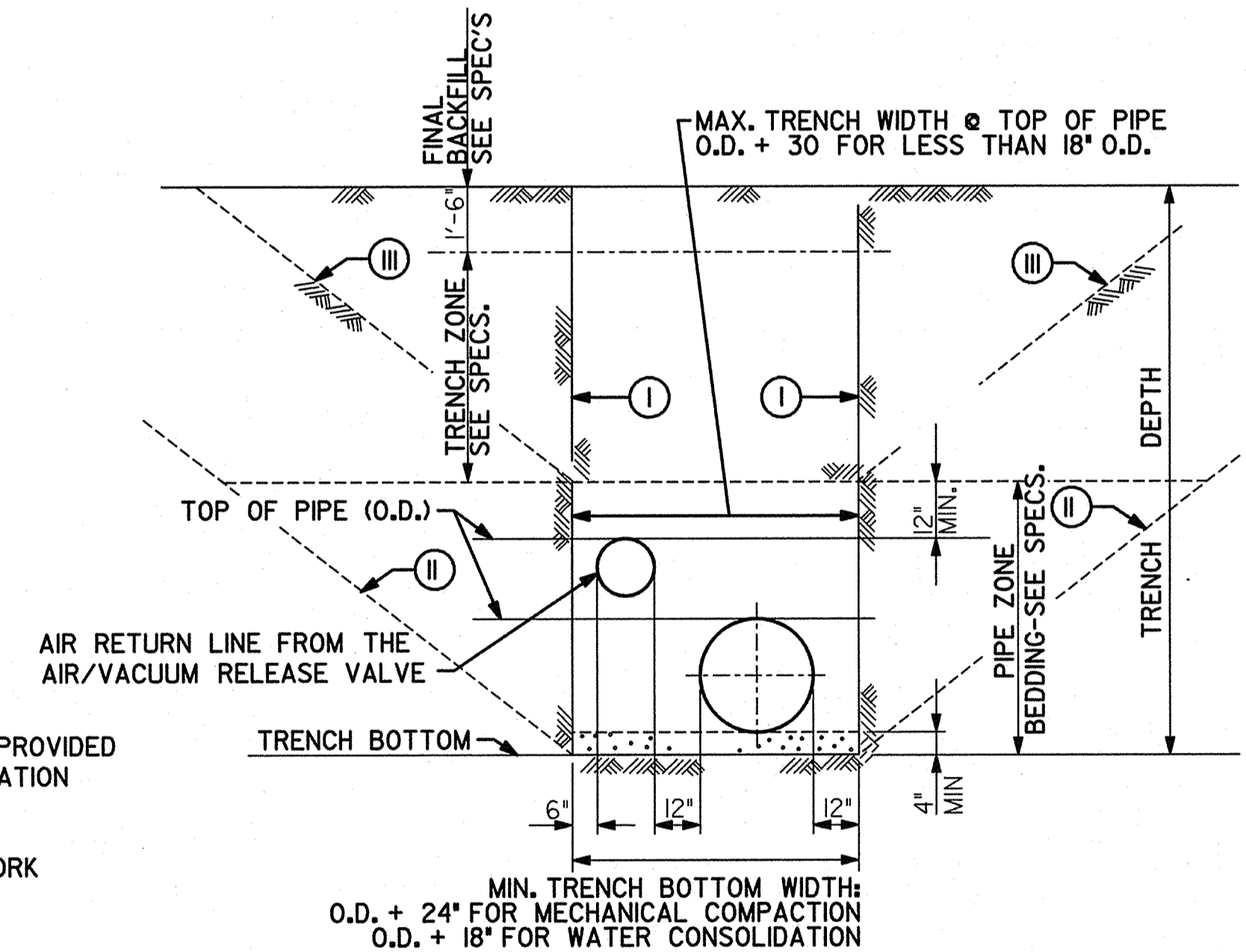
C-194
CWP



CLEANOUT
SEWER FORCE MAIN
NTS

FLEXIBLE PIPE TYPICAL TRENCH SECTIONS

- A. FLEXIBLE PIPE REFERS TO ALL STEEL, DUCTILE-IRON AND PLASTIC PIPES.
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MODIFIED FLEXIBLE PIPE TYPICAL TRENCH SECTION
NTS

C-001
84-C-107

NOTES:

- 1. SIMILAR POLYVINYL CHLORIDE COMPONENTS MAY BE USED IN ACCORDANCE WITH A.S.T.M. STANDARD SPECIFICATION D-2241 AND D-3139.
- 2. CONCRETE SLAB SHALL BE 560-C-3250 CONCRETE.
- 3. USE HEAVY DUTY MANHOLE FRAME AND COVER, STANDARD DRAWING M-1, IN AREAS SUBJECT TO VEHICULAR TRAFFIC; USE LIGHT DUTY MANHOLE FRAME COVER, STANDARD DRAWING M-2, IN ALL OTHER LOCATIONS.
- 4. MINIMUM PVC PIPE PRESSURE CLASS 305.

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1\"/>

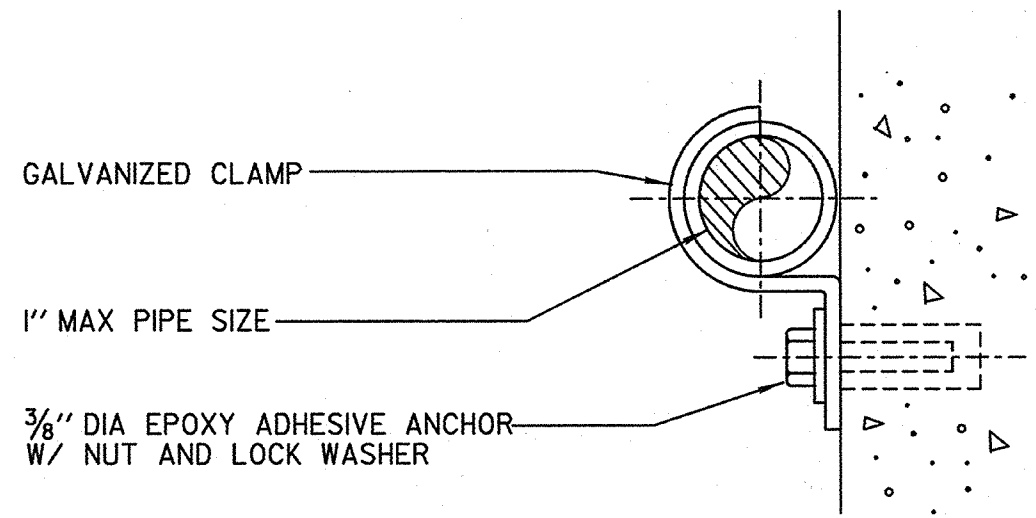
HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333
SCALE: HORIZONTAL, VERTICAL

**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

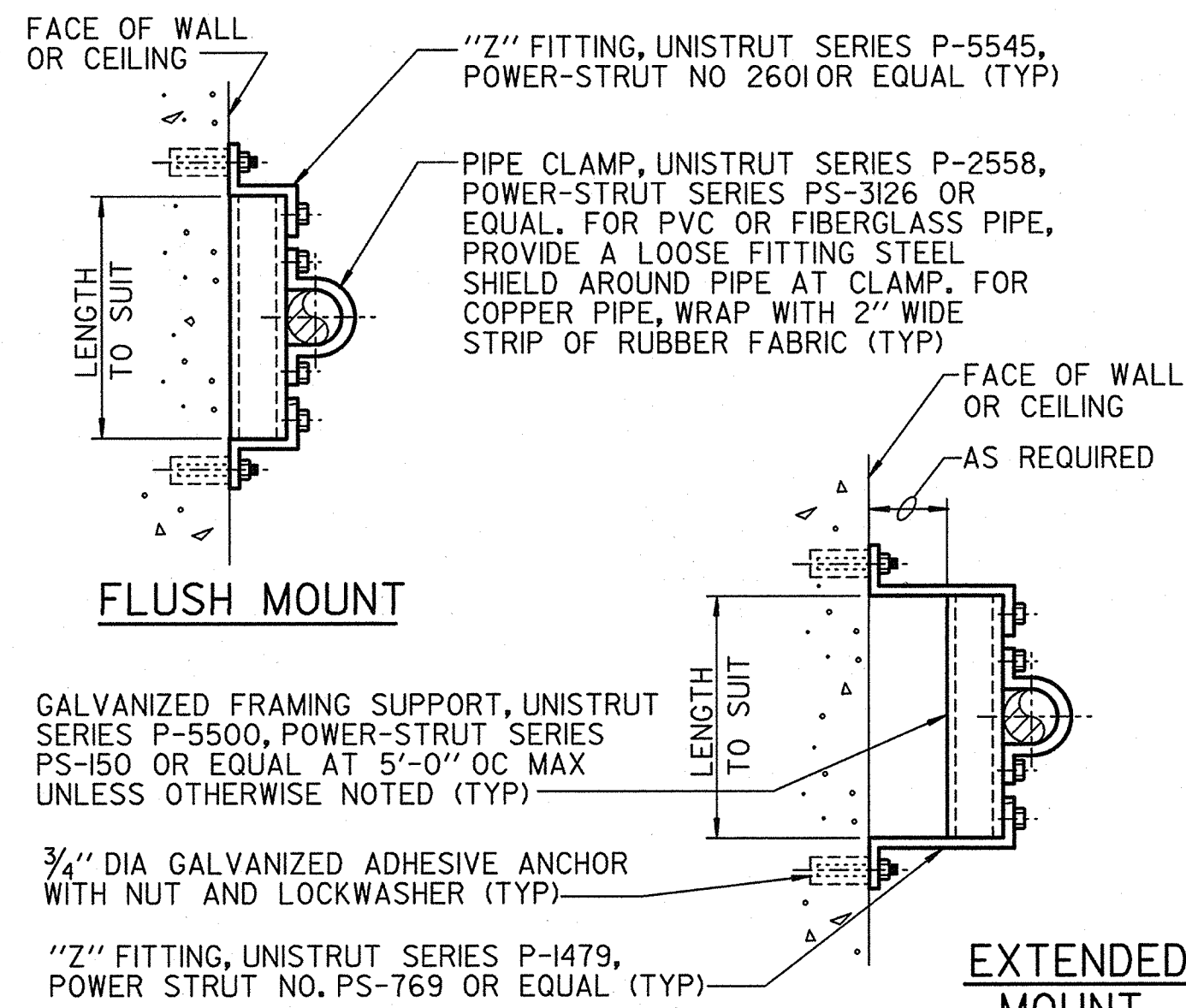
DRAWING NO. T-C2	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT			
SHEET NO. 110	CIVIL DETAILS - 2			
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA		WATER WBS SEWER WBS S-00308	
	SHEET 110 OF 118 SHEETS			
	Hosei Arey 7-26-11			
	FOR CITY ENGINEER	BY	APPROVED	DATE
	CONSTRUCTION ENGINEER			
	INSPECTOR			
	CONTRACTOR		DATE STARTED	
			DATE COMPLETED	
				36196-110-D



- NOTES:
- WHERE SUBMERGED, PIPE CLAMP, BOLT, WASHER, SHIELD AND SELF DRILLING CONCRETE ANCHOR TO BE TYPE 316 STAINLESS STEEL
 - WHEN USED WITH PVC OR FIBERGLASS PIPE, PROVIDE STEEL SHIELD AROUND PIPE AT CLAMP WITH LOOSE FIT. WRAP COPPER TUBES WITH 2" WIDE STRIP OF RUBBER FABRIC

PIPE CLAMP FOR INDIVIDUAL PIPES
1" DIA OR LESS

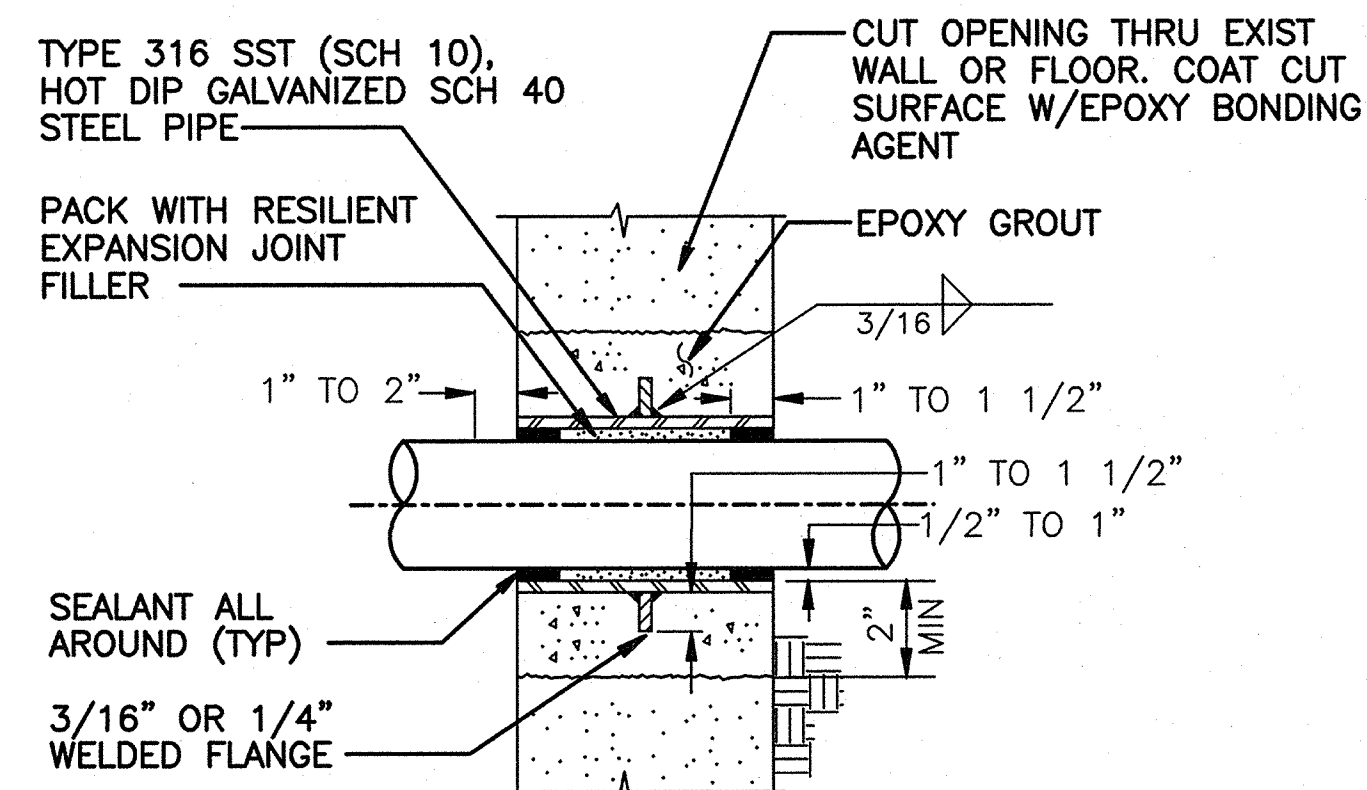
M-118
VAR



PIPE SUPPORT FOR INDIVIDUAL PIPES

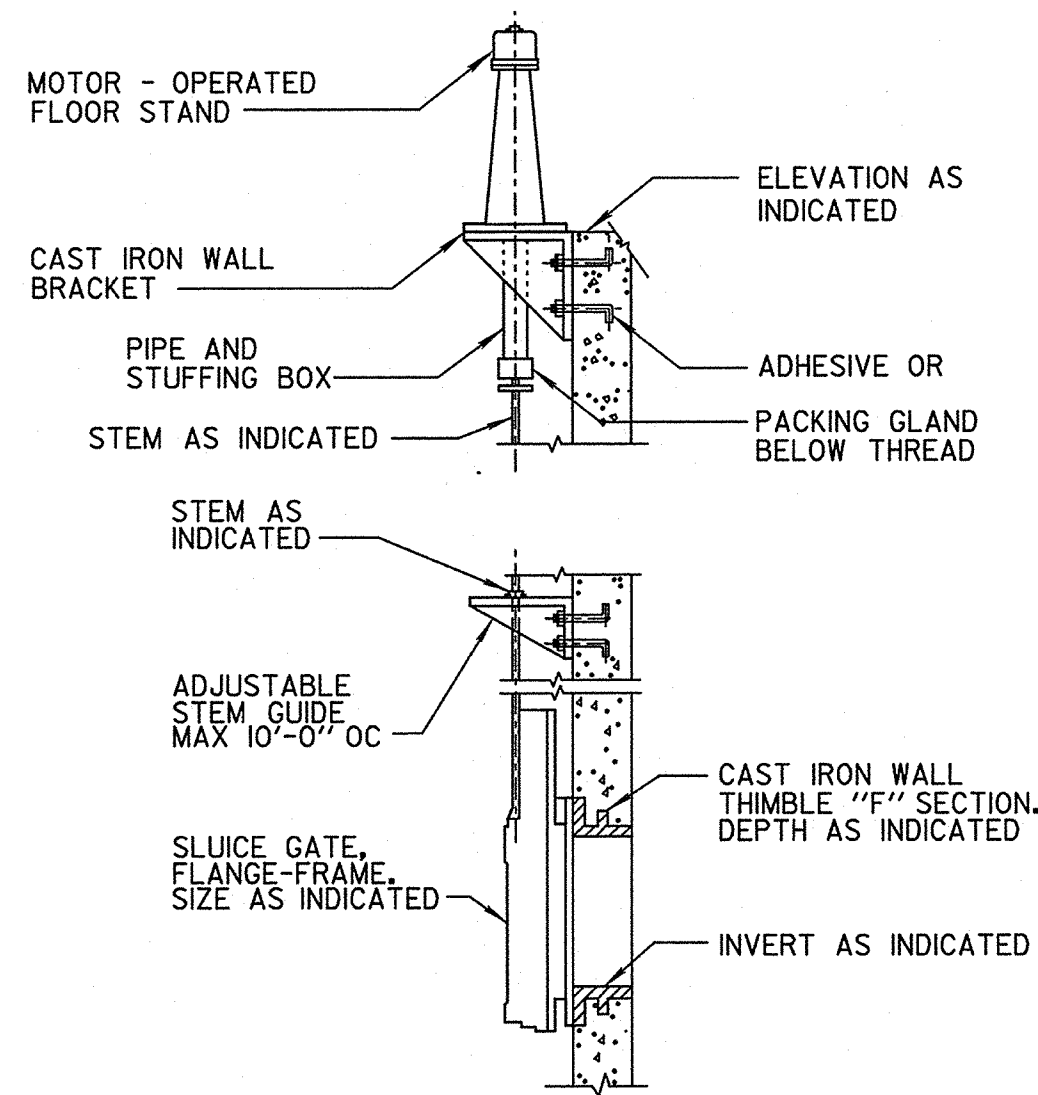
M-130
VAR

NOTE: USE THIS DETAIL FOR PIPES 6 INCHES AND SMALLER IN DIAMETER



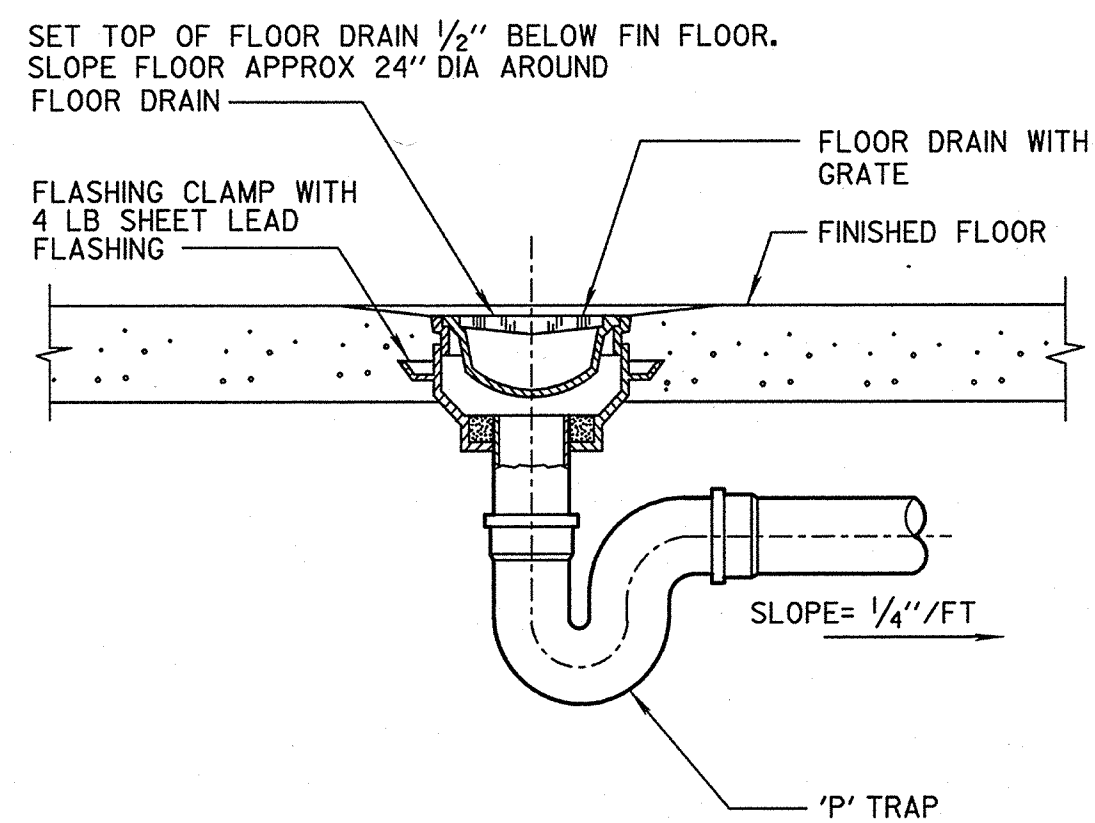
GAS TIGHT WALL PENETRATION

DETAIL C
VAR



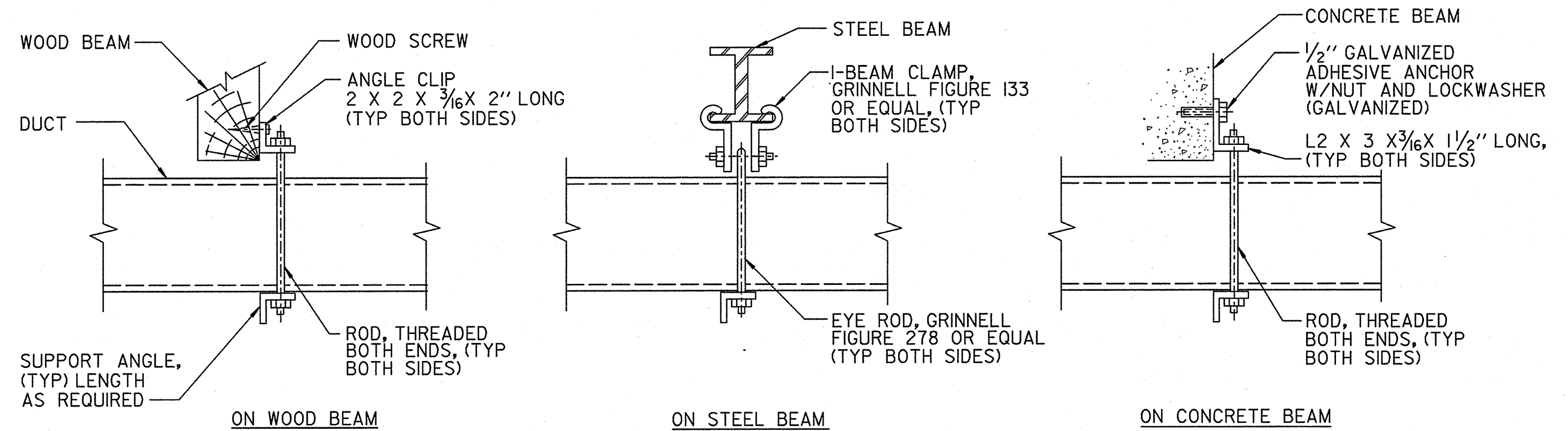
SLUICE GATE

G
VAR



FLOOR DRAIN

M-302
VAR



SIZING AND SPACING (INCHES)			
MAX DUCT SIZE	ROD DIA	SUPPORT ANGLE	MAXIMUM SPACING
36 X 12	3/8	1-1/2 X 1/2 X 1/8	8'-0" ON CENTER
48 X 18	1/2	2 X 2 X 1/8	8'-0" ON CENTER
60 X 24	1/2	2 X 2 X 3/16	6'-0" ON CENTER
80 X 24	1/2	2 X 2 X 1/4	6'-0" ON CENTER

HANGERS FOR DUCTS

M-510
VAR

7/18/2011 10:59:02 AM

SPS84-T-M3.dgn



WARNING
0 1/2 1
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HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

SCALE
HORIZONTAL NO SCALE
VERTICAL

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

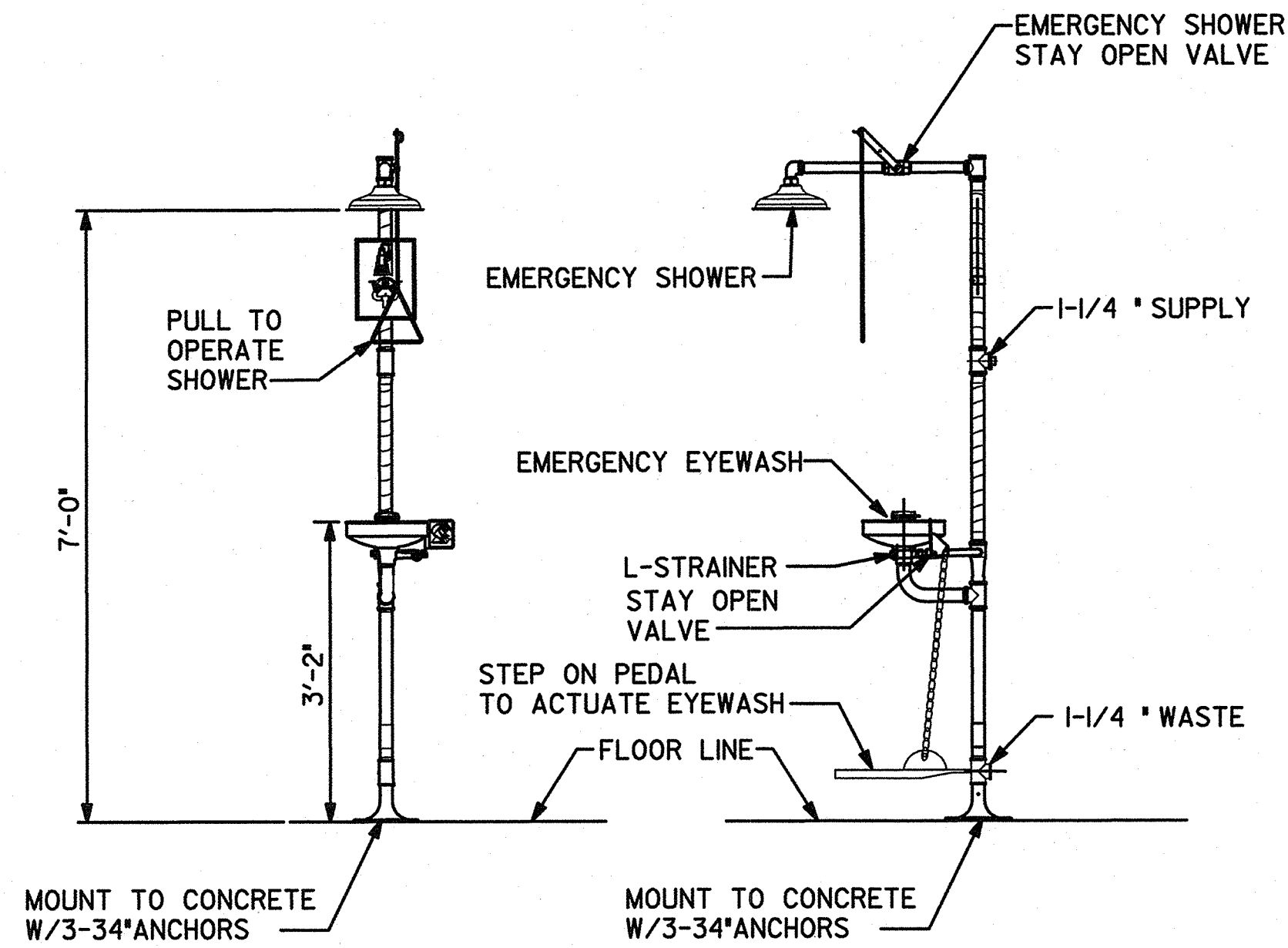


DRAWING STATUS									
NO.	DATE	REQ.	REVISION DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

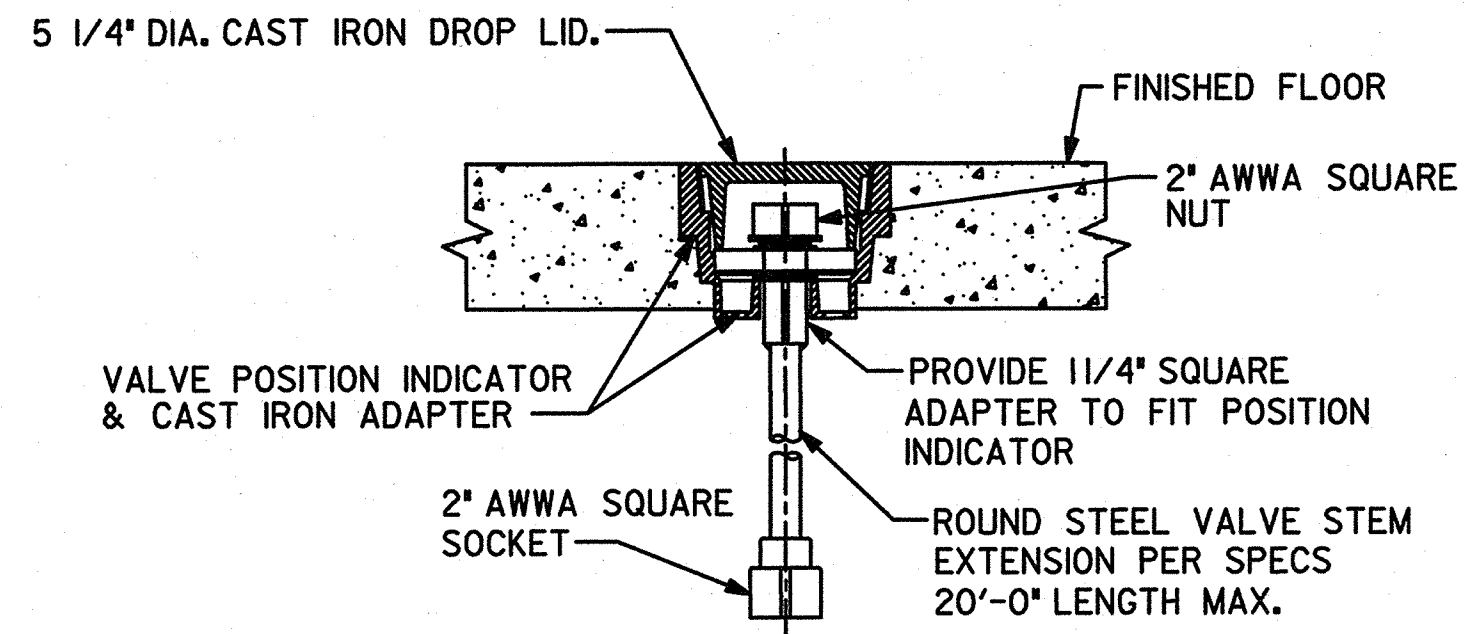
DRAWING NO. T-M3	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT		
SHEET NO. 117	MECHANICAL DETAILS - 3		
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 117 OF 118 SHEETS		WATER WBS SEWER WBS S-00308
APPROVED BY: FOR CITY ENGINEER	Hosni Agay 7-26-11		DATE
CHECKED BY: CONSTRUCTION ENGINEER	DESCRIPTION	BY	APPROVED DATE FILMED
CHECKED BY: INSPECTOR	302-1737		LAMBERT COORDINATES
CONTRACTOR	DATE STARTED	INSPECTOR	DATE COMPLETED
36196-117-D			

7/18/2011 11:00:51 AM

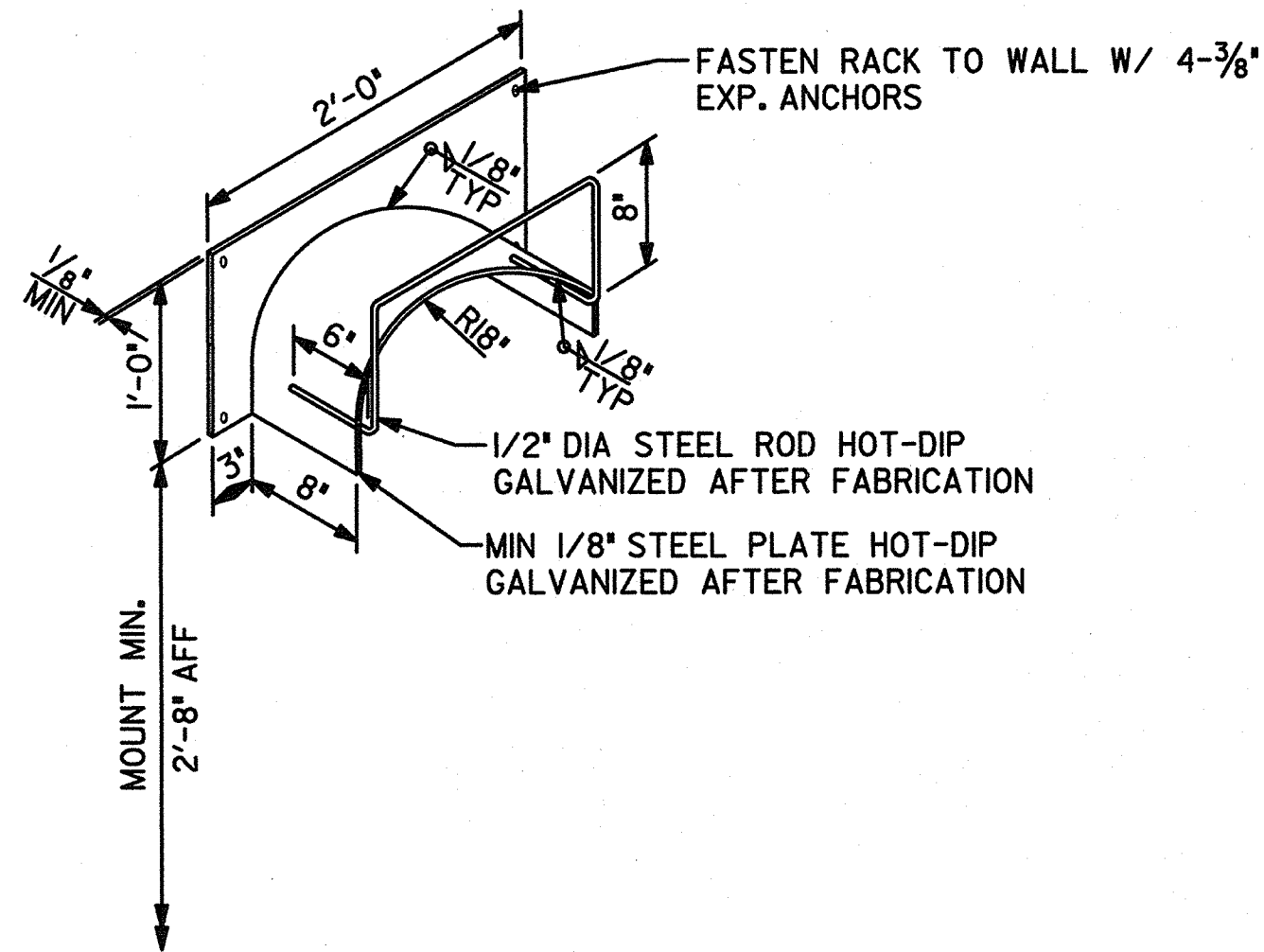
SPS84-T-M4.DGN



EMERGENCY SHOWER & EYEWASH D
NTS

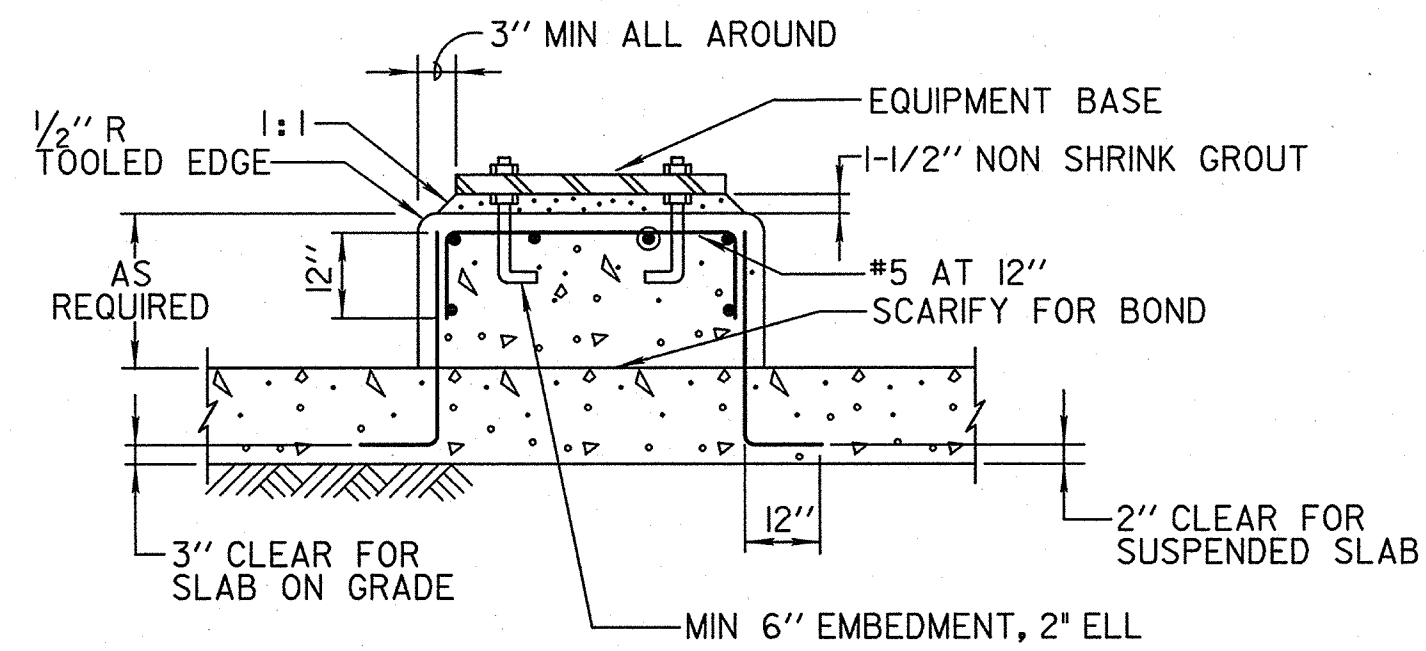


VALVE STEM EXTENSION E
NTS



TYPICAL HOSE RACK F
NTS

- NOTE:
1. THIS DETAIL APPLIES WHERE NO ANCHORING DETAILS HAVE BEEN INDICATED BY THE EQUIPMENT MANUFACTURER OR IN THE CONTRACT DOCUMENTS
 2. CONCRETE SHALL COVER BARS 2" MIN



EQUIPMENT BASE S-122
NTS CWP

DRAWING NO. T-M4	CITY WIDE PUMP STATION UPGRADES SPS 84 UPGRADE/SPS 62 ABANDONMENT	
SHEET NO. 118	MECHANICAL DETAILS - 4	
SPECIFICATION NO. 5525	CITY OF SAN DIEGO, CALIFORNIA SHEET 88 OF 118 SHEETS	WATER WBS SEWER WBS S-00308



WARNING
0 1/2 1
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HDR
8690 BALBOA AVENUE, SUITE 200
SAN DIEGO, CA 92123-1502
(858)712-8400 FAX (858)712-8333

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



DRAWING STATUS										
NO.	DATE	REQ.	REVISION	DESCRIPTION	DRAWN	CKD	APD	PE	EM	QA/QC

APPROVED BY:	Hosni Agor 7-26-11				
FOR CITY ENGINEER	DESCRIPTION	BY	APPROVED	DATE	FILMED
CHECKED BY:					
CONSTRUCTION ENGINEER					
CHECKED BY:					
INSPECTOR					
CONTRACTOR INSPECTOR					
DATE STARTED					
DATE COMPLETED					
CONTROL CERTIFICATION					
302-1737					
LAMBERT COORDINATES					
36196-118 -D					