

City

Mr. Brian J. Wier, Vice President
Wier Construction Corporation

0

2255 Barham Drive

CONTRACTOR'S NAME: _____

Escondido, CA 92029

ADDRESS: _____

P. (760) 743-6776 F. (760) 746-5224

TELEPHONE NO.: _____

CITY CONTACT: Claudia Abarca - Contract Specialist, Email: CAbarca@sandiego.gov.

Phone No. (619) 533-3439, Fax No. (619) 533-3633

DManela/BD/RIR

**CONTRACT
DOCUMENTS**

COPY



FOR

SEWER PUMP STATION 13

VOLUME 1 OF 2

BID NO.:	<u>K-13-5717-DBB-3</u>
SAP NO. (WBS/IO/CC):	<u>B-00476</u>
CLIENT DEPARTMENT:	<u>2011</u>
COUNCIL DISTRICT:	<u>2</u>
PROJECT TYPE:	<u>BP</u>

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.
- BID DISCOUNT PROGRAM (The WHITEBOOK, SLBE-ELBE Program Requirements, Section IV(2))

BID DUE DATE:

2:00 PM

APRIL 16, 2013

CITY OF SAN DIEGO

PUBLIC WORKS DEPARTMENT

1010 SECOND AVENUE, SUITE 1400, MS 614C

SAN DIEGO, CA 92101

ENGINEER OF WORK

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

Eric D. Lovering
1) Registered Engineer

2/19/2013
Date

Seal:



Hossein Motamami-Azar
2) For City Engineer

2/19/2013
Date

Seal:

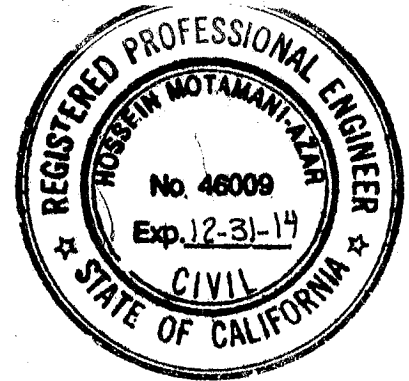


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CITY OF SAN DIEGO, CALIFORNIA

NOTICE INVITING BIDS

1. **RECEIPT AND OPENING OF BIDS:** Bids will be received at the Public Works Contracting Group at the location, time, and date shown on the cover of these specifications for performing work on **SEWER PUMP STATION 13** (Project).
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 in this contract comprises the following but is not limited to; wet well modifications including extension of walls and relining work, demolition and replacement of existing dry-pit, 10 HP pumps with new 10 HP, solids handling, immersible pumps (install 1 duty, 1 standby and provide 1 spare). It also includes the removal and replacement of existing suction and discharge piping and valving. Partial demolition and redesign of pump station roof, installation of new access hatch, valve rod access boxes and new ventilation system. Provide new electrical, instrumental and controls to make the systems complete and functional. Installation of drop manhole to serve as a rock trap and provide, operate and maintain temporary pumping facilities during construction.

2.1. The Work shall be performed in accordance with:

2.1.1. This Notice Inviting Bids and Plans numbered **37021-01-D** through **37021-22-D**, inclusive.

3. **EQUAL OPPORTUNITY**

3.1. To The WHITEBOOK, Chapter 10, Sections D and E, DELETE in their entirety and SUBSTITUTE with the following:

D. CITY'S EQUAL OPPORTUNITY COMMITMENT.

1. Nondiscrimination in Contracting Ordinance.

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

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

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

2. Disclosure of Discrimination Complaints. As part of its Bid or Proposal, the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors, or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.
3. Upon the City's request, the Contractor agrees to provide to the City, within 60 days, a truthful and complete list of the names of all Subcontractors and Suppliers that the Contractor has used in the past 5 years on any of its contracts that were undertaken within San Diego County, including the total dollar amount paid by the Contractor for each subcontract or supply contract.
4. The Contractor further agrees to fully cooperate in any investigation conducted by the City pursuant to the City's Nondiscrimination in Contracting Ordinance, Municipal Code §§22.3501 through 22.3517. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the Contract and may result in remedies being ordered against the Contractor up to and including contract termination, debarment and other sanctions for violation of the provisions of the Nondiscrimination in Contracting Ordinance. The Contractor further understands and agrees that the procedures, remedies and sanctions provided for in the Nondiscrimination in Contracting Ordinance apply only to violations of the Ordinance.

E. EQUAL EMPLOYMENT OPPORTUNITY OUTREACH PROGRAM.

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

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

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

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

3. If a Work Force Report is submitted, and the City determines there are under-representations when compared to County Labor Force Availability data, the selected Bidder shall submit an Equal Employment Opportunity Plan.
4. If the selected Bidder submits an Equal Employment Opportunity Plan, it shall include the following assurances:
 1. The Contractor shall maintain a working environment free of discrimination, harassment, intimidation and coercion at all sites and in all facilities at which the Contractor's employees are assigned to work.
 2. The Contractor reviews its EEO Policy, at least annually, with all on-site supervisors involved in employment decisions.
 3. The Contractor disseminates and reviews its EEO Policy with all employees at least once a year, posts the policy statement and EEO posters on all company bulletin boards and job sites, and documents every dissemination, review and posting with a written record to identify the time, place, employees present, subject matter, and disposition of meetings.
 4. The Contractor reviews, at least annually, all supervisors' adherence to and performance under the EEO Policy and maintains written documentation of these reviews.
 5. The Contractor discusses its EEO Policy Statement with subcontractors with whom it anticipates doing business, includes the EEO Policy Statement in its subcontracts, and provides such documentation to the City upon request.
 6. The Contractor documents and maintains a record of all bid solicitations and outreach efforts to and from subcontractors, contractor associations and other business associations.
 7. The Contractor disseminates its EEO Policy externally through various media, including the media of people of color and women, in advertisements to recruit, maintains files documenting these efforts, and provides copies of these advertisements to the City upon request.
 8. The Contractor disseminates its EEO Policy to union and community organizations.
 9. The Contractor provides immediate written notification to the City when any union referral process has impeded the Contractor's efforts to maintain its EEO Policy.
 10. The Contractor maintains a current list of recruitment sources, including those outreaching to people of color and women, and provides written notification of employment opportunities to these recruitment sources with a record of the organizations' responses.

11. The Contractor maintains a current file of names, addresses and phone numbers of each walk-in applicant, including people of color and women, and referrals from unions, recruitment sources, or community organizations with a description of the employment action taken.
12. The Contractor encourages all present employees, including people of color and women employees, to recruit others.
13. The Contractor maintains all employment selection process information with records of all tests and other selection criteria.
14. The Contractor develops and maintains documentation for on-the-job training opportunities, participates in training programs, or both for all of its employees, including people of color and women, and establishes apprenticeship, trainee, and upgrade programs relevant to the Contractor's employment needs.
15. The Contractor conducts, at least annually, an inventory and evaluation of all employees for promotional opportunities and encourages all employees to seek and prepare appropriately for such opportunities.
16. The Contractor ensures the company's working environment and activities are non-segregated except for providing separate or single-user toilets and necessary changing facilities to assure privacy between the sexes.

4. SUBCONTRACTING PARTICIPATION PERCENTAGES.

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

1. SLBE participation	8.2%
2. ELBE participation	14.1%
3. Total mandatory participation	22.3%

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

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

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

4.3.2. Bidder's submission of Good Faith Effort documentation demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 3 Working Day of the Bid opening if the overall mandatory participation percentage is not met.

5. PRE-BID MEETING:

5.1. There will be a Pre-Bid Meeting to discuss the scope of the Project, bidding requirements, pre-qualification process, and Equal Opportunity Contracting Program requirements and reporting procedures in the Public Works Contracting Group, Conference Room at 633 Tourmaline Street, San Diego, CA 92109 **at 10:00 A.M., on March 27, 2013.**

5.2. All potential bidders are encouraged to attend.

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

6. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:

6.1. **Prior** to the Award of the Contract or each Task Order, you and your Subcontractors and Suppliers **must** register with Prism®, the City's web-based contract compliance portal at:

<https://pro.prismcompliance.com/default.aspx>.

6.2. The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.

7. PRE-BID SITE VISIT: The prospective Bidders are encouraged to visit the Work Site with the Engineer. The purpose of the Site visit is to acquaint Bidders with the Site conditions. To request a sign language or oral interpreter for this visit, call the Public Works Contracting Group at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. A Pre-Bid Site Visit is offered when the details are provided as follows:

Time: Immediately following Pre-Bid Meeting
Date: March 27, 2013
Location: Sewer Pump Station 13
633 Tourmaline Street
San Diego, CA 92109

8. **CONSTRUCTION COST:** The City’s estimated construction cost for this contract is **\$527,000**.
9. **LOCATION OF WORK:** The location of the Work is **Sewer Pump Station No.13, 633 Tourmaline Street, San Diego, CA 92109**
10. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **180 Working Days**.
11. **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.
 - 11.1. The City has determined the following licensing classification(s) for this contract:
 - CLASS A
12. **JOINT VENTURE CONTRACTORS.** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receiving the Contract forms. See 2-1.1.2, “Joint Venture Contractors” in The WHITEBOOK for details.
13. **WAGE RATES:** Prevailing wages are not applicable to this contract.
14. **INSURANCE REQUIREMENTS:**
 - 14.1. All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City’s Notice of Intent to Award letter.
 - 14.2. Refer to sections 7-3, “LIABILITY INSURANCE”, and 7-4, “WORKERS’ COMPENSATION INSURANCE” of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.
15. **PREQUALIFICATION OF CONTRACTORS:**
 - 15.1. Contractors submitting Bid must be pre-qualified for the total amount proposed, inclusive of all alternate items prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified will be deemed **non-responsive** and ineligible for award. Complete information and prequalification questionnaires are available at:

<http://www.sandiego.gov/cip/bidopps/prequalification.shtml>
 - 15.2. 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 - Engineering & Capital Project, Prequalification Program, 1010 Second Avenue, Suite 1200, San Diego, CA 92101. For additional information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

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

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

- 17. 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.
- 18. CITY’S RIGHTS RESERVED:** The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.
- 19. 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.
- 20. SUBMITTAL OF “OR EQUAL” ITEMS:** See Section 4-1.6, “Trade Names or Equals” in The WHITEBOOK and as amended in the SSP.
- 21. AWARD PROCESS:**
- 21.1.** The Award of this contract is contingent upon the Contractor’s compliance with all conditions precedent to Award.
- 21.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract

approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.

- 21.3.** This contract will be deemed executed, and effective, only upon the signing of the Contract by the Mayor or designee of the City.
- 22. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" in The WHITEBOOK and as amended in the SSP which requires the Contractor to self perform the amount therein stipulated. Failure to comply with these requirements may render the Bid **non-responsive** and ineligible for award.
- 23. AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/cip/>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracting Group.
- 24. QUESTIONS:**
- 24.1.** The Director (or designee), of the Public Works Department is the officer responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. All questions related to this procurement action shall be addressed to the Public Works Contracting Group, Attention Contract Specialist, 1010 Second Avenue, Suite 1400, San Diego, California, 92101, and Telephone No. (619) 533-3450.
- 24.2.** Questions received less than 14 days prior to the date for opening of Bids may not be answered.
- 24.3.** Interpretations or clarifications considered necessary by the City in response to such questions will be issued by Addenda which will be uploaded to the City's online bidding service.
- 24.4.** Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. It is the Bidder's responsibility to become informed of any Addenda that have been issued and to include all such information in its Bid.
- 25. ELIGIBLE BIDDERS:** No person, firm, or corporation shall be allowed to make, file, or be interested in **more** than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.
- 26. SAN DIEGO BUSINESS TAX CERTIFICATE:** The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, first floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms with the Notice Inviting Bids and Contract forms.

27. 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.

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

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

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

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

28. BIDDERS' GUARANTEE OF GOOD FAITH (BID SECURITY):

28.1. With the exception of the contracts valued \$5,000 or less, JOC 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.

28.2. 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.

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

29. AWARD OF CONTRACT OR REJECTION OF BIDS:

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

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

- 29.3. The City reserves the right to reject any or all Bids, and to waive any informality or technicality in Bids received and any requirements of these specifications as to bidding procedure.
- 29.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City from the Bidder within 3 Working Days, excluding Saturdays, Sundays, and state holidays, after the opening of Bids, of written notice which includes proof of honest, credible, clerical error of material nature, free from fraud or fraudulent intent, and of evidence that reasonable care was observed in the preparation of the Bid.
- 29.5. 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."
- 29.6. The City of San Diego will not discriminate with regard to race, religious creed, color, national origin, ancestry, physical handicap, marital status, sex or age, in the award of contracts.
- 29.7. Each Bid package properly executed as required by these specifications shall constitute a firm offer, which may be accepted by the City within the time specified in the Proposal.
- 29.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of any proposed alternates, additive items or options, at its discretion that will be disclosed in the Volume 2 of 2.

30. BID RESULTS:

- 30.1. The Bid opening by the City shall constitute the public announcement of the Apparent Low Bidder. In the event that the Apparent Low Bidder is subsequently deemed non-responsive or non-responsible, a public announcement will be posted in the City's web page: <http://www.sandiego.gov/bids-contracts/>, with the name of the newly designated Apparent Low Bidder.
- 30.2. To obtain Bid results, either attend Bid opening, review the results on the City's web site, or provide a self-addressed, stamped envelope, referencing Bid number, and Bid tabulation will be mailed to you upon verification of extensions. Bid results cannot be given over the telephone.

31. THE CONTRACT:

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

- 31.2.** If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
- 31.3.** If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.
- 31.4.** Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.
- 31.5.** The award of the Contract is contingent upon the satisfactory completion of the above mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.
- 32. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK:** The Bidder shall examine carefully the Project Site, the Plans and Specifications other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.
- 33. CITY STANDARD PROVISIONS.** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
- 33.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
- 33.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
- 33.3.** The City of San Diego Municipal Code §22.3004 for Pledge of Compliance.

- 33.4. The City of San Diego’s Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
- 33.5. Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.
- 33.6. The City’s Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
- 33.7. The City’s Information Security Policy (ISP) as defined in the City’s Administrative Regulation 90.63.

34. PRE-AWARD ACTIVITIES:

- 34.1. The selected contractor by the City to execute a contract for this Work shall provide the information required within the time specified in “Required Documents,” of this bid package. Failure to provide the information within the time specified may result in the Bid being rejected as **non-responsive**.
- 34.2. If the Bid is rejected as non-responsive, the selected contractor by the City to execute a contract for this Work shall forfeit the required Bid. The decision that the selected contractor by the City to execute a contract for this Work is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

35. REQUIRED DOCUMENT SCHEDULE:

- 35.1. The Bidder’s attention is directed to the City’s Municipal Code §22.0807(e), (3)-(5) for important information regarding grounds for debarment for failure to submit required documentation.
- 35.2. The specified Equal Opportunity Contracting Program (EOCP) forms are available for download from the City’s web site at:

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

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
1.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid
2.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Non-collusion Affidavit to be Executed By Bidder and Submitted with Bid under 23 USC 112 and PCC 7106
4.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
5.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
7.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
8.	WITHIN 3 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	SLBE Good Faith Efforts Documentation
9.	WITHIN 3 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Form AA60 – List of Work Made Available
10.	WITHIN 3 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
11.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principal individual owners of the Apparent Low Bidder
12.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture: <ul style="list-style-type: none"> • Joint Venture Agreement • Joint Venture License
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	Contract Forms - Agreement
15.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Payment and Performance Bond
16.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Certificates of Insurance and Endorsements

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
17.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - Drug-Free Workplace
18.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - American with Disabilities Act
19.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractors Standards - Pledge of Compliance
20.	WITHIN 5 WORKING DAYS BEFORE THE PRE-CONSTRUCTION MEETING	LOW BIDDER	Vendor's Past Project Documentation. See Sections 02999.

CONTRACT FORMS
AGREEMENT

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 WIER CONSTRUCTION CORPORATION, herein called "Contractor" for construction of **Sewer Pump Station 13** ; Bid No.**K-13-5717-DBB-3**; in the amount of FIVE HUNDRED NINETY SIX THOUSAND ONE HUNDRED NINETY DOLLARS AND 00/100 (\$596,190.00), which is comprised of the Base Bid alone.

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

1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) Reference Standards listed in the Notice Inviting Bids and the Supplementary Special Provisions (SSP).
 - (d) That certain documents entitled Sewer Pump Station 13, on file in the office of the City Clerk as Document No. **B-00476**, as well as all matters referenced therein.
2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **Sewer Pump Station 13, K-13-5717-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

CONTRACT 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 Municipal Code §22.3102 (a)(1) authorizing such execution.

THE CITY OF SAN DIEGO

APPROVED AS TO FORM AND LEGALITY

Jan I. Goldsmith, City Attorney

By Tony Heinrichs

By Jeremy Jung

Print Name: Tony Heinrichs
Director, Department of Public Works

Print Name: Jeremy Jung
Deputy City Attorney

Date: 7/5/13

Date: 7-9-13

CONTRACTOR

By Cathy J. Wier

Print Name: Cathy J. Wier

Title: President

Date: May 21, 2013

City of San Diego License No.: 1994001930

State Contractor's License No.: 481419

**CONTRACT/AGREEMENT
ATTACHMENTS**

CONTRACT ATTACHMENT
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

WIER CONSTRUCTION CORPORATION, a corporation, as principal, and
Philadelphia Indemnity 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
FIVE HUNDRED NINETY SIX THOUSAND ONE HUNDRED NINETY DOLLARS AND 00/100
(\$596,190.00) for the faithful performance of the annexed contract, and in the sum of
FIVE HUNDRED NINETY SIX THOUSAND ONE HUNDRED NINETY DOLLARS AND 00/100
(\$596,190.00) for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract Sewer Pump Station 13,
K-13-5717-DBB-3, San Diego, California then the obligation herein with respect to a faithful
performance shall be void; otherwise it shall remain in full force.

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

The obligation herein with respect to laborers and materialmen shall inure to the benefit of all
persons, firms and corporations entitled to file claims under the provisions of Chapter 3 of Division 5
of Title I of the Government Code of the State of California or under the provisions of Section 3082
et seq. of the Civil Code of the State of California.

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

CONTRACT ATTACHMENT (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 May 14, 2013

Approved as to Form and Legality

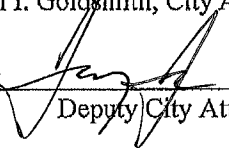
WIER CONSTRUCTION CORPORATION

Principal

By 

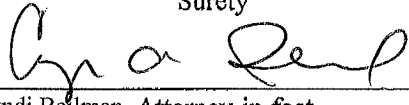
Cathy J. Wier, President
Printed Name of Person Signing for Principal

Jan I. Goldsmith, City Attorney

By 
Deputy City Attorney

Philadelphia Indemnity Insurance Company


Surety

By 
Cyndi Bellman, Attorney-in-fact

Approved:

251 South Lake Avenue, Ste. 360

Local Address of Surety

By 
Tony Heinrichs
Director, Department of Public Works

Pasadena, CA 91101

Local Address (City, State) of Surety

626-639-1323

Local Telephone No. of Surety

Premium \$ 9,462.00

Bond No. PB 115111 00048

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA

County of San Diego }

On May 14, 2013 before me, Dana L. Michaelis, Notary Public,
Date Here Insert Name and Title of the Officer

personally appeared Cyndi Beilman
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 Dana L. Michaelis
Signature of Notary Public Dana L. Michaelis



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: _____

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

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing: _____

Signer's Name: _____

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

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing: _____

PHILADELPHIA INDEMNITY INSURANCE COMPANY

231 St. Asaph's Rd., Suite 100
Bala Cynwyd, PA 19004-0950

Power of Attorney

KNOW ALL PERSONS BY THESE PRESENTS: that PHILADELPHIA INDEMNITY INSURANCE COMPANY (the Company), a corporation organized and existing under the laws of the Commonwealth of Pennsylvania, does hereby constitute and appoint: CYNDI BEILMAN, ANNE WRIGHT AND DANA MICHAELIS OF SURETY ASSOCIATES OF SOUTHERN CALIFORNIA INSURANCE SERVICES its true and lawful Attorney(s) in fact with full authority to execute on its behalf bonds, undertakings, recognizances and other contracts of indemnity and writings obligatory in the nature thereof, issued in the course of its business and to bind the Company thereby, in an amount not to exceed \$5,000,000.00;

This Power of Attorney is granted and is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of PHILADELPHIA INDEMNITY INSURANCE COMPANY at a meeting duly called the 1st day of July, 2011.

RESOLVED: That the Board of Directors hereby authorizes the President or any Vice President of the Company to: (1) Appoint Attorney(s) in Fact and authorize the Attorney(s) in Fact to execute on behalf of the Company bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof and to attach the seal of the Company thereto; and (2) to remove, at any time, any such Attorney-in-Fact and revoke the authority given. And, be it

FURTHER RESOLVED: That the signatures of such officers and the seal of the Company may be affixed to any such Power of Attorney or certificate relating thereto by facsimile, and any such Power of Attorney so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with the respect to any bond or undertaking to which it is attached.

IN TESTIMONY WHEREOF, PHILADELPHIA INDEMNITY INSURANCE COMPANY HAS CAUSED THIS INSTRUMENT TO BE SIGNED AND ITS CORPORATE SEAL TO BE AFFIXED BY ITS AUTHORIZED OFFICE THIS 15TH DAY OF NOVEMBER 2012.

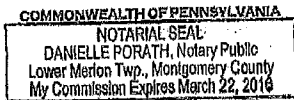


(Seal)

President

Sean S. Sweeney, President
Philadelphia Indemnity Insurance Company

On this 15th day of November 2012, before me came the individual who executed the preceding instrument, to me personally known, and being by me duly sworn said that he is the therein described and authorized officer of the PHILADELPHIA INDEMNITY INSURANCE COMPANY; that the seal affixed to said instrument is the Corporate seal of said Company; that the said Corporate Seal and his signature were duly affixed.



Notary Public:

residing at:

Bala Cynwyd, PA

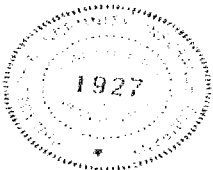
(Notary Seal)

My commission expires:

March 22, 2016

I, Craig P. Keller, Executive Vice President, Chief Financial Officer and Secretary of PHILADELPHIA INDEMNITY INSURANCE COMPANY, do hereby certify that the foregoing resolution of the Board of Directors and this Power of Attorney issued pursuant thereto are true and correct and are still in full force and effect. I do further certify that Sean S. Sweeney, who executed the Power of Attorney as President, was on the date of execution of the attached Power of Attorney the duly elected President of PHILADELPHIA INDEMNITY INSURANCE COMPANY,

In Testimony Whereof I have subscribed my name and affixed the facsimile seal of each Company this 14th day of May 20 13.



Craig P. Keller, Executive Vice President, Chief Financial Officer & Secretary
PHILADELPHIA INDEMNITY INSURANCE COMPANY

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

PROJECT TITLE: Sewer Pump Station 13

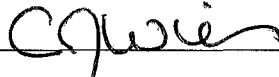
I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

Wier Construction Corporation

(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 Cathy J. Wier

Title President

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

PROJECT TITLE: Sewer Pump Station 13

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the American With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 7-13.2, "American With Disabilities Act", of the project specifications, and that;

Wier Construction Corporation

(Name under which business is conducted)

has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

Signed Cathy J. Wier

Printed Name Cathy J. Wier

Title President

CONTRACTOR CERTIFICATION

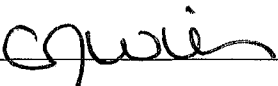
CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

PROJECT TITLE: Sewer Pump Station 13

I declare under penalty of perjury that I am authorized to make this certification on behalf of Wier Construction Corp., as Contractor, that I am familiar with the requirements of City of San Diego Municipal Code § 22.3224 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than \$50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3224.

Dated this 21st Day of May, 2013.

Signed 

Printed Name Cathy J. Wier

Title President

AFFIDAVIT OF DISPOSAL

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

Sewer Pump Station 13

(Name of Project)

as particularly described in said contract and identified as Bid No. **K-13-5717-DBB-3**; SAP No. (WBS/IO/CC) **B-00476**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, _____.

Contractor
by

ATTEST:

State of _____
County of _____

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

Notary Public in and for said County and State

SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

SUPPLEMENTARY SPECIAL PROVISIONS

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

- 1) Standard Specifications for Public Works Construction (The GREENBOOK) currently in effect.
- 2) The City of San Diego Standard Specifications for Public Works Construction (The WHITEBOOK).

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

1-2 TERMS AND DEFINITIONS.

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

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

ADD the following:

Construction Manager – See Engineer.

SECTION 2 - SCOPE AND CONTROL OF WORK

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

1. You must perform, with your own organization, Contract work amounting to at least 50% of the base bid alone or base bid and any additive or deductive alternate(s) that together when added or deducted form the basis of award.
2. The self performance percentage requirement will be waived for contracts when a “B” License is required or allowed.

2-5.3.2 Working Drawings. TABLE 2-5.3.2(A), ADD the following:

Item	Section No.	Title	Subject
17	306-1.6	Water Valve Bypass for Mainlines 16” and Larger	SDW-154 *

* Note: The distance dimensions shown between the bypass pipes and between bypass pipes and the mainlines are subject to change to field conditions.

ADD:

2-7.1 Soils Investigation.

The Allowance bid item for Soils Investigation includes full compensation for all equipment, materials, and labor required for Soils investigation as required by all Permits and indicated in Contract Documents.

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.

SECTION 4 - CONTROL OF MATERIALS

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

The Contractor shall employ and pay for the services of qualified inspection entity to perform specialty inspection services as specified in plans sheet S-2.

4-1.6 Trade Names or Equals. ADD the following:

You must submit your list of proposed substitutions for "an equal" ("or equal") item(s) **no less than 15 Working Days prior to Bid due date** and on a City form when provided by the City.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

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

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

7-3.1 Policies and Procedures.

1. You must procure the insurance described below, at its sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.

2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
3. You must maintain this insurance for the duration of this contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this contract. Your liabilities under the Contract, e.g., your indemnity obligations, is not deemed limited to the insurance coverage required by this contract.
4. Payment for insurance is included in the various items of Work as bid by you, and except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any work under this contract until you have provided and the City has approved all required insurance.
5. Policies of insurance must provide that the City is entitled to 30 days (10 days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

7-3.2 Types of Insurance.

7-3.2.1 Commercial General Liability Insurance.

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

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

7-3.2.2 Commercial Automobile Liability Insurance.

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

7-3.2.3 Contractors Pollution Liability Insurance.

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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..

1. You must provide at its expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance must be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and filling. The policy or policies limits must be 100% of this contract value of the Work plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
2. Insured property must include material or portions of the Work located away from the Site but intended for use at the Site, and must cover material or portions of the Work in transit. The policy or policies must include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies must cover the cost of removing debris, including demolition.
3. The policy or policies must provide that all proceeds thereunder must be payable to the City as Trustee for the insured, and must name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. We as Trustee will collect, adjust, and receive all monies which may become due and payable under the policy or policies, may compromise any and all claims thereunder, and will apply the proceeds of such insurance to the repair, reconstruction, or replacement of the Work.
4. Any deductible applicable to the insurance must be identified in the policy or policies documents and responsibility for paying the part of any loss not covered because of the application of such deductibles must be apportioned among the parties except for the City as follows: if there is more than one claimant for a single occurrence, then each claimant must pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City must be entitled to 100% of its loss. The Contractor must pay the City any portion of that loss not covered because of a deductible, at the same time the proceeds of the insurance are paid to the City as trustee.
5. Any insured, other than the City, making claim to which a deductible applies must be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies must provide that the City is entitled to 30 days prior written notice (10 days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.3

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

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

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

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

7-3.5 Policy Endorsements.

7-3.5.1 Commercial General Liability Insurance

7-3.5.1.1 Additional Insured.

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

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

7-3.5.1.3 Project General Aggregate Limit.

The policy or policies must be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments

which arise from the Work must reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit must be in addition to the aggregate limit provided for the products-completed operations hazard.

7-3.5.2 Commercial Automobile Liability Insurance.

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

7-3.5.3 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.

7-3.5.5 Builders Risk Endorsements.

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

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

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

7-3.7 Reservation of Rights. The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit, or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this contract.

7-3.8 Notice of Changes to Insurance. You must notify the City 30 days prior to any material change to the policies of insurance provided under this contract.

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

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

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

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

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

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

3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you must comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

7-4.1.1 Waiver of Subrogation.

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

7-10.5.3 Steel Plate Covers. Table 7-10.5.3(A), REVISE the plate thickness for 5'-3" trench width to read 1 3/4".

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

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

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

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

SECTION 9 - MEASUREMENT AND PAYMENT

9-3.1 General. ADD the following:

General Construction. The lump sum price payment for General Construction shall include all equipment, materials, and labor, full compensation for supervision, planning, design, engineering fees associated w/construction activities for contractor required design efforts, furnishing and construction of all facilities, complete in place as defined in the Contract Documents with exclusion of payments to be made as defined herein for other items required by Contract Documents and listed in the Bid proposal.

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 costs 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. All costs shall be included in the prices named in the Bid Schedule for the various items of work at no additional cost to the City.

Demolition - Lump Sum bid item shall include full compensation for all equipment, materials, labor required for all demolition indicated in the Contract Documents. The price shall include all hauling of materials to required locations for disposal, disposal costs and fees, if any.

Vertical recessed Impeller Pumps/Motors - The lump sum bid item for Vertical recessed Impeller Pumps includes full compensation for all equipment, materials, labor to be installed as indicated in the Contract Documents.

Vertical recessed Impeller Pumps /Motors (Spare) - The lump sum bid item for Vertical recessed Impeller Pumps (Spare) includes full compensation for all equipment, materials, labor to be installed as indicated in the Contract Documents.

Electrical – The lump sum bid item for Electrical includes full compensation for all equipment, materials, labor to be completed as indicated in the Contract Documents. The price for this bid item shall include all work related to Electrical, including but not limited to, conduits and wiring, miscellaneous electrical work, and relocation of existing Instrumentation and Controls.

Site Repair - The lump sum Bid Item for Site repair includes full compensation for all equipment, materials and labor to be installed as indicated on sheet C-1 and C-2 and as required in the Contract Documents. Cost shall include all work related to access driveway, pump station site resurfacing, sidewalk, asphalt paving and site repair required as indicated in sheet C-1 and C-2.

Special Inspection - The Allowance bid item for Special Inspection includes full compensation for all equipment, materials, labor required for Special Inspection as required by all Permits and indicated on sheet S-1.

9-3.2.5

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

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

ADD:

- 9-3.7** Compensation Adjustments for Price Index Fluctuations. This Contract is not subject to the provisions of The WHITEBOOK for Compensation Adjustments for Price Index Fluctuations for the paving asphalt.

SECTION 203 – BITUMINOUS MATERIALS

- 203-15** **RUBBER POLYMER MODIFIED SLURRY (RPMS).** RPMS shall be used on this contract.

SECTION 207 – PIPE

- 207-27** **FUSIBLE NON-PRESSURE POLYVINYLCHLORIDE PIPE.** DELETE in its entirety.

SECTION 300 – EARTHWORK

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

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

SECTION 302 – ROADWAY SURFACING

- 302-3** **Preparatory Repair Work.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

- 302-3** **Preparatory Repair Work.**

1. Prior to roadway resurfacing or the application of slurry, the Contractor shall complete all necessary preparation and repair work to the road segment e.g., tree trimming, weed spray, weed abatement, crack sealing, asphalt repair, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc. and as specified in the Special Provisions.
2. Preparatory work shall include, but not be limited to, tree trimming, weed spray, weed abatement, crack sealing, asphalt repair i.e., mill and pave, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc.
3. The Contractor shall repair areas of distressed asphalt concrete pavement by milling or removing damaged areas of pavement to a minimum depth of 2” for Residential streets, and a minimum depth of 3” for all others to expose firm and unyielding pavement. The Contractor shall prepare subgrade as needed and install a minimum of 2” for residential streets, and a minimum of 3” for all others, of compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

4. If, in order to achieve the minimum specified depth, the base material is exposed, the material shall be compacted to 95% relative compaction to a depth 10" below the finished grade (dig out). Compaction tests shall be made to ensure compliance with the specifications. The Engineer will determine when and where the test will occur. The City will pay for the soils testing required by the Engineer, which meets the required compaction. The Contractor shall reimburse the City for the cost of retesting failing compaction tests. If additional base material is required, the Contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base."
5. Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Crushed Miscellaneous Aggregate Base."
6. Prior to replacing asphalt, the area shall be cleaned by removing all loose and damaged material, moisture, dirt, and other foreign matter and shall be tack coated in accordance with 302-5.4 "Tack Coat."
7. The Contractor shall install new asphalt within the repair area or for patches in accordance with 302-5, "ASPHALT CONCRETE PAVEMENT." Asphalt concrete shall be C2-PG 64-10 in compliance with 400-4, "ASPHALT CONCRETE."
8. No preparatory asphalt work shall be done when the atmospheric temperature is below 50 °F or during unsuitable weather.
9. Following the asphalt placement, the Contractor shall roll the entire area of new asphalt in both directions at least twice. The finished patch shall be level and smooth in compliance with 302-5.6.2 "Density and Smoothness." After placement and compaction of the asphalt patch, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.
10. The minimum dimension for each individual repair shall be 4' x 4' and shall be subject to the following conditions:
 - a) If the base material is exposed to achieve the required minimum removal thickness, the base material shall be prepared conforming to 301-1, "SUBGRADE PREPARATION."
 - b) When additional base material is required, then the contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base." Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Crushed Miscellaneous Base."
 - c) The Contractor may use grinding as a method for removal of deteriorated pavement when the areas indicated for removal are large enough (a minimum of the machine drum width) and when approved by the Engineer.
 - d) For both scheduled and unscheduled base repairs, failed areas may be removed by milling or by excavation provided that the edges are cut

cleanly with a saw. The areas shall be cleaned and tack coated in accordance with 302-5.4, "Tack Coat" before replacing the asphalt. The areas for scheduled repairs have been marked on the street.

302-3.1 Asphalt Patching.

1. Asphalt patching shall consist of patching potholes, gutter-line erosion, and other low spots in the pavement that are deeper than ½" per 302-5.6.2, "Density and Smoothness." These areas are generally smaller and more isolated than those areas in need of mill and pave.
2. The areas requiring patching have been identified in the Contract Documents, marked on the streets, or as directed by the Engineer. The Contractor shall identify any new areas that may require patching prior to slurry work to ensure the smoothness and quality of the finished product.
3. The Contractor shall identify and repair any areas that may require patching, prior to the placement of slurry seal for smooth finished product.
4. Asphalt overlay shall not be applied over deteriorated pavement. Preparatory asphalt work shall be completed and approved by the Engineer before proceeding with asphalt overlay.
5. The Contractor shall remove distressed asphalt pavement either by saw cutting or milling, to expose firm and unyielding pavement; prepare subgrade (as needed); and install compacted asphalt concrete pavement over compacted native material as directed by the Engineer.
6. Prior to replacing asphalt, the area shall be cleaned and tack coated per 302-5.4, "Tack Coat".
7. Following the asphalt placement, the Contractor shall roll the entire patch in both directions covering the patch at least twice.
8. After placement and compaction of the asphalt patch, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.
9. Base repairs shall not exceed 20% RAP in content.

302-3.2 Payment.

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

2. The areas and quantities shown on the road segments and in appendices are given only for the Contractor's aid in planning the Work and preparing Bids. The Engineer will designate the limits to be removed and these designated areas shall be considered to take precedent over the area shown in an Appendix to the Contract Documents. The quantities shown in the appendices are based on a street assessment survey and may vary.
3. At the end of each day, the Contractor shall submit to the Engineer an itemized list of the asphalt pavement repair work completed. The list shall include the location of the work and the exact square footage of the repair.
4. Preparatory repair work and tack coating will be paid at the Contract unit price per ton for Asphalt Pavement Repair. No payment shall be made for areas of over excavation unless previously approved by the Engineer.
5. Milling shall be included in the Bid item for Asphalt Pavement Repair unless separate Bid item has been provided.
6. Payment for miscellaneous asphalt patching shall be included in the Contract unit price for slurry and no additional payment shall be made therefore.

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

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

SECTION 304- METAL FABRICATION AND CONSTRUCTION

ADD:

304.3.4 Chain Link Fence with Gate. The bid item for Fence/Gate includes full compensation for all equipment, materials, labor to be installed for Fence/Gate as indicated in the Contract Documents. Payment shall be lump sum.

SECTION 306 – UNDERGROUND CONDUIT CONSTRUCTION

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

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
306-1.8	House Connection Sewer (Laterals) and Cleanouts	306-1.9
306-1.7.1	Payment	306-1.9.1
306-1.7.2	Sewer Lateral with Private Replumbing	306-1.9.2
306-1.7.2.1	location	306-1.9.2-1
306-1.7.2.2	Permits	306-1.9.2-2

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
306-1.7.2.3	Submittals	306-1.9.2-3
306-1.7.2.4	Trenchless Construction	306-1.9.2-4
306-1.7.2.5	Payment	306-1.9.2-5
306-1.7.3.6	Private Pump Installation	306-1.9.2-6
306-1.7.3.7	Payment	306-1.9.2-7

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

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

The bid item for Rock Trap shall be lump sum, and includes full compensation for all equipment, materials, labor required to installed Rock Trap as indicated in the Contract Documents and as referenced on sheets C-2, and C-3. The price in this bid item shall include full compensation for all equipment, materials, labor required for all pipeline, rock trap, and required connections(POC 1, and POC 2), in the Contract Documents, and as indicated on sheets C-2 and C-3.

306-22 Pipe Fusion. DELETE in its entirety.

SECTION 705 – WATER DISCHARGES

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

705-2.6.3 Community Health and Safety Plan. See 703-2, “Community Health and Safety Plan.”

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

SECTION 707 – RESOURCE DISCOVERIES

ADD:

707-1.1 Environmental Document. The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department has prepared Notice of Exemption for The Sewer Pump Station 13 Improvements Project, as referenced in the Contract Appendix A. The Contractor shall comply with all requirements of the Notice of Exemption as set forth in Contract Appendix.

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

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

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SECTION 01014 - WORK SEQUENCE

PART 1 -- GENERAL

1.1. THE REQUIREMENT

- A. The CONTRACTOR shall coordinate the scheduling of construction activities so that the operation of the existing pump station and the flow of sewage will not be disrupted.
- B. CONTRACTOR shall be responsible for the draining and removal of any liquids in the pipelines prior to any connections. CONTRACTOR to coordinate such removal of liquids with the CITY.
- C. The CONTRACTOR shall provide the necessary personal and equipment in order to prevent sewage spills.

1.2. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02050, Demolition
- B. Section 02200, Earthwork
- C. Section 02999, Temporary Handling of Sewage Flows

1.3. CONTRACTOR SUBMITTALS

In addition to the Construction Schedule required by the General Requirements, the CONTRACTOR shall submit a detailed sequence of operation plan and schedule. The plan will address the detailed implementation steps necessary to accomplish the scope of work, Work specified herein, and work per the Contract Documents. The detailed implementation steps shall address and include, but not be limited to, the following conditions and restrictions:

- A. Specific restrictions and conditions specified in Part 3 – EXECUTION of this section of the Specifications.
- B. A detailed outage plan and time schedule for operations.
- C. The detailed plan shall describe the CONTRACTOR's method of operation and the length of time required to complete said operation.
- D. Systems or individual equipment items that will be isolated dewatered, decommissioned, de-energized, or depressurized in accordance with the detailed outage plan and schedule. Notify the CONSTRUCTION MANAGER in writing at least one week in advance of the planned operation.
- E. Detailed implementation or modifications to the traffic control plan.
- F. The CONTRACTOR's sewage bypassing plan to accomplish the switch over from the existing sewage system to the new sewage pumping scheme per the CONTRACT DOCUMENTS.

- G. The CONTRACTOR shall provide detailed plans and details showing temporary shoring and protection of existing pipelines and utilities. Detailed plan shall be designed and signed by Registered Engineer in the State of California and approved by the CONSTRUCTION MANAGER per Section 02200, Earthwork.

1.4. CONTINUITY OF SYSTEM OPERATIONS

- A. The Existing Pump Station No. 13 is currently and continuously receiving and conveying sewage, and those functions shall not be interrupted except as specified herein. The CONTRACTOR shall coordinate the Work to avoid any interference with normal operation of the system.
- B. CONTRACTOR must provide bypass pumping for the Existing Pump Station No. 13 during construction and demolition of all the sewer lines. All tie-in points and lay down area for the bypass pumps must be designed and installed by the CONTRACTOR and approved by the CITY. CONTRACTOR to design and provide detailed plan and receive approval from CITY for each phase of construction. CONTRACTOR shall also comply with requirements of Section 02999, Temporary Handling of Sewage Flow.

1.5. SEWAGE SPILLS

- A. Spills of untreated treated sewage to surface waters or drainage courses is prohibited. In the event of a spill caused by the CONTRACTOR's operations, the CITY shall immediately be entitled to employ others to stop the spill without giving written notice to the CONTRACTOR.
- B. Cost of penalties imposed on the CITY as a result of a spill caused by the actions of the CONTRACTOR, its employees, or subcontractors, shall be borne in full by the CONTRACTOR, including legal fees and other expenses to the CITY resulting directly or indirectly from the spill.

1.6. WET WEATHER

- A. Wet weather flows occur from October 1st thru May 31st. See Contract Documents for restrictions during wet weather season.

PART 2 -- PRODUCTS

- A. CONTRACTOR shall provide all required equipment and personal necessary to perform Work specified herein. Any approved deviations from Work herein shall be borne in full by the CONTRACTOR at no additional cost to the CITY.

PART 3 -- EXECUTION

3.1 REHABILITATION OF EXISTING PUMP STATION

- A. CONTRACTOR shall not proceed from one step to the next as outlined below without satisfying the requirements of the Contract Documents and upon CITY approval. Work not specifically listed herein shall be sequenced in a logical order and shown in CONTRACTOR's detailed sequence of operation plan and schedule and approved by the CITY.

- B. **Sequencing Plan:** The presented sequencing provided does not contain all action items to make it complete. It is the CONTRACTOR's full responsibility to adopt, modify and/or to propose and submit a complete detailed plan.

1. **Isolate PS-13 and Provide Bypass Pumping**

- a. Install all necessary temporary bypass piping.
- b. Install two temporary submersible sump pumps. Install one in the manhole from the comfort station, the other in manhole 384.
- c. Hot tap into existing 4" PVC forcemain. In-lieu of hot tapping, Contractor may install a tee if they can demonstrate beforehand that they can drain the forcemain line, and install the fittings in time without overflowing the wetwell. Any valves installed for temporary bypassing shall be removed after completion of the bypass pumping and a solid closure installed permanently.
- d. Install two temporary line stops. The first in the 6" VCP pipe downstream of existing comfort station manhole, and the second downstream of manhole 384 in Tourmaline Street in the 8" VCP pipe.
- e. Bypass pumping shall be limited in duration to that which is necessary to make the improvements to Pump Station 13. The total duration of bypass pumping shall not exceed 10 weeks.
- f. Note: There is an adjacent storm channel along Tourmaline Street with a diversion valve that discharges additional flows into the northern gravity line in addition to the normal sewer flows. During any bypass pumping or when temporary bypass connections are made, the Contractor shall coordinate with City Staff to have the upstream diversion valve closed to facilitate construction of Pump Station 13.

2. **PS-13 Improvements**

- a. Complete modifications to wet well and pump station roof in coordination with the replacement of all existing suction and discharge piping and installation of new pumps per the design drawings.
- b. Replace existing ventilation system.
- c. Complete electrical improvements.
- d. Install the rock trap.

3. **Commission and Test P-1 and P-2**

- a. Commission and test P-1 and P-2
- b. Contractor must demonstrate compliance with the 7-Day Operational Test. The station must operate 7 continuous days without failure to be complete.

4. **Demolition of Existing Comfort Station Manhole**
 - a. Install line stop inside the 6" VCP just outside of Pump Station 13 wetwell.
 - b. Remove all temporary bypass pumps and piping.
 - c. Coordinate with the City for the closure of the comfort station. The comfort station shall be closed no more than 48 hours to allow for the completion of the new 6" PVC gravity line and demolition of the existing sewer manhole per plans. The Contractor shall provide 4 weeks' notice prior to the closure of the comfort station. The Contractor shall supply 3 temporary porta-potties for public use in the vicinity of the existing comfort station for the duration of the 48 hour closure. Contractor to provide signage 2 weeks in advance notifying the public of the closure of the station and stating that showers will not be made available, and post signage stating the facility is closed during the outage.
 - d. Demolish existing comfort station manhole and VCP piping as shown on the plans.
 - e. Lay new 6" PVC pipe between POC 1 and new rock trap.
 - f. Backfill trench.
 - g. Remove line stop and reopen the comfort station.

5. **Restore and Site Improvements**
 - a. Install new crushed miscellaneous base within the fence line per plans and specifications.
 - b. Install new fence per plans.
 - c. Install new driveway per plans.

* *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

- A. 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, which 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.
- 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 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.
- 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 reinspection 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, 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 Manual. 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 CONSTRUCTION MANAGER.
 - 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 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 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 equipment and items shown on the CONTRACT DRAWINGS.

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).

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. Uniform Building Code

1.5 SUBMITTALS

- A. **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.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 GENERAL

- A. Structures shall be demolished and removed in compliance with Standard Specifications for Public Works Construction (SSPWC) subsection 306-5 and the requirements indicated herein.

3.2 POLLUTION CONTROL

- A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used for dust suppression.
- B. Water shall not be used when it creates hazardous or objectionable conditions such as flooding, erosion, sedimentation, or pollution.

3.3 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.
- 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.
- 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.

3.4 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.

3.5 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.
- D. After fill and compaction, surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures, or as indicated.

3.6 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.

3.7 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.
- 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.

3.8 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.
- 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 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).

1.4 SCHEDULE AND PLAN

- A. Prior to any trenching or installation of the rock trap manhole, the following shall be submitted:
 - 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 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 documents.
- 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 MWWD 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.
- 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 01014 Work Sequence
 - 2. Section 02050 Demolition
 - 3. Section 02140 Dewatering
 - 4. Section 02575 Pavement Rehabilitation
 - 5. Section 02644 PVC Non-Pressure Pipe
 - 6. Section 02701 Precast Concrete Manholes

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).

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:

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 UBC 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 with the requirements of SSPWC, Subsection 200 2.
- B. Materials for use as untreated base or subbase shall be:
 1. Crushed Aggregate Base
 2. Crushed Miscellaneous Base
 3. Processed Miscellaneous Base
 4. Select Subbase

2.4 TOPSOIL (NOT USED)

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. 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. 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 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 overexcavated 95%
 - b. One foot layer of crushed aggregate backfill in overexcavated trench. Where trench is overexcavated more than 2 feet, minimum of 2 layers shall be compacted. 95%
 - c. Pipe zone for flexible and rigid pipe : 95%
 - d. Fill beneath structures, including water containing structures: 95%
 - e. Backfill on underground structure roof: 90%

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. 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.

*** *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

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction together with the latest adopted editions of the Regional and City of San Diego Supplement Amendments.

1.4 PROJECT RECORD DRAWINGS

- A. The following shall be included in the PROJECT RECORD:
 - 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 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. Polyurethane and 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 09800 Protective Coating
 - 4. 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).

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

AWWA C110/ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. for Water and Other Liquids
AWWA C150/ANSI A21.50 AWWA C153/ANSI A21.53	Thickness Design of Ductile-Iron Pipe Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C153/ANSI A21.53	Ductile-Iron Compact Fittings, 3 in. through 24 inches and 54 through 64 inches for Water Service

ANSI/AWWA C203	Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied
ANSI/AWWA C213	Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
ASTM D 16	Definition of Terms Relating to Paint, Varnish, Lacquer, and Related Products
ASTM, D 471	Test Method for Rubber Property - Effect of Liquids
ASTM D 1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D 2240	Test Method for Rubber Property - Durometer Hardness
ASTM D 4060	Test Method for Abrasion Resistance of Organic Coatings by Taber Abraser
ASTM D 4541	Method for Pull-Off Strength of Coatings using Portable Adhesion Testers
ASTM E 96	Test Methods for Water Vapor Transmission of Materials
ASTM G 14	Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
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.
 3. Certification from the polyurethane manufacturer that the proposed material meets all the indicated requirements.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL:
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. NOT USED
- 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.
- B. **Bonding and Electrical Conductivity:** NOT USED
- C. **Closures and Correction Pieces:** NOT USED.

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.

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.
- 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 CEMENT MORTAR LINING (NOT USED)

2.6 FUSION-BONDED POLYETHYLENE LINING (NOT USED)

2.7 POLYURETHANE COATING AND LINING (NOT USED)

2.8 EXTERIOR COATING OF EXPOSED PIPING (NOT USED)

2.9 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 bond epoxy where indicated. 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 1900 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 16 mils .
 - 2. Exterior 14 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:

The pipe and fittings shall be heated to between 4250 F and 4750F and held at that temperature for 60 minutes or until total outgassing is achieved.

F. Blast Cleaning:

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.

G. Continuity Tests:

1. Interior of pipe shall be electrically inspected at the factory for continuity at 2100 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 1965 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:

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. Fusion Bond Epoxy Manufacturers

1. Scotchkote
2. Lilly Powder Coatings
3. HB Fuller
4. or equal

J. 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, 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 (NOT USED)

****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 non-pressure 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 02140 Dewatering
 - 3. Section 02200 Earthwork
 - 4. Section 03300 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).

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 Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 - 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.
 - 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:
 - 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.

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 02701, and as indicated herein.

3.2 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of Sections 02200, Section 02701, 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 and 02701.

*** *END OF SECTION* ***

SECTION 02701 - PRECAST CONCRETE MANHOLE

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 02644 PVC Non-Pressure Pipe
 - 4. Section 06650 Plastic Liner for Concrete Surfaces
 - 5. 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:
 - 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 M-4.

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 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 02644 – PVC Non-pressure Pipe.

2.5 FILL AND BACKFILL MATERIAL

- A. Fill and backfill materials shall be in accordance with Section 02200.

2.6 MANUFACTURER

- A. Products shall be manufactured by one of the following (or equal):
 - 1. Manhole Sections: Ameron; Associated Concrete Products
 - 2. Frames and Covers: Neenah Foundry Co.; Vulcan Foundry, Inc.

3. Warning Sign: W.H. Brady Company; Seton Nameplate Corporation

PART 3 -- EXECUTION

3.1 INSTALLATION OF PRECAST MANHOLE

- A. Precast concrete manholes shall be installed in strict conformance with the manufacturer's written instructions, on a well-compacted foundation.

3.2 DEWATERING

- A. Install and operate according to Section 02140 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. Dewatering shall prevent softening of the bottom of excavations or formation of "quick" conditions. Dewatering shall not remove native soils. All loose soil shall be removed and recompacted in accordance with Section 02200.

3.3 EXCAVATION

- A. Unless indicated otherwise, excavation and overexcavation shall be in accordance with Section 02200.
- B. 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 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 150 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.

3.5 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. 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. 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.
- D. 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.
- E. 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.

- 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
- 3.6 SITE RESTORATION
- A. Backfill and compact soil in accordance with Section 02200.
 - B. Place subgrade and base materials in accordance with Section 02200.
 - C. Replace damaged pavement, curbs, gutters, and sidewalks, shrubs, and trees as indicated in SSPWC Subsection 306-1.5.2.
- 3.7 INSPECTION
- A. Upon request, the CONTRACTOR shall provide the CONSTRUCTION MANAGERa workman with ladder or other safe and adequate means for inspection access.

*** *END OF SECTION* ***

SECTION 02832 – STAINLESS STEEL FENCE AND ACCESS GATE

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing stainless steel tubing perimeter fence, access gate, and 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 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).

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. Uniform 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:

Commercial Standards:

ANSI/AWS D1.1 Structural Welding Code - Steel

NFPA 101 Life Safety Code

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted prior to fabrication and construction.

- 1. Manufacturer's product information including catalog cuts indicating materials.
- 2. The layout of the stainless steel fence and access gate indicating fence height, post sizes, bracing configurations, corner construction, and accessories.

PART 2 – PRODUCTS

2.1 GENERAL

- A. General: Materials for stainless steel fencing, access gate, and appurtenances shall conform to the requirements indicated herein.

2.2 TUBING, POSTS, GATE, AND BRACES

- A. Materials for tubing, posts, gate, and braces shall be type 316 stainless steel (SST). Field “fabric” shall be constructed of SST tubing 1” SQ, 8 feet high with picket heads, installed 5” on center. Structural posts shall be type 316 stainless steel, and sufficient size and strength to support the fence. Access gate shall be provided with a locking hasp.

2.3 HARDWARE

- A. All hardware for stainless steel fence and gate shall be Type 316 stainless steel.

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.

3.2 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.

****END OF SECTION****

SECTION 02999-TEMPORARY HANDLING OF SEWAGE FLOW

PART 1 -- GENERAL

1.1 WORK DESCRIPTION

- A. The CONTRACTOR is responsible for the temporary handling of sewage throughout the construction of the Project. This includes the construction, modifications, and the relocations of CITY sewers and facilities.
- B. The CONTRACTOR shall comply with the Regional Water Quality Control Board, Health Department, and CITY standards, Air Quality Management District permits, and regulations. The CONTRACTOR shall cooperate with CITY staff and other regulators and environmental agencies.

1.2 CONTRACTOR LIABILITY

- A. The CONTRACTOR shall be responsible for continuity of sanitary sewer service during the execution of the Work to be performed under this Contract. In the event that sewage backup occurs and enters dwellings or other structures due to in any part to a failure of the bypass piping system or to non-compliance with the Contract Documents, the CONTRACTOR shall be responsible for cleanup, repair, property damage costs, fines imposed by jurisdictional authorities, and all claims arising there from. All spills shall be contained and returned to the sewer system.
- B. In the event the Regional Water Quality Control Board levies a fine on CITY because of a sewage spill caused by the CONTRACTOR (directly or indirectly) due to its lack of attention to procedures or other negligence, the CONTRACTOR shall be held responsible and liable for reimbursing CITY for the entire amount of any fine imposed. CITY may access the amount of the fine against payments due the CONTRACTOR. The California Water Code gives the Regional Water Quality Control Board authority to fine up to \$10 per gallon and \$10,000 per day for an illicit discharge.

1.3 CONTRACTOR SUBMITTALS

- A. Unless otherwise indicated, the following shall be submitted, for each bypass installation, to the CONSTRUCTION MANAGER 15 days after receiving the Notice to Proceed, in compliance with the General Requirements, and as specified herein.
- B. Plans showing any proposed changes from the Contract Documents for the temporary handling of sewage flow, routing and protection of bypass lines, containment areas, equipment location, schematic of pump set-up and discharge, and proposed sequencing.
- C. Shop drawings for the sewage bypass pipe material and fittings, pipe repair kits and procedures, spill recovery mats, and video camera.
- D. Bypass pump characteristic curves, electrical, controls, and instrumentation.

- E. Proposed alternatives to the spill prevention, control, and countermeasure plan as described in Part 3 of this specification.
- F. Odor monitoring reports.

1.4 PAYMENT

- A. Unless otherwise provided in these specifications, full compensation for temporary handling of sewage, implementation of the spill prevention, control and countermeasure plan, and the odor assessment and odor control plan shall be included in the contract unit price for which such work is appurtenant thereto, and no additional allowance shall be made therefore. Said various contract unit prices shall include all labor, materials, tools, and equipment necessary or incidental to the temporary sewer service operations.

PART 2 – PRODUCTS

2.1 PUMPING EQUIPMENT

- A. Pumps shall be non-clog sewage pumps.
- B. In the event the CONTRACTOR elects to use engines or Engine/Generators to drive pumps, these shall be muffled in such a manner that the maximum noise level will not exceed 80 dBA at a distance of five feet from the engine. Lower noise levels may be specified in the permit by governing agencies. Regardless of the noise level, soundproofing shields not less than eight feet high shall be provided around each engine by the CONTRACTOR to absorb noise.
- C. Standby pumping equipment shall be at the site continuously during pumping to provide 100 percent standby pumping capacity. The CONTRACTOR shall provide manpower to continuously monitor the pumping equipment on a 24-hour basis while in operation and to activate standby equipment, if necessary.

2.2 TEMPORARY PLUGGING OF SEWER

- A. Plugs shall be appropriate for the application. Unless otherwise indicated, plugs shall be a heavy-duty inflatable type with a steel rod through plug centerline, a retaining plate and an eye-lift on both ends. Plugs shall be new, made of natural rubber and shall show no cracks or signs of damage. The plugs shall have a flexible sealing design to compensate for any irregular interior surface of the pipe. The plug length shall be suitable for the specific application. Plugs shall be equipped with continuous pressure monitoring and an audible alarm when the pressure drops below the minimum pressure recommended by the manufacturer. The installed pressure shall be as recommended by the manufacturer for the application. The eye-lifts shall be secured to a 5/8-inch diameter stainless steel pulling cable accessible for removal without entry. Inflatable plugs should be installed immediately upstream from the dry manhole to aid emergency removal of the plug. A double block and bleed may be required to protect workers per O.S.H.A.

2.3 LINE STOPS

- A. In the event that the CONTRACTOR chooses to implement a line stop system, the system shall be provided by a single vendor, including the tapping saddle. Vendor shall have a minimum experience of 3 projects of similar size and scope, and references shall be submitted. All calculations for the system must be stamped by a licensed Engineer under the CONTRACTOR's contract. CONTRACTOR shall maintain and monitor system while in use to prevent accidental sewage spill. Vendor shall be Team Industrial Services, Inc. or approved equal.
- B. Stop/Plug
 - 1. System shall be resilient pivot head design or inflatable bag type.

Inflatable Bag Type: Provide lead/standby compressors, control manifold with regulator, valves, hoses, and pressure gages for a complete and functional system.

PART 3 -- EXECUTION

3.1 TEMPORARY HANDLING OF SEWAGE

- A. The CONTRACTOR shall construct, operate, maintain, and remove, without damage to existing structures, all temporary sewage handling facilities. CITY forces will not assist the CONTRACTOR with flow handling during the Work. The CONTRACTOR shall submit details of proposed equipment for temporary handling of sewage flow as specified in Section 1.2. Requirements for operating the bypass system shall be as indicated herein and as shown on the Plans. The system shall operate as specified to insure that neither the upstream nor downstream systems are threatened with sewage overload or spill.

Under no circumstances shall sewage or solids be deposited onto the ground surface, streets, or into ditches, catch basins or storm drains or natural drainage ways. Sewage shall be handled in a manner so as not to create a public nuisance or health hazard.

As soon as the bypass system is proved to be operating as specified, the CONTRACTOR shall stop the pump(s) and install and operate all backup pumps to prove their capability and establish a switchover time.

3.2 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN

- A. The CONTRACTOR shall implement the Spill Prevention, Control and Countermeasure Plan as specified in this section and shown on the Plans. The CONTRACTOR may submit equivalent materials and methods for consideration.
- B. The CONTRACTOR shall submit for approval, all duty and emergency equipment for bypassing flow, containment, cleanup, and repair of any damage. Specifics for each bypass installation shall include as applicable, but are not limited to:
 - 1. Pipe repair kits

2. Sand bags
 3. Rubber matting
 4. Bypass pipes, spare pipe sections, pumps, and other relevant equipment
 5. Standby pumps
 6. Secondary containment in trench or other surrounding land relief
- C. The CONTRACTOR shall maintain standby and emergency equipment on site.
- D. The CONTRACTOR shall provide the names, phone numbers, and hourly working schedules of at least three (3) people who can be contacted 24 hours per day by phone and that may be brought on-site at any time to address on-site emergencies. The CONTRACTOR shall provide notification of any substitution in writing at least two days in advance. When bypassing flows, CONTRACTOR shall have at least two people on site 24 hours per day to monitor and maintain the bypass and implement the emergency procedures in case of an emergency.
- E. The CONTRACTOR shall protect storm drains during construction as shown on the Plans. The Plans indicate where the storm drains are located with relief features that could assist in containing the spill. The plans indicate how storm drains will be blocked in the event of a spill: what material and how long will it take. The CONTRACTOR shall verify the time specified for each activity.
1. The CONTRACTOR shall identify those responsible for each activity, present a training plan for approval, and perform the approved training.
 2. The CONTRACTOR shall coordinate the plan with the construction storm water management requirements to protect water quality and respond to spills of sewage, groundwater, or fuels, ensuring there are no conflicts with implementing each of the respective programs. The CONTRACTOR shall implement all indicated spill prevention measures (e.g. monitoring of upstream manholes, monitoring in the trench).
- F. The following spill procedures shall be followed by the CONTRACTOR.
1. If a spill is detected or a catastrophic pipe failure occurs, the immediate priority of the CONTRACTOR shall be to prevent any sewage from reaching storm drains and ultimately surface waters. A storm drain may be used for containment of a large spill if adequate preparations are made as indicated in the Plans. The CONTRACTOR shall protect vulnerable drains using rubber mats or sand bags continuously during bypass or immediately (have all materials at hand) upon spillage.
 2. The CONTRACTOR shall anticipate the following bypass system failure modes in the plan and be prepared to act accordingly.
 - a. If the bypass pump fails, begin using standby equipment as soon as possible.

- b. In the event the bypass pipe is ruptured in a traffic accident or otherwise, the CONTRACTOR shall immediately stop the bypass pump, install containment as indicated in the plan, and notify the Control Center. Inform the Control Center what emergency diversion, if any, is indicated in the plan. Make repairs to the bypass pipe and restart the system. Begin cleanup. Notify the Control Center when the system is back in service.
3. The CONTRACTOR shall anticipate the following in-trench failure mode in its plan and be prepared to act accordingly.
 - a. As the CONTRACTOR is excavating for a new trench and comes across moderate leaks in the existing pipe, the CONTRACTOR shall make coupling/clamp repairs as soon as possible to minimize sewage flow into the trench.
 - b. If the leak is too large to make fast coupling repair, the CONTRACTOR shall start bypassing (see bypassing sequence below), then make repair.
4. In case of catastrophic in-trench leak, the CONTRACTOR shall immediately start the bypassing sequence:
 - a. Plug downstream side of the manhole upstream from the leak.
 - b. Insert bypass pump. The pump shall be sized to handle peak flow of existing sewer. Full capacity standby pumps shall be available for immediate installation at all times a bypass system is operating.
 - c. Connect hose or pipe from pump to discharge point. NOTE: Hose or pipe shall already be in place and connected to a downstream discharge point at all times when working near or with live sewers. Hose shall only be allowed for emergency bypass systems.
5. In event of any spill, the CONTRACTOR shall immediately and in parallel with above activities, notify CITY's Control Center and request CITY's collections staff to be dispatched. The CONTRACTOR should attempt to give the best indication to the Control Center staff of the approximate size of the spill (<1,000 gallons is small; 1,000 gallons to 10,000 gallons is medium; and >10,000 gallons is large) along with the approximate amount, if any, of sewage discharged to a storm drain or channel so the appropriate response can be dispatched.
6. CITY staff will respond to monitor the CONTRACTOR's clean-up-related activities to ensure the spill is cleaned in accordance with this Plan. It is the CONTRACTOR's responsibility to provide the primary means for pipe repair and spill recovery and clean-up including mobilizing any necessary equipment to be onsite within an hour of a spill. Clean up may require a sweeper truck, Vactor truck, water truck, and/or other equipment. All CITY time and material and special equipment for spill cleaning will be deducted from the CONTRACTOR's progress payment

7. The CONTRACTOR shall attempt to pond the water in an area away from storm drains that can be easily and fully recovered for discharge to CITY's collection system. This ponding activity should not impact any environmentally sensitive areas.
8. The CONTRACTOR and CONSTRUCTION MANAGER with the assistance of CITY's collections staff shall coordinate the most efficient and appropriate response, repair, and cleanup of a spill as soon as possible. The CONTRACTOR will cooperate with CITY staff to the fullest extent possible in order to minimize the impacts and volume of the spill in the most efficient manner possible.
9. Disinfection of a spill is not allowed (especially if the water is reaching State waters). All wash water and sewage-contaminated wash water must be contained and recovered in the same manner as the sewage.
10. The CONTRACTOR shall have cameras on hand and shall document the spill, its cause, and the response activities as these occur with a video camera and photographs. The CONTRACTOR is required to attend a debriefing at the jobsite immediately after the spill is contained and cleaned up.

3.3 ODOR MITIGATION

The CONTRACTOR shall comply with the Odor Monitoring requirements as specified below:

- A. The CONTRACTOR shall prepare a listing of all potential construction activities that might produce odors. For each of these construction activities, the CONTRACTOR shall include the scheduled construction date(s), expected construction duration(s), a listing of the potential receptors, and the distance to these receptors. Potential nuisance odor areas shall include open manholes, and open sewers where sewage gases can be present or can be released. Potential nuisance odor areas do not include covered manholes that are sealed or plugged (closed) sewer pipes.

All potential construction activities that might produce odors shall be identified on the construction schedule as required in the General Requirements. If multiple construction activities of this type are required simultaneously due to schedule constraints, multiple sets of gas analyzers shall be obtained and provided for monitoring by the CONTRACTOR.

- B. For each site where potential odors may be produced, the CONTRACTOR shall prepare a plan for monitoring with the use of four gas analyzers. The high range gas (0-200 ppmv) analyzers shall be located in the manhole and the three low range gas (0-2 ppmv) analyzers shall be located at the nearest receptors and at a height between 3 and 6 feet above the ground as approved by the CONSTRUCTION MANAGER. The CONTRACTOR shall utilize the Air Quality Monitoring Logistic Report form or approved similar form to report and document construction and monitoring activities. The CONTRACTOR shall submit each monitoring plan in the form of a Shop Drawing Submittal for review and acceptance prior to conducting monitoring.
- C. The CONTRACTOR shall obtain fully functioning and calibrated hydrogen sulfide gas analyzers to measure hydrogen sulfide emission concentrations from potential odor

areas during construction. The CONTRACTOR shall obtain three low range hydrogen sulfide gas analyzers, and one high range hydrogen sulfide gas analyzer. The hydrogen sulfide gas analyzers shall be Odalog as manufactured by App-Tek International Pty Ltd or approved equal. The low range hydrogen sulfide gas analyzers shall be capable of measuring and logging hydrogen sulfide gas concentrations between 0.01 and 2 ppmv. The high range hydrogen sulfide gas analyzer shall be capable of measuring and logging hydrogen sulfide gas concentrations between 0 to 200 ppmv. The CONTRACTOR shall also obtain one software kit for downloading data from the gas analyzer, and one calibration kit for calibrating the gas analyzer per the manufacturer requirements. All gas analyzers and accessories that are purchased by the CONTRACTOR shall become the property of CITY at the end of the Project. The analyzers shall be in good working order when turned over to CITY. The software and calibration kits shall also be provided at the same time.

Prior to purchase, the CONTRACTOR shall submit a shop submittal for review and acceptance. The CONTRACTOR shall ensure that the gas analyzers are calibrated by the manufacturer.

- D. After acceptance of the monitoring plan for the specific construction site where odors are anticipated, the CONTRACTOR shall notify the CONSTRUCTION MANAGER at least forty-eight (48) hours in advance of the proposed work.
- E. The CONTRACTOR shall, prior to the commencement of any work, install all gas analyzers as described on the reviewed shop submittal.
- F. The CONTRACTOR shall determine the means of achieving less than 10 ppbv at the receptors, as required in the General Requirements, prior to the commencement of all work. Where odor mitigation measures are planned, they shall be in place during the construction period.
- G. The CONTRACTOR shall download and record the readings of the hydrogen sulfide gas concentrations daily and present these results in a tabular format to the CONSTRUCTION MANAGER. Readings shall be logged at an interval to be determined by the CONSTRUCTION MANAGER. Readings shall be organized in a way that specifies which gas analyzer was used and the location of the analyzer. The CONTRACTOR shall utilize the Air Quality Monitoring Logistic Report form or approved similar form to report and document construction and monitoring activities. The CONTRACTOR shall provide these organized readings to the Inspector at a frequency to be determined by the CONSTRUCTION MANAGER (which may be daily or less frequently).
- H. CITY may choose to download the data directly from the hydrogen sulfide gas analyzers that the CONTRACTOR has set up on-site. CITY may also set up independent hydrogen sulfide gas analyzers at the construction site for additional monitoring. If the CONTRACTOR's hydrogen sulfide gas analyzer readings do not reasonably correlate with CITY's hydrogen sulfide gas analyzer readings, the CONSTRUCTION MANAGER may require calibration of all gas analyzers, and reevaluation of the monitoring set up.

- I. The CONTRACTOR shall record the wind speed and prevailing wind direction where the high range gas monitor has been installed. Depending on wind speed and direction, the CONTRACTOR may be required by the CONSTRUCTION MANAGER during the course of construction to adjust the locations of the three low range gas analyzers so that at least one of the three low range gas analyzers remains directly downwind of the high range gas monitor and the remaining two monitors also relocated as appropriate.
- J. If hydrogen sulfide concentrations exceed 10 ppbv at any of the low range gas monitors (CITY or CONTRACTOR) during the course of construction work activities, the CONTRACTOR shall invoke the Odor Assessment and Odor Control Plan (OAOCP) for mitigation, and notify the CONSTRUCTION MANAGER immediately. If the CONTRACTOR fails to mitigate ambient hydrogen sulfide concentrations below 10 ppbv at the receptors using OAOCP, the CONTRACTOR shall stop work immediately and coordinate with the CONSTRUCTION MANAGER on further odor mitigation and control prior to commencement of work at the site where odors are released.
- K. The CONTRACTOR shall abide by the following Odor Assessment and Odor Control Plan (OAOCP), at a minimum, to prevent emissions of nuisance odors when hydrogen sulfide concentrations exceed 10 ppbv during the course of construction work:
 - 1. Cover manholes and openings where bypass pumps are used with plywood or other approved material, including sealing cracks and edges with sealing putty or caulking. Ensure that all covers are secure, safe from vandalism and safe from potential life and safety hazards (i.e. falling or tripping hazards).
 - 2. Seal open sewer pipes during tie-ins
 - 3. Keep the duration of open manholes to a minimum
 - 4. Plug sewers as necessary to reduce odor emissions
 - 5. Provide in-line bypasses in closed conduits when working in manholes
 - 6. Reasonably prevent sewer gases from escaping the construction work area
- L. If CITY staff determines that odor control is required during construction, the CONTRACTOR shall coordinate with CITY staff for odor control and mitigation requirements. All chemical, liquid or vapor treatment measures will be provided by CITY. Other forms of treatment by the contractor will be considered on a case by case basis.

****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 03290 Joints in Concrete Structures
 - 3. Section 03300 Cast-in-Place Structural Concrete
 - 4. 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).

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	Recommended Practices for Concrete Formwork

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
- 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:**
 - Burke Penta - Tie System by the Burke Company
 - Richmond Snap Tys by the Richmond Screw Anchor Company
 - 2. **Form ties with Integral Waterstops:**
 - Burke Taper - Tie System by the Burke Company
 - Taper Ty by the Richmond Screw Anchor Company

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 CONSTRUCTION MANAGER 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

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. California Building Code, the latest edition

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.

ACI 315	Details and Detailing of Concrete Reinforcement.
ACI 318	Building Code Requirements for Structural Concrete.
ACI 350	Code Requirements for Environmental Engineering Concrete Structures
CRSI MSP-1	Concrete Reinforcing Steel Institute Manual of Standard Practice
WRI	Manual of Standard Practice for Welded Wire Fabric.
AWS D1.4	Structural Welding Code - Reinforcing Steel.
ASTM A 82	Specification for Steel Wire, Plain, for Concrete Reinforcement.

ASTM A 185	Specification for Welded Steel Wire Fabric For Concrete Reinforcement.
ASTM A 615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
ASTM A706	Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM A 775	Specification for Epoxy-Coated Reinforcing Steel Bars.

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 - 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. Deformed reinforcing bars shall be in accordance with ASTM A615 except bars to be welded shall be in accordance with ASTM A706 or as shown on the drawings. Bars shall be Grade 60.
 - 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.

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 Richmond Screw Anchor Company

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: + 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 CBC.
- 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 (dobbies) 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 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.

ASTM C 920	Specification for Elastomeric Joint Sealants.
ASTM D 412	Test Methods for Rubber Properties in Tension.
ASTM D 624	Test Method for Rubber Property -- Tear Resistance.
ASTM D 638	Test Method for Tensile Properties of Plastics.
ASTM D 746	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
ASTM D 747	Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
ASTM D 1056	Specification for Flexible Cellular Materials -- Sponge or Expanded Rubber.
ASTM D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

ASTM D 2240	Test Method for Rubber Property -- Durometer Hardness.
CRD-C572	PVC Waterstop.
TT-S-0227E(3)	Sealing Compound, elastomeric type, Multi-component for Caulking, Sealing, and Glazing Buildings and Other Structures).

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 walls 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

The following shall be submitted:

- A. **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.

- B. **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.
- C. 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.
- D. **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.
- E. **Joint Location:** The CONTRACTOR shall submit placement shop drawings showing the location and type of all joints for each structure.
- F. 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
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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 or Federal Specification TT-S-00227 E(3) for 2-part material, as applicable.
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, or Federal Specification TT-S-0027 E(3), Type II, Class A.
3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C 920 Class 25, Grade P, or Federal Specification TT-S-0027 E(3), Type I 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 Rubber Company
 - Water Seals, Incorporated
 - Progress Unlimited, Incorporated
 - Greenstreak Plastic Products Company

- 2. **Multi-Rib Waterstops:**

- Water Seals, Incorporated
 - Progress Unlimited, Incorporated
 - Greenstreak Plastic Products Company

- 3. **Sealants:**

- Permapol RC-270 by Products Research
 - Elastothane 227R by Pacific Polymers
 - Sikaflex 2C by Sika Corporation

- 4. **Bond Breaker:**

- Super Bond Breaker by Burke Company
 - Select Cure CRB by Select Products Company

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.

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.

- D. **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.

- E. **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. 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.

- F. **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.

- G. 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.

- H. All sealant shall be installed by a competent waterproofing specialty contractor who has a successful record of performance in similar installations.

- I. Thorough, uniform mixing of 2-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application.

J. 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.

K. **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 CONSTRUCTION MANAGERing 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 03290 Joints in Concrete Structures
 - 4. Section 03315 Grout
 - 5. 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.
- B. **Federal Specifications:**
 - UU-B-790A (Int.Amd. 1) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant).

C. **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
ACI 350	Code Requirements for Environmental CONSTRUCTION MANAGERing Concrete Structures
ASTM C 31	Practices 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 C40	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 Portland 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 Method of Sampling Freshly Mixed Concrete
ASTM C 192	Method of 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 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 Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation
ASTM D 175	Specification for Preformed Expansion Joint Fillers 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:

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 ± 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:

Item	Tolerance
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.
 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	611	0.45
12" and thicker walls, slabs on	4,000	1-1/2	611	0.45

grade and footings.
(optional)

Pea Gravel Mix.	4,000	3/8	752	0.40
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Thin 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% by weight of aggregate.

Lean concrete	2,000	1	376	0.60
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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.
- D. **Quick Set Concrete Mix:** Due to the limitation of pumping the ready mix concrete, quick set concrete mix package can be replaced with ready mix concrete. The products shall be the following, or approved equal: Quikrete 5000 Concrete Mix by Quikrete, Rapidset Concrete Mix by RapidSet. The mixing, curing, and finishing shall be in accordance with manufacturer's installation instructions.

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:

Part of Work	Slump (in)
All concrete, unless noted otherwise	3 inches +/- 1 inch
With high range water reducer added	7 inches +/- 2 inches
Pea gravel mix	7 inches +/- 2 inches
Ductbanks	5 inches +/- 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

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:**

Material	Percent of total weight
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 Master Builders
 - Daravair by W.R. Grace
 - Sika AEA-15 by Sika Corporation

- 2. **Set Retarding Admixture:**

- Plastocrete by Sika Corporation
 - Pozzolith 300R by Master Builders
 - Daratard by W.R. Grace

- 3. **Set Accelerating Admixture:**

- Plastocrete 161FL by Sika Corporation
 - Pozzutec 20 by Master Builders
 - Daraset by W.R. Grace

- 4. **Normal Range Water Reducer:**

- WRDA 79 by W.R. Grace

Pozzolith 322-N by Master Builders
Plastocrete 161 by Sika Corporation

5. **High Range Water Reducer:**

Daracem 100 or WRDA 19 by W.R. Grace
Sikament FF or Sikament 86 by Sika Corporation
Rheobuild 1000 or Rheobuild 716 by Master Builders

6. **Curing Compound:**

Aqua Resincure by Burke
Aqua-cure by Euclid Chemical Company
Masterkure-W by Master Builders

7. **Evaporation Retardant:**

Confilm by Master Builders
Eucobar by Euclid Chemical Company

8. **Dampproofing Agent:**

Hydrocide 600 by Sonneform
Sealmastic by W.R. Meadows
Damp proofing Asphalt Coating 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 Master Builders
BurkEpoxy MV by Burke

10. **Agents for Bonding Hardened Concrete to Steel:**

Sikadur 31 Hi-Mod Gel by Sika Corporation
BurkEpoxy NS by Burke
Concresive Paste (LPL) by Master Builders

11. **White Portland Cement:**

Atlas White

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.
- H. **Cold Weather Placement:** Remove all snow, ice and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6 inches. All reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.

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 ½ inch in diameter or deeper than ¼ 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

Area	Finish
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): (Not Used)**

F. **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. 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

3.8 ARCHITECTURAL FINISH (Not Used)

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:

Surface to be Cured or Dampproofed	Method
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

The exterior surface of all buried roof slabs shall be dampproofed as follows:

1. 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.
2. 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 CURING AND THERMAL PROTECTION IN COLD WEATHER

- A. The CONTRACTOR shall be prepared to protect all concrete against freezing. After the first frost or when the mean daily temperature in the vicinity of the worksite falls below 40 degrees F for more than one day, the concrete shall be maintained at a temperature not lower than 50 degrees F for at least 72 hours after it is placed.
- B. Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the worksite is less than 40 degrees F. The concrete shall be maintained at not less than 50 degrees F for the entire curing period.
- C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.
- D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

3.12 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. 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.

3.13 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 unless there is an existing waterstop in place.

3.14 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 03315 – GROUT

PART 1 -- GENERAL

1.1 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

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current versions of the following apply to the WORK of this Section:

CRD-C 621	Corps of CONSTRUCTION MANAGERS Specification for Non-shrink Grout
ASTM C 109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C 531	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfacing
ASTM C 579	Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacing
ASTM C 827	Test Method for Early Volume Change of Cementitious Mixtures
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:

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.

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. **Non-Shrink 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 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 611 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 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:** BurkEpoxy Anchoring Grout by the Burke Company

PART 3 -- EXECUTION

3.1 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300. 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 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 the following:
1. Anchor Bolts
 2. Power Driven Pins
 3. Bolts
 4. Seat Angles, Supports and Brackets
 5. Iron Castings
 6. Gratings
 7. Pipe Columns

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 03315 Grout
 3. Section 05120 Structural Steel
 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. California 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).

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:**

QQ-F-461 C (1)	Floor Plate, Steel, Rolled
MIL-6-18015	(Ships) Aluminum Planks, (6063-T6)

2. **Commercial Standards:**

AISC MO11	Manual of Steel Constructions
AASHTO HS-20	Truck Loading
ASTM A36 / A992	Specification for 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, Shapes and Bars
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
ASTM A320	Specification for Alloy Steel Bolting Materials for Low-Temperature Service
ASTM A489	Carbon Steel Eyebolts
ASTM A 569	Specification for Steel, Carbon, (0.15 Maximum Percent) Hot Rolled, Sheet and Strip, Commercial Quality
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, Shapes and Tubes
ASTM B 438	Specification for Sintered Bronze Bearings (Oil-Impregnated)
ANSI/AWS D1.1	Structural Welding Code - Steel
NFPA 101	Life Safety Code
NAAMM	Metal Stairs Manual

1.6 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted:

1. Shop drawings showing connection details and locations proposed for power driven pins.
2. Shop drawings of miscellaneous metalwork including seat angles, supports and guides.
3. Shop drawings showing proposed use of adhesive anchors.
4. Data indicating load capacities, chemical resistance and temperature limitations of power driven pins.
5. Manufacturer's catalog data for manhole frame, covers, and each type of anchor.
6. Welding procedures and welder qualifications.

1.7 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL:

1. Manufacturer's installation instructions.

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 Grade 36 & A992 Grade 50.

- B. **Corrosion Protection:** Miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment or will be submerged, shall be 316 stainless steel. 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. **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.

- E. **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,	ASTM A320, Type 316nuts, washers
 - 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.

B. **Adhesive Anchors:** Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors. Substitutions will not be considered unless accompanied with ICC 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 steel and shall be galvanized after fabrication. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 325, or threaded parts of ASTM A 36. ASTM A 325 bolts and nuts shall not be galvanized.
- 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 SEAT ANGLES, SUPPORTS AND BRACKETS

- A. Seat angles over slide gate guides shall be welded to the guides. Seat angles for supports for floor plates, clips for precast panels and brackets for piping shall be steel, hot-dip galvanized after fabrication unless otherwise indicated. Over tanks and channels seat angles and brackets shall be Type 316 L stainless steel.
- B. Seat angles for grating shall be aluminum or steel as indicated, except that Type 316 L stainless steel shall be used over tanks and channels. Guides for slide gates shall be Type 316 L stainless steel.

2.6 IRON CASTINGS

- A. Castings shall conform to the requirements of ASTM A 48 unless otherwise indicated. Castings weighing less than 100 pounds shall be hot-dip galvanized after machining. Castings weighing greater than 100 pounds shall be galvanized where indicated.

2.7 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 80 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.

1. **Aluminum:** 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.

2. **Steel:** Steel grating bearing bars and cross bars shall be of welding quality mild carbon steel conforming to ASTM A569. Steel floor plates and cover plates shall be of structural quality steel conforming to ASTM A36.

Steel grating shall be used only where indicated. Steel grating shall be hot dip galvanized. Notching, slotting, or cutting the top or bottom edges of bearing bars to receive cross bars will not be permitted unless each intersection of bars is fully welded to restore each bearing bar to its full cross sectional strength.

2.8 FLOOR AND COVER PLATES:

- A. Plates shall be set flush with surrounding floor. No single piece of floor and cover plate shall weigh more than 80 pounds unless specifically detailed otherwise. Floor and cover plates over tanks and channels shall be Type 316 stainless steel.

2.9 STAIRS (NOT USED)

2.10 SAFETY STAIR TREADS

- A. Safety stair treads shall be provided on stairs or where indicated and shall be 4 inches wide aluminum. Aluminum stair treads shall have isolation coating to prevent direct contact with concrete surfaces per Section 09800.

2.11 FLOOR HATCHES (NOT USED)

2.12 PIPE COLUMNS

- A. Pipe column steel shall conform to the requirements of ASTM A 53, Grade B.

2.13 FALL PREVENTION SYSTEM (NOT USED)

2.14 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 H-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.

2.15 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 RE-500 Epoxy Anchor System
 - Simpson Set-XP Epoxy Adhesive
 - Red Head Epcon G5 Epoxy Adhesive

- 2. **Glass Capsule Polyester Resin Adhesive Anchors:**

- Hilti HY-150 Injection Adhesive
 - Red Head Epcon A7 Acrylic Adhesive

- 3. **Expanding-Type Anchors:**

- Red Head Trubolt
 - Hilti Kwik-Bolt 3

- 4. **Steel Gratings:**

- Grating Pacific Type 19-4
 - McNichols Type GW

- 5. **Floor and Cover Plates:**

- Alcoa C 102 Aluminum Tread Plate
 - Reynolds Diamond Tread Plate

- 6. **Field Repairs to Galvanizing:**

- "Galvinox"
 - "Galvo-Weld"

7. **Aluminum Grating:**

Grating Pacific
Seidelhuber

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.
 - 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.
 - 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.

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 SEAT ANGLES, SUPPORTS AND GUIDES

- A. Seat angles shall be set flush with the floor.

3.4 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:.

Material Penetrated by Pin	Material's Minimum Thickness	Pin's Shank Penetration in Supporting Material	Minimum Space From Pin's CL to Edge of Penetrated Material	Minimum Pin Spacing
Concrete	16D	6D minimum	14D	20D
Steel	1/4-inch	Steel thickness	4D	7D

3.5 INSTALLATION OF GRATING, FLOOR AND COVER PLATES

- A. Grating, floor and cover plates shall be field measured for proper cutouts and proper sizes.

3.6 INSTALLATION OF STAIRS AND LADDERS

- A. Stairs and ladders shall be fitted accurately and field measured where necessary.

3.7 INSTALLATION OF SAFETY STAIR TREADS

- A. Unless otherwise indicated, safety stair treads shall be installed on all concrete stairs. Treads shall be secured to concrete with suitable anchors at 15 inches on centers and not more than 4 inches from the ends. Rubber tape, 1/8-inch thick, shall be provided at both ends and cut to fit shape of tread prior to concrete placement.

3.8 INSTALLATION OF FLOOR HATCHES (NOT USED)

3.9 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.

3.10 INSTALLATION OF MANHOLE FRAMES AND COVERS

- A. The installation of manhole frames and covers shall comply with SSPWC Subsection 301-1.6.

*** *END OF SECTION* ***

SECTION 05515-VAULT DOOR FALL PROTECTION GRATING SYSTEM

PART 1 -- GENERAL

1.1 SUMMARY

- A. Work included: Furnishing and installing factory fabricated vault door modified with fall protection grating system.
- B. Related Work:
 - Section 03100 - Concrete Formwork
 - Section 03300 - Cast-in-Place Structural Concrete
 - Section 05500 - Miscellaneous Metalwork
 - Section 06610 - Glass Fiber and Resin Fabrications General

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM, 1916 Race Street, Philadelphia, PA 19103); (215) 299-5400, fax (215) 977-9679
 - 1. ASTM A123
- B. Occupational Safety & Health Administration, 200 Constitution Avenue NW, Washington, DC 20210
 - 1. 29 CFR 1910.23 Fall Protection in General Industry

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for all materials in this specification.
- B. Shop Drawings: Show profiles, accessories, location, and dimensions.
- C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
- D. Contract Closeout: Fall protection grating system manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.4 PRODUCT HANDLING

- A. All materials shall be delivered in manufacturer's original packaging.
- B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

- C. Remove protective wrapping immediately after installation.

1.5 SUBSTITUTIONS

- A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.6 JOB CONDITIONS

- A. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- B. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- C. Observe all appropriate OSHA safety guidelines for this work.

1.7 WARRANTY/GUARANTEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of twenty-five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The BILCO Company (Or approved Equal)

P.O. Box 1203
New Haven, CT 06505
1-203-934-6363
Fax: 1-203-933-8478
Internet address: <http://www.bilco.com>

2.2 GENERAL

- A. All structural components such as the frame, cover hatch, and hardware shall be made of 316 stainless steel. Hatch shall also have a stainless steel lift assist mechanism.

2.3 FALL PROTECTION GRATING SYSTEM

- A. Furnish and install on vault access doors, where indicated on plans, fall protection grating system. Door manufacturer shall install the grating system when the door is fabricated. If field installation is necessary, grating system shall be installed per the manufacturer's instructions.
- B. Performance characteristics:
 - 1. Grating panel(s) shall be high visibility safety yellow in color.

2. Grating panel(s) shall lock in the fully open position.
 3. Grating panel(s) shall be provided with lift assistance for ease of operation.
 4. Grating system shall be UV and corrosion resistant construction with a twenty-five year warranty.
 5. Grating panel(s) shall have a provision for locking to prevent unauthorized opening.
- C. Grating: Panels shall be fiberglass, molded in one piece, with load bearing bars in both directions to allow for use without continuous side support. Grating shall be designed to support a 300 PSF live load.
- D. Lift assistance: A Type 316 stainless steel torsion rod shall be incorporated into the grating panel design to provide lift assistance when opening the grating panel.
- E. Hold open feature: A Type 316 stainless steel hold open arm shall be provided to lock the cover in the fully open 90 degree position. A release handle shall be provided to allow the grating panel to be closed.
- F. Hardware: All hardware (mounting brackets, hinges, torsion rod, hold open arm, padlock loop, and fasteners) shall be Type 316 stainless steel.

PART 3 -- EXECUTION

3.1 INSPECTION

- A. Verify that fall protection grating system installation will not disrupt other trades (retrofit installation only). Report and correct defects prior to any installation.

3.2 INSTALLATION

- A. Submit product design drawings for review and approval to the CONSTRUCTION MANAGER before fabrication.
- B. The installer shall check as-built conditions and verify the manufacturer's fall protection grating system details for accuracy to fit the application prior to fabrication. The installer shall comply with the fall protection grating system manufacturer's installation instructions.
- C. The manufacturer shall furnish fasteners necessary for field installation of fall protection grating system.
- D. Unless otherwise indicated, the WORK of this Section includes a 1/2-inch drain line to the nearest floor drain for all floor hatches.

****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 03300 Cast-In-Place Structural Concrete
 - 2. Section 05500 Miscellaneous Metalwork
 - 3. 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).

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. California 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 Bolting Materials 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:
 - 1. Shop drawings showing details of railings.
 - 2. Layout plan showing post location and spans, gate locations, and removable railing sections.
 - 3. CONSTRUCTION MANAGERing 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 round pipe and round picket railing system unless otherwise indicated. Railing system shall be side bracket mounted unless indicated otherwise.
- C. Railing systems shall meet CBC and Cal-OSHA requirements.
- D. Railings and handrail brackets shall be designed for the two non-simultaneous, capable of withstanding either of the following 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 tube and round picket and 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.
- 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 marine type hardcoat.
- B. **Picket Railing System:** Picket railing system including handrails, railings, tube caps, gates, and other miscellaneous parts of railing shall be provided with a 0.7-mil clear anodized finish AA-M12-C22-A41 marine type hardcoat.
- C. **Marine Type Hardcoat:** Marine type hardcoat anodizing shall conform to MIL-A-8625C, Type III, Class 1, with 0.0020" minimum coating thickness.

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. **Rectangular Sections:** Rectangular picket railing posts shall be not less than 1-1/2-inch square, 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 3/4-inch square and spaced not more than 6-1/2 inches on centers. Top rails and railings shall be not less than 2 1/2-inch by 1 1/8-inch and shall be provided with bottom enclosures. Bottom rails shall be not less than 1-3/8 inch by 1-inch and shall be provided with bottom enclosures. Top railings shall be as long as possible and the posts shall not project through the top rails. Toe board of picket rails shall function as a bottom rail enclosure. Handrails at stairs shall have both picket rails and round 1-1/2-inch diameter handrails.
- C. **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.
- D. **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. Public use areas, tour route, and Administration and Operations Buildings shall have no spaces larger than 6 inches per UBC requirements.
 2. Industrial use areas, such as process and maintenance buildings and exit ways, shall have no spaces larger than 12 inches per UBC requirements.
 3. Work areas and surfaces, such as rails around tanks, bridges to equipment and walkways at process units (not used as exit ways from any building), shall have no spaces larger than 15 inches. The railing shall be not less than a three railing system meeting Cal-OSHA 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"

2. Rectangular Tube and Square Picket Railings:

Aluminum Tube Railing Co.
"Railtec 400" vertical bar railing by CraneVeyor Corp.

3. Round Tube and Round Picket Railings:

Oval-Tube Railing "IJ" (w/bottom fillers) by Aluminum Tube Railing Co.
"Baluster Railing", by CraneVeyor Corp.

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 be painted to match adjacent aluminum finishes, except fasteners at clear anodized railings or elements 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 05530 – COUNTER BALANCED LADDER

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes furnishing and installing factory fabricated counter balanced ladder.

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 05500 Miscellaneous Metalwork

1.3 STANDARDS AND SPECIFICATIONS

- A. Occupational Safety & Health Administration, 200 Constitution Avenue NW, Washington, DC 20210

- 1. 29 CFR 1910.23 Fall Protection in General Industry

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: All ladders shall be made from extruded anodized aluminum with anodized rungs, anodized attachment brackets and stainless steel fasteners.
- B. Ladder rungs: Ladder rungs shall have a minimum clear width of 15 inches. Rungs shall support a minimum load of 650 lbs. per rung and shall be factory welded to the inside of the ladder uprights. Distance between the rungs shall not exceed 12”.
- C. Attachment brackets: Attachment brackets shall allow a minimum clear distance to the wall from the rear of the rung of 7”. Where the distance at the access point between the centerline of the rung and the wall exceeds 12”, a landing platform shall be provided.
- D. Cable: Cable for the counter-balanced weights shall be stainless steel and will be contained within the upper side profiles and attached to the base of the movable (descending) section. Counter-balancing weights shall be lead and in sufficient weight to provide neutral weight to the ladder.

When installed parallel to a wall requiring pass-through at the top, extension profiles will provide a minimum pass-through clearance of 42 inches. Where the ladder is required to be installed below the access or starting level, a foldaway extension handle is provided to facilitate access.

- E. Composition and Materials: Counter-balanced ladders are to be of extruded aluminum sections formed from 6061-T5 and 6063-T6 alloy. Oblong tubular uprights are to be formed from 6005-T5 and T6 alloy. Attachment hardware including expansion bolts and pop-rivets are to be of stainless steel and are to be provided by JOMY , Inc.

2.8 MANUFACTURERS

- A. Counter balanced ladders shall be manufactured by the following (or equal):

- 1. Counter balanced ladder:

JOMY,® Inc., P.O. Box 577, Louisville, CO 80027.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Finish: All aluminum components shall have a clear anodized finish on all exposed surfaces unless ordered in a custom color. All individual sections shall be separately wrapped in plastic film and shipped in cartons or container to the site designated by the contractor.
- B. Installation: The contractor shall furnish and install the JOMY® Counter-Balanced ladder or equal where indicated on the drawings. To ensure satisfactory performance, the manufacturer's installation instructions, included with each shipment, must be strictly followed.
- C. Warranty: The JOMY® Counter-Balanced ladders are warranted to be free of any defects in materials or workman-ship for 10 years if installed according to manufacturer specifications.
- D. Ordering/Assistance: To place orders or obtain additional assistance, call 877-303-5888

****END OF SECTION****

SECTION 06610 - GLASS FIBER AND RESIN FABRICATIONS, GENERAL

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this section includes providing products fabricated from fiberglass reinforced plastic (FRP) and bolts, nuts, washers, supports, and accessories.
- B. The WORK also provides quality standards for all fabricated fiberglass reinforced plastic equipment of this section and any other section containing FRP equipment.
- C. The WORK also requires that one manufacturer accepts responsibility for the WORK as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- 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 05500 Miscellaneous Metalwork
 - 2. Section 09800 Protective Coating
 - 3. Section 11000 Equipment General Provisions
 - 5. 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. Uniform Building Code
 - 2. Uniform Mechanical Code
 - 3. Uniform Fire Code
 - 4. 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. NBS PS 15 Custom Contact-Molded Reinforce Polyester Chemical-Resistant Process Equipment
2. ASTM A 325 Specification for High-Strength Bolts for Structural Steel Joints
3. ASTM A 490 Specification for Heat-Treated Steel Structural Bolts 150 ksi (1035 MPa) Tensile Strength
4. ASTM C 581 Practice For Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures, Intended for Liquid Service
5. ASTM D 638 Test Method for Tensile Properties of Plastics
6. ASTM D 695 Test Method for Compressive Properties of Rigid Plastics
7. ASTM D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
8. ASTM D 883 Definitions of Terms Relating to Plastics
9. ASTM D 2563 Recommended Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts
10. ASTM D 2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
11. ASTM D 2584 Test Method for Ignition Loss of Cured Reinforced Resins
12. ASTM D 3299 Specification for Filament-Wound Glass Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks
13. ASTM D 3467 Test Method for Carbon Tetrachloride Activity of Activated Carbon
14. AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
15. NFPA 255 Method of Test for Surface Burning Characteristics of Building Materials
16. ANSI/AWS D1.1 Structural Welding Code -- Steel

- | | |
|--------------------|---|
| 17. ANSI/AWWA F101 | Contact-Molded, Fiberglass-Reinforced Plastic Wash Water Troughs and Launderers |
| 18. ANSI/AWWA F102 | Matched-Die-Molded, Fiberglass-Reinforced Plastic Weir Plates, Scum Baffles and Mounting Brackets |

1.5 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL:
 - 1. Maintenance and repair instructions for fiberglass work.
 - 2. Name, address and telephone number of fiberglass fabricators and manufacturers.
 - 3. Certificate of compliance with the specifications and requirements of all fiberglass items of the WORK.

PART 2 – PRODUCTS

2.1 GENERAL

- A. **General:** Only products certified as complying with the indicated requirements shall be provided.
- B. **Products:** All items shall be new, of current design, from reputable manufacturers specializing in such products.
- C. **Manufacturer's Recommendations:** Products shall be recommended by the manufacturer for the application indicated.

2.2 GENERAL REQUIREMENTS

- A. **Quality:** Fiberglass items shall be constructed of new, filament-wound or fiberglass-fabric-reinforced polyester resin laminate material of the strength, thickness, and dimensions indicated, using the matched die-molded or contact molded method.
- B. **Finish:** Finished surfaces of fiberglass items and fabrications shall be smooth, resin-rich, free of voids, without dry spots and unreinforced areas, corrosion resistant and without exposed glass fibers.
- C. **Supports and Fasteners:** Bolts, anchor bolts, washers and supports shall be fabricated of Type 316 stainless steel, unless otherwise indicated.

2.4 FALL PROTECTION FIBERGLASS GRATING

- A. **Construction:** Grating panels shall be fiberglass molded in one piece with load bearing bars in both directions to allow for use without continuous side support. Panel shall be designed to support a 300 psf live load and be high visibility safety yellow in color. Torsion rod lift assistance shall be provided for ease of operation and a hold-open arm shall be included to automatically lock the panel in the fully 90 degree position. A release handle shall be provided to allow the grating panel to be closed and there shall

be a provision for locking the panel to prevent unauthorized access. Hold-open arm shall be stainless steel with a stainless steel release handle. All other hardware, including mounting brackets, hinges, torsion rod, padlock loop, and fasteners, shall be Type 316 stainless steel. Manufacturer shall provide a twenty-five year warranty against defects in material and workmanship.

2.4 FIBERGLASS GRATING

Fiberglass grating shall be minimum one inch high with one inch by 4-inch grid, or 1-1/2 inch high with 1-1/2 inch by 6-inch grid, and cut edges shall be resealed. The maximum deflection under design load (300 psf) shall not exceed 1/8-inch at 24-inch span. Fiberglass grating shall have a permanently slip-resistant surface. Cut edges and openings shall be banded.

2.7 MANUFACTURERS

1. Fiberglass Grating:

Fibergrate Corp., "Fibergrate"
Chemical Proof Corp., "Chemi-Grate"
Bilco

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Products shall be installed in accordance with the manufacturer's installation instructions.

*** *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 Reinforced 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).

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 - 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.

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 08310 – TYPE J-AL HORIZONTAL ACCESS DOOR

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes furnishing and installing factory fabricated vault access doors.
- 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 05515 Vault Door Protection Grating System

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 36, A 36-93a Standard Specification for Structural Steel

1.4 SUBMITTALS

- A. The following shall be submitted:

- 1. Product Data: Provide manufacturer's product data for all materials in this specification.
- 2. Shop Drawings: Show profiles, accessories, location, and dimensions.
- 3. Samples: Manufacturer to provide upon request; sized to represent material adequately.
- 4. Contract Closeout: Vault access door manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.5 PRODUCT HANDLING

- A. All materials shall be delivered in manufacturer's original packaging.
- B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Remove protective wrapping immediately after installation.

1.6 SUBSTITUTIONS

- A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.7 JOB CONDITIONS

- A. Verify that other trades with related work are complete before installing vault access door(s).
- B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- D. Observe all appropriate OSHA safety guidelines for this work.

1.8 WARRANTY/GUARANTEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com

2.2 ACCESS DOOR

- A. Furnish and install where indicated on plans vault access door Type J-AL, size width 2'-6" x length 2'-6". Length denotes hinge side. The vault access door shall be single leaf. The vault access door shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Cover: Shall be reinforced to support a minimum live load of 300 psf (1464 kg/m²) with a maximum deflection of 1/150th of the span.
 - 2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the cover shall not be affected by temperature.
 - 4. Entire door, including all hardware components, shall be highly corrosion resistant.

- C. Cover: Shall be 1/4" (6.3 mm) aluminum diamond pattern.
- D. Frame: Channel frame shall be 1/4" (6.3mm) extruded aluminum with bend down anchor tabs around the perimeter.
- E. Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
- F. Drain Coupling: Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame.
- G. Lifting mechanisms: 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" gusset support plate.
- H. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
- I. Hardware:
 - 1. Hinges: Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4" (6.3 mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
 - 2. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position.
 - 3. Cover shall be fitted with the required number and size of compression spring operators. Springs and spring tubes shall be Type 316 stainless steel.
 - 4. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
 - 5. Hardware: Shall be Type 316 stainless steel throughout.
- J. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

PART 3 -- EXECUTION

3.1 INSPECTION

- A. Verify that the vault access door installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.2 INSTALLATION

- A. Submit product design drawings for review and approval to the CONSTRUCTION MANAGER before fabrication.
- B. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the application prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions.
- C. The installer shall furnish mechanical fasteners consistent with the vault access door manufacturer's instructions.

*** *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. Stainless steel
 - 2. Machined surfaces
 - 3. Grease fittings
 - 4. Glass
 - 5. Equipment nameplates
 - 6. 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.
- E. Architectural Coatings (NOT USED)

1.2 RELATED SECTIONS (NOT USED)

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. Uniform 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 CONSTRUCTION MANAGERS, 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 Piping

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 D102 Painting Steel Water-Storage Tanks

4. **Federal Specifications:**

TT-P-28 Paint, Aluminum, Heat Resisting (1200OF)

DOD-P-23236 Military Specification, Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast

1.5 SHOP DRAWINGS AND SAMPLES

A. 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.

B. 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. Two sets of color samples to match each color selected by the CONSTRUCTION MANAGER from the Manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the CONSTRUCTION MANAGER. The color formula shall be shown on the back of each color sample.
- 3. 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 & Rasor 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

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. 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 and meet current VOCs requirements for San Diego, California.
 - 1. Ameron
 - 2. Carboline Coatings Company
 - 3. Inorganic Coatings, Inc.
 - 4. International (Courtaulds)
 - 5. Tnemec Company
- B. **System 1 Alkyd Enamel:** High quality, gloss or semi-gloss, medium long oil alkyd finish shall have a minimum solids content of 49 percent by volume. Primer shall be as recommended by manufacturer.
 - 1. Prime coat (DFT = 3 mils) Amercoat 5105, Tnemec 4-55, or equal.
 - 2. Finish coats (two or more, DFT = 3 mils), Amercoat 5401 HSA, or 5405, Tnemec 2H, or equal.
 - 3. Total system DFT = 6 mils.
- C. **System 2 Not Used**
- D. **System 3 Aluminum Silicone Resin: (NOT USED)**
- E. **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 74, 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.

F. **System 5 Inorganic Zinc/Polyurethane:** The inorganic zinc primer shall be a water or solvent based, self-curing, zinc silicate 2-component inorganic coating which contains at least 85 percent of metallic zinc by weight in the dried film, and is recommended by the coating manufacturer as a primer for this system. The intermediate coat shall be a high-build two component epoxy with a solids content of at least 70 percent by volume. Finish coats shall be a 2-component aliphatic acrylic or polyester polyurethane coating material that provides superior color and gloss retention, resistance to chemical fumes and severe weathering, and a minimum solids content of 58 percent by volume.

1. Prime coat (DFT = 2 mil), Ameron Dimetecote 21-5 or 21-9, Inorganic Coatings 531, or equal.
2. Intermediate coat (DFT = 4 mils), Ameron 385, Inorganic Coatings P24, or equal.
3. Finish coats (one or more, DFT = 3 mils), Ameron Amershield, Inorganic Coatings 64, or equal.
4. Total system DFT = 10 mils.
5. Intermediate coat shall be applied in excess of 4 mils DFT or in more than one coat as necessary to completely cover the inorganic zinc primer and prevent application bubbling of the polyurethane finish coat.
6. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.
7. If the inorganic zinc primer is used as a pre-construction or shop applied primer, all damaged and uncoated areas shall be spot abrasive blasted and coated after construction using the indicate material.

G. **System 6 Inorganic Zinc, Water Based: (NOT USED)**

H. **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), Ameron Amercoat 220, Carboline 3359, Tnemec 6, or equal.
 3. Total system DFT = 8 mils.
- I. **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, Ameron 385, Tnemec 69, or equal.
 2. Prime coat, where shop applied. (DFT = 3 mils), universal primer, Ameron 185 HS, Tnemec 50-330 or 161, or equal.
 3. Finish coat (2 or more, DFT = 6 mils), Ameron 385, Tnemec 69, or equal.
 4. Total system DFT = 6 mils.
- J. **System 9 - Inorganic Zinc/Epoxy, Equipment: (NOT USED)**
- K. **System 10 Acrylic, Concrete:** The acrylic coating material shall be a single component, industrial grade, high molecular weight acrylic coating material shall have a minimum solids content of 35 percent by volume. The filler-sealer shall be a two component epoxy masonry sealer for wet and exterior exposure, with a solids content of at least 64 percent by volume. A 100 percent solids epoxy surface shall be used to fill holes and patch the concrete surface after abrasive blasting.
1. Prime coat (Filler-sealer), applied in two coats to the entire surface and worked into the surface with a squeegee to achieve a smooth, void-free surface, Tnemec 54-660, Ameron Nu-Klad 105A followed by Nu-Klad 114A (2 coats), or equal.
 2. Finish coats (2 or more, DFT = 6 mils), Tnemec 6, Ameron Amercoat 220, or equal.
- L. **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), Ameron Nu-Klad 105A followed by, Nu-Klad 114 Tnemec 54-660, or equal.

2. Intermediate coat (DFT = 4 mils), Ameron Amerlock 400, Tnemec 104 HS, or equal.
 3. Finish coats (2 or more, DFT = 3 mils), Ameron Amersfield, Tnemec 74, or equal.
- M. **System 12 Aliphatic Polyurethane, Fiber Glass:** Two-component aliphatic 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. A primer, tie coat, or mist coat shall be used as recommended by the manufacturer.
1. Prime coat (Tie coat), Ameron Amercoat 385, Tnemec 66, or equal.
 2. Finish coats (2 or more, DFT = 3 mils), Ameron Amersfield, Tnemec 74, 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 100 Amine Cured Epoxy:** High build, amine cured, straight epoxy resin shall have a solids content of at least 80 percent by volume, and shall be suitable for long-term immersion service in potable water and wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61B Drinking Water System Components - Health Effects.
1. Prime coat and finish coats (3 or more, DFT = 16 mils), Amercoat 395, Tnemec 139, or equal.
 2. For coating of valves and non-submerged equipment, DFT = 12 mils.
- C. **System 101 - Cold-Applied Tape:** (NOT USED)
- D. **System 102 - Polyamide Cured Epoxy:** (NOT USED)
- E. **System 103 Coal Tar Epoxy:** (NOT USED)
- F. **System 104 - Not Used**
- G. **System 105 - Epoxy, Reservoirs:** (NOT USED)
- H. **System 106 Fusion Bonded Epoxy:** The coating material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, 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 or electrostatic spray process.

1. Coating DFT = 16 mils, Scotchkote 134 (electrostatic) or 206N (fluidized bed), or equal, applied in one coat.
2. For coating of valves, DFT = 12 mils.
3. 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.

I. **System 107 - Chemical Resistant Sheet Lining:** (NOT USED)

J. **System 108 - Epoxy, Concrete:** The coating material shall be an amino cured epoxy material suitable for long-term immersion in water and wastewater and for service where subjected to occasional splash and spillage of water and wastewater treatment chemicals. The finish coating material shall have a minimum solids content of 69 percent by volume. If used for potable water service the finish coating material shall be listed by the NSF International as in compliance with NSF Standard 61, and shall conform with state and local health regulations and policies for service in potable water. The filler-sealer shall be a 1000 percent solids amine-cured epoxy material with silica and inert fillers.

1. **Filler-sealer:** Plastic 9029 (applied by squeegee); Tnemec 69-1211 (6-8 mils) followed by Tnemec 63-1500; Ameron Nu-Klad 105A followed by Nu-Klad 114A (two coats) or equal.
2. Finish coats (two or more, DFT = 12 mils); Plasite 9133; Tnemec 69; Ameron Amercoat 395, or equal. On walking surfaces use a non-skid additive such as Ameron 886 in the final coat.

K. **System 109 - Not Used**

L. **System 110 - Not Used**

M. **System 111 - Vinyl Ester:** (NOT USED)

N. **System 112 Vinyl Ester, Concrete:** Vinyl ester resin coating material with an inert flake pigment suitable for immersion service in hydrochloric acid and sulfuric acid solutions. The filler-sealer shall be a 100 percent solids amine-cured epoxy or vinyl ester material with silica and inert fillers. The filler-sealer is applied to the entire concrete surface. A 100 percent solids epoxy or vinyl ester surfacer shall be used to fill holes and patch the concrete surface after abrasive blasting.

1. Prime coat (filler-sealer), applied in two coats using a squeegee to achieve a smooth void-free surface, Plasite 9028 MI, or equal.
2. Finish coats (two or more, DFT = 40 mils), Plasite 4100, 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 201 Rich Portland Cement Mortar: Rich Portland cement mortar coating shall have a minimum thickness of 1/8-inch, followed by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped and sealed with tape.
- C. System 203 Epoxy Surfacing: Two-component epoxy floor surfacing shall be formulated to resist many acids, alkalies, and solvents. Material shall be resistant to liquid alum, sodium hydroxide, and 50 percent sulfuric acid. Products shall be as follows, or equal:
 - 1. Prime coat Nu-Klad 105; finish coat Nu-Klad 110 (1/4-inch thick), or equal.
- D. **System 204 Water-Retardant:** (NOT USED)
- E. **System 205 Polyethylene Encasement:** Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.
- F. **System 206 Cement Mortar Coating:** (NOT USED)
- G. **System 207 - Not Used**
- H. **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.
- I. **System 209 - Alkyd-Wood:** (NOT USED)
- J. **System 210 - Acrylic-Wood:** (NOT USED)
- K. **System 211 - Acrylic Drywall:** (NOT USED)

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 CONSTRUCTION MANAGERS, 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 (NOT USED)
- 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:
 - A. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.
 - B. Dust or smoke laden atmosphere.
 - C. Damp or humid weather.

- D. When the substrate or air temperature is less than 5 degrees F above the dewpoint.
- E. 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.
- F. 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 in the.

3.14 TESTING FOR VOLATILE ORGANIC COMPOUNDS IN POTABLE WATER RESERVOIRS (NOT USED)

3.15 IDENTIFICATION OF PIPING

- A. Identification of piping 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.

3.16 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	(1) alkyd enamel
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Near white metal blast cleaning SSPC-SP10	(5) inorganic zinc/polyurethane
FM-2	(NOT USED)		
FM-3	(NOT USED)		
FM-4	(NOT USED)		
FM-5	(NOT USED)		
FM-6	(NOT USED)		
FM-7	Where indicated, ferrous surfaces in water passages, or below grade drywells of all valves 4-inch size and larger (only if fusion bonded epoxy is not available), exterior surfaces of submerged valves.	White metal blast cleaning SSPC-SP5	(100) amine-cured epoxy
FM-8	Where indicated, ferrous surfaces in water passages, below grade drywells, and submerged surfaces of all pumps which have discharge size of 4 inches or larger (only if fusion bonded epoxy	White metal blast cleaning	(100) amine-cured epoxy

	is not available).		
FM-9	Ductile iron pipe, ferrous surfaces of sleeve-couplings, valves in dry or wet well, pump (including pump bowl, casing, inside and out, and suction can)	Solvent cleaning SSPC-SP1, followed by near-white metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-10	(NOT USED)		
FM-11	(NOT USED)		
FM-12	(NOT USED)		
FM-13	(NOT USED)		
FM-14	(NOT USED)		
FM-15	(NOT USED)		
FM16	(NOT USED)		
FM-17	The following existing equipment: All piping, painted electrical boxes, pipe supports, electrical supports, and all existing painted ferrous materials within the existing dry well shall be re-coated as part of this CONTRACT. Work excluded from this re-coating includes: existing non-painted services, and equipment outside the drywell.	Minimum preparation shall be the more stringent requirement of either the manufacturer's requirements for service preparation or per SSPC-SP2, hand tool cleaning removal of loose rust, mill scale, and loose paint, by hand chipping, scraping, sanding and wire brushing; not all mill scale, rust and paint may not be removed by this process, but loose mill scale, loose rust, loose paint and other detrimental foreign matter	Prime and Recoat per FM-1 requirements

		present shall be removed.	
FM-18	Buried pipe couplings, valves, fittings, and flanged joints (where piping is plastic).	Removal of dirt, grease, oil	(201) rich Portland cement mortar
FM-19	(NOT USED)		
FM-20	(NOT USED)		

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 except for the following items shall be coated unless coating is required by other Sections: (1) Floor gratings and frames, (2) Handrails, (3) Stair treads, (4) Chain link fencing and appurtenances.

	<u>Item</u>	<u>Surface Prep</u>	<u>System No.</u>
FM-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1	(1) alkyd enamel
FM-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1	(4) aliphatic polyurethane
FM-2	(NOT USED)		
FM-3	(NOT USED)		
FM-4	(NOT USED)		
FM-5	(NOT USED)		
FM-6	Surfaces buried or submerged in water or wastewater, including all surfaces lower than two feet above high water level and all surfaces inside enclosed hydraulic structures and vents.	Solvent cleaning SSPC-SP1 followed by brush-off grade blast cleaning SSPC-SP7	(100) amine-cured epoxy

C. **Coating System Schedule, Steel Water Reservoir Interior:** (NOT USED)

D. **Coating System Schedule, Steel Digester Floating Covers and Digester Gasholders:** (NOT USED)

E. **Coating System Schedule, Interior Surfaces of Welded Steel Tanks:** (NOT USED)

3.17 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 cleaning SSPC-SP1	(1) alkyd enamel
NFM-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1	(4) aliphatic polyurethane
NFM-2	(NOT USED)		
NFM-3	Aluminum surfaces in contact with concrete, or with any other metal except galvanized ferrous metal.	Solvent cleaning SSPC-SP1	(208) aluminum metal isolation
NFM-4	Polyvinyl chloride plastic piping, indoors and outdoors, or in structures, not submerged.	Solvent cleaning SSPC-SP1	(7) acrylic latex
NFM-5	Fiber glass surfaces.	Per Paragraph [3.8]	(12) aliphatic polyurethane-fiber glass
NFM-6	Buried non-ferrous metal pipe.	Removal of dirt, grease, oil	(200) PVC tape

3.18 COATING SYSTEM SCHEDULE-CONCRETE

	<u>Item</u>	<u>Surface Prep</u>	<u>System No.</u>
C-1	(NOT USED)		
C-1	All surfaces indoors and outdoors, as included	Per Paragraph 3.8	(11) aliphatic polyurethane

			concrete
C-2	(NOT USED)		
C-2	(NOT USED)		
C-3	Floor slab, exposure to chemicals, as shown.	Per Paragraph 3.8	(203) epoxy surfacing
C-4	(NOT USED)		
C-5	Interior surfaces of sewer manholes, including bottom, and metal appurtenances, for manholes indicated.	Per Paragraph 3.8	(112) Vinyl ester, concrete
C-6	(NOT USED)		

3.19 COATING SYSTEM SCHEDULE-CONCRETE BLOCK MASONRY (NOT USED)

****END OF SECTION****

SECTION 10520 - FIRE EXTINGUISHERS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing fire protection equipment, cabinets, and appurtenant work, complete.

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. Uniform Building Code
 - 2. Uniform Fire Code

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. **Trade Standards:**
 - National Fire Protection Association, Standard No. 10, "Portable Fire Extinguishers" Underwriter's Laboratory, Fire Protection Equipment List

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300:
 - 1. Manufacturer's catalogue containing technical data, installation instructions, and details.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Fire extinguishers and appurtenant materials shall be delivered in original unbroken packages or containers, bearing the manufacturer's label with manufacturer's name, product description, and rating.
- B. **Storage:** All materials shall be carefully stored in an area which is protected from deleterious elements as recommended by the material manufacturer. Storage shall be in a manner that will prevent damage to the material and its finish.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All fire protection equipment shall be from the same manufacturer and shall meet the requirements of NFPA Standard No. 10, "Portable Fire Extinguishers"

2.2 FIRE EXTINGUISHERS

- A. Type A extinguisher shall be 20 lb minimum capacity, dry chemical type with minimum UL rating of 10-A:60-B:C, in enameled steel container, for Class A, Class B, and Class C fires.
- B. Type B extinguisher shall be 10 lb minimum capacity, dry chemical type with minimum UL rating of 4-A:60-B:C, in enameled steel container, for Class A, Class B, and Class C fires.
- C. Type C extinguisher shall be 14 lb minimum capacity, CleanGuard 14 Model CA-1481 with minimum UL rating of 2-A:10-B:C, in enameled seamless steel container, for Class A, Class B, and Class C fires.

2.3 CABINETS (NOT USED)

2.4 BRACKETS AND OTHER MATERIALS

- A. Mounting brackets shall be specially designed for extinguishers or cabinets, and shall be made of 316 stainless steel.
- B. All other materials, not specifically described, but required for a complete and proper installation of fire fighting devices shall be as selected by the CONTRACTOR.

2.5 MANUFACTURERS

- A. Fire protection equipment shall be manufactured by one of the following (or equal):
 - 1. General Fire Extinguisher Corp.
 - 2. J.L. Industries
 - 3. Potter-Roemer
 - 4. Standard Fire Equipment (Division of Zurn Co.)
 - 5. Walter Kidde and Co.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Brackets: All fire extinguishers shall be provided with and installed on brackets or brackets within cabinets. The CONTRACTOR shall block and reinforce the wall area as necessary to support the fire extinguishers.
- B. Locations: Fire protection equipment locations shall be verified with the CONSTRUCTION MANAGER and Fire Marshal before installation and shall be installed, where directed, per NFPA Standard No. 10, "Portable Fire Extinguishers."

****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. Equipment in Divisions 11, 13, 15 and 16.

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 11002 Equipment Supports, Grouting and Installation
 - 4. Section 13300 Instrumentation and Control
 - 5. Section 15000 Piping Components
 - 6. Section 15020 Pipe Supports
 - 7. Section 16030 Electrical Tests
 - 8. Section 16040 Electric Motors
 - 9. Section 16050 Basic Electrical Materials and Methods

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. Uniform Mechanical Code (UMC)
 - 2. Uniform Plumbing Code (UPC)
 - 3. Uniform Fire Code (UFC)

4. National Electrical Code (NEC)
5. Uniform Building Code (UBC)

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 CONSTRUCTION MANAGERS (ASME)
5. American Water Works Association (AWWA)
6. American Society of Heating, Refrigerating, and Air Conditioning CONSTRUCTION MANAGERS (ASHRAE)
7. American Welding Society (AWS)
8. National Fire Protection Association (NFPA)
9. National Electrical Manufacturers Association (NEMA)
10. Antifriction Bearing Manufacturers Association (ABMA)
11. American Gear Manufacturers Association (AGMA)

B. The current editions of the following apply to the WORK of this Section:

ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys
ANSI B46.1	Surface Texture
ANSI S12.6	Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
ANSI/ASME B1.20.1	General Purpose Pipe Threads (Inch)
ANSI/ASME B31.1	Power Piping

ANSI/AWWA D100	Welded Steel Tanks for Water Storage
AWWA C206	Field Welding of Steel Water Pipe
ASTM A 48	Specification for Gray Iron Castings
ANSI A 58.1	Minimum Design Loads for Buildings and Other Structures
ASTM A 108	Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
ANSI/NFPA 70	National Electrical Code
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:

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. The following shall be included in the OWNER'S MANUAL:

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:** 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 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. NOT USED.
 - B. **Product Testing:** Products shall be tested at the factory for compliance with the indicated requirements. The CONTRACTOR shall provide the CONSTRUCTION MANAGERa 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 CONSTRUCTION MANAGERing 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:

$$S = Scf \times \frac{(G \times D \times \Delta \Theta)}{2L}$$

where:

- | | | |
|-----|---|---|
| S | = | stress, psi |
| Scf | = | stress concentration factor, dimensionless |
| D | = | minimum shaft diameter, inches, at point of concentration |
| ΔΘ | = | twist in shaft between adjacent masses, radians |
| L | = | effective length between masses, inches |
| G | = | shear modulus of material, lb/in ² |

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. 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. NOT USED.
- B. NOT USED.
- C. **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.
- D. **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.
- E. **Identification of Equipment Items:** Each item of equipment shall have an indelible, legible identifying mark corresponding to the equipment number indicated.
 - F. **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.
 - G. **Shop Fabrication:** Shop fabrication shall be performed in accordance with the shop drawings.
 - H. **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.
 - I. **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.
 - H. **Seismic Design:** The seismic design of equipment shall be based on the horizontal peak ground acceleration indicated in the Geotechnical Report or in accordance with California Building Code 2010 (CBC), whichever is greater. Unless otherwise indicated, Occupancy Category shall be III, and seismic design importance factors shall be $I = 1.25$, $I_p = 1.5$ in accordance with Table 11.5-1 per ASCE7-05. Determination of seismic forces and load combinations shall follow procedures in the ASCE7-05, Chapter 13.

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 California Building Code 2010. Unless otherwise indicated, Occupancy Category shall be III, and seismic design importance factors shall be $I = 1.25$, $I_p = 1.5$ in accordance with Table 11.5-1 per ASCE7-05. Determination of seismic forces and load combinations shall follow procedures in the ASCE7-05, Chapter 13.

- B. **Equipment Foundations:** Unless otherwise indicated, equipment foundations shall conform to the requirements of Section 11002.

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 Anti-Friction Bearing Manufacturers Association, Inc. (ABMA).
- B. Bearing selection shall include the following criteria: fitting practice, mounting, lubrication, sealing, static rating, and housing strength.
- C. Re-lubricatable 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. 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 DRIVE CHAINS (NOT USED)

2.11 SPROCKETS (NOT USED)

2.12 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.

2.13 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.

2.14 FLEXIBLE CONNECTORS AND DUAL PIPE COUPLINGS

- A. Flexible connectors and dual pipe couplings shall be provided per Section 15000-Piping General, 2.6-A Flexible Connectors. Flexible couplings shall be installed on pump suction and discharge piping.

2.15 INSULATING CONNECTIONS

- A. Insulating bushings, unions, couplings, and flanges, shall comply with the requirements of Section 15000.

2.16 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.

2.17 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.

2.18 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.

2.19 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. Ferguson Machine Company

2.20 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 manufacturers 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 CONSTRUCTION MANAGER.

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 1.3.4	Centrifugal pumps, Horizontal Baseplate Design
ANSI/HI 1.4	Centrifugal Pumps B Installation, Operation and Maintenance

Reference	Title
ANSI/HI 2.4	Vertical Pumps: Intallation, Operation and Maintenance
API 610, 1995	Centrifugal Pumps for Petroleum, Heavy Duty Chemical and Gas Industry Services
API RECOMMENDED PRACTICE 686	Recommended Practices for Machinery Installation and Installation Design
ASTM C531	Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, and Monolithic Surfacing.
ASTM C579	Compressive Strength of (Method/B) Chemical Resistant Mortars and Monolithic Surfacing.
ASTM C638	Tensile Properties of Plastics.
ASTM C882	Bond Strength of Epoxy-Resin Systems Used with Concrete
ASTM C884	Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay
ASTM C1181	Creep of Concrete in Compression
ASTM D2471	Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins
SSPC	Society for Protective Coatings Specifications, Vol. 2

1.3 SHOP DRAWINGS AND SAMPLES

- A. The following information shall be submitted:
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 MWWD 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. 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.
6. 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 II/III Bases:** (NOT USED)

D. **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.

E. **Sole Plates:**

1. 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 D638	Tensile strength shall not be less than 1700 psi. Modulus of elasticity shall not be less than 1.8×10^6 psi
ASTM C1181	Creep of the epoxy grout shall be less than 0.005 in/in with the test at 70oF and 140oF with a load of 400 psi
ASTM D2471	Peak exothermic temperature shall not exceed

Test	Result
	110oF when a specimen 6 inch diameter x 12 inches high is used. Gel time shall be a least 150 minutes

2. 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. 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, 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.

3. 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 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 both new and modified, 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 11220 Vertical Non-clogging Vortex Type Pump

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 11002 Equipment Supports, Grouting and Installation
 - 3. Section 11005 Machine Alignment

1.3 SPECIFICATIONS AND STANDARDS

- A. Specifications and standards shall comply with Section 11000 and shall include the following:

AISC	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design - 9th Edition
AISI 1045	Steel
ANSI/ASME B73.1	Specifications for Horizontal End Suction Centrifugal Pumps for Chemical Process
ANSI/ASME B73.2	Specifications for Vertical In-Line Centrifugal Pumps for Chemical Process
ANSI/AWWA E101	Deep Well Vertical Turbine Pumps - Line Shaft and Submersible Types
ANSI/HI 1.1-1.6	Centrifugal Pumps
ANSI/HI 2.1-2.6	Vertical Pumps

ANSI/HI 3.1-3.6	Rotary Pumps
ANSI/HI 6.1-6.6	Reciprocating Pumps
ANSI/HI 7.1-7.5	Controlled Volume Pumps
ANSI/HI 9.1-9.5	Pumps - General Guidelines
ANSI/HI 9.3.3	Pumps - Polymer Material Selection
ANSI/HI 9.6.1	Centrifugal and Vertical Pumps for NPSH Margin
ANSI/HI 9.6.3	Centrifugal/Vertical Pumps Allowable Operating Region
ANSI/HI 9.6.4	Centrifugal and Vertical Pumps. Vibration Measurements and Allowable Values.
ANSI/HI 9.8	Pump Intake Design Standard
ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
ANSI/IEEE 115	Test Procedure for Synchronous Machines
API 610, 1995	Centrifugal Pumps for Petroleum, Heavy Duty Chemical and Gas Industry Services
ASME Code	ASME Boiler and Pressure Vessel Code
ASTM A 53	Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
ASTM A128	Steel Castings, Austenitic Manganese
ASTM A 216	Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service
ASTM A217	Steel Castings, Austenitic and Martensitic Stainless and Alloy
ASTM A 276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A 278	Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650° F (345° C)
ASTM A 283	Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 322	Specification for Steel Bars, Alloy, Standard Grades

ASTM A 395	Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A 470	Specification for Vacuum-Treated Carbon and Alloy Forgings for Turbine Rotors and Shafts
ASTM A 536	Specification for Ductile Iron Castings
ASTM A 571	Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low Temperature Service
ASTM A 576	Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A 743	Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, and Nickel-Base Corrosion-Resistant for General Application
ASTM A 744	Castings, Iron Chromium-Nickel, Corrosion Resistant, for Severe Service
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings
ASTM B 148	Aluminum Bronze Sand Castings
ASTM B 505	Copper-Base Alloy Continuous Castings
ASTM B 584	Copper Alloy Sand Castings for General Applications
ASTM E 448	Recommended Practices for Scleroscope Hardness Testing of Metallic Materials
AWS-B3.0	Welding Procedures and Performance Qualifications
AWS-D1.1	Structural Welding Code--Steel
Hydraulic Institute	(See applicable ANSI/HI Standard) Standards
ISO 9001	Quality Systems
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.
NEMA MG1	Motors and Generators

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000 and the material listed in the detailed specification, the following shall be submitted:
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 (☐) 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 mgd) 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. NOT USED
11. Drawings showing general dimensions and confirming the size of pumps, motors, drives, flywheels (if required), and specified appurtenances; piping connections; construction details of equipment; wiring diagrams; and weight of equipment.
12. NOT USED
13. 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.
14. 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.
15. 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.
16. Manufacturer's design and calculations for intermediate shafting, if intermediate shafting is required. Show shaft lengths, location of bearing supports, and shaft critical speed.
17. Shaft deflection calculations to demonstrate compliance with paragraph 11175-1.10 if shaft deflection calculations are required by the terms of these specifications.

18. Calculations justifying the dimensions of flywheels, if flywheels are required.
19. Details of the pump and drive unit foundation, including type, size, number, and arrangement of anchor bolts, dimensional drawings of the sole and base-plates, and all other information required under Section 11002.
20. 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.
21. 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.
22. 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:
 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, if flywheels are required.
 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, 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.

- 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 API 610.

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 150 horsepower and larger, shall be factory tested as complete, assembled units and witnessed by a representative of the CONSTRUCTION MANAGER 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:** Not Used.
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. Performance test shall be conducted in the presence of the Owner and the Construction Manager. Copy of the certified test results with curves shall be provided to the Owner.
- B. Pre-operational and start up testing shall include testing reports on the following and other equipment as required: switchgear and MCC, control system operation, pumping units, (including vibration testing) on installed pump/motor unit to ensure no unusual vibration/harmonics within hydraulic Institute limits), piping pressure and leakage testing, gate valves, ventilation system, equipment noise testing, and equipment hoists (OSHA Certification). Failure conditions shall be simulated as required to demonstrate proper control operations and warning displays. This testing may utilize potable water recycled to the wet well for pumping demonstration.
- C. After CONTRACTOR has completed the pre-operational testing utilizing potable water (to be re-circulated to the wet well) for preliminary mechanical and electrical/control equipment operation, and submitted equipment certifications described above, the operational testing shall be scheduled. This shall demonstrate pump station operation on automatic control without equipment or control failure and with sewage tie-in. The pump station mechanical equipment, electrical/control systems, and emergency power equipment shall operate without failure during the operational test. This testing period shall consist of an 8-hour first test followed by a 5-day operational test.
- D. CONTRACTOR is responsible for all costs including power, fuel, potable water, testing/training specialists, and other testing costs associated with the facility test sequence until such time that station is accepted by the City.

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 supercede 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 paragraph 2.1.1, API 610. 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. The Preferred Operating Range shall be not less than that specified in paragraph 2.1.12, API 610. Proposed pump selections shall be selected to allow not less than a five percent increase in head, as specified in paragraph 2.1.4 of API 610. Variable speed operation to achieve this objective will not be considered. Pump selections proposing maximum diameter impellers for the proposed pump model and casing size will not be accepted.

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 CONSTRUCTION MANAGERed 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 B 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 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.

3. **Pumps Used for Clear Liquids:** The methodology set forth in ANSI/HI 9.6.1 shall be employed for determining NPSHA margin for pumps to be used on liquids which do not normally contain solids, such as potable and process water, heating water, and secondary and tertiary effluent pumping service. The acceptable minimum NPSHA less NPSHR margin shall be 5 feet at any specified operating condition falling within 85 percent and 115 percent of best efficiency capacity at the speed required to achieve the specified operating condition, and not less than 8 feet for any specified operating condition falling outside that zone. Suction nozzle size for wet pit and column-type pumps shall be the impeller eye diameter of the proposed pump.

- H. **Motor Selection:** Unless otherwise specified, pumps shall be electric motor driven. Electric motors shall conform to the requirements set forth 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.

In addition to the information submitted under the requirements of Section 16040, the CONTRACTOR shall provide certified reed frequency calculations for both the motor rotor and frame for motors driving “Custom CONSTRUCTION MANAGERed” pumps, with the data to be submitted under paragraph 11175-1.4. Upon completion of construction of the motors driving “Custom CONSTRUCTION MANAGERed” pumps for this project, each rotor and frame and the completed assembly shall be given a bump test to confirm the reed frequency calculations. The results of the bump test, certified by an officer of the manufacturing corporation and notarized, shall be furnished to the design professional responsible for the rotor and critical speed analysis (paragraph 11175-1.10) and submitted under paragraph 11175-1.4 and included in the Owner’s Manual.

1.10 ROTOR AND CRITICAL SPEED ANALYSIS AND SYSTEM DESIGN

- A. **General:** New and modified existing pumps shall be subject to the analysis. Differences, if they exist, shall be identified (example impeller shaft differences). The requirements of this paragraph shall apply to all variable speed pumping systems with pump nozzle sizes 12 inches in diameter and greater, all pumping unit specifications where the words “Custom CONSTRUCTION MANAGERed” appear in the title or in paragraph 1.1A of the specification section, and elsewhere when a detailed pump specification makes reference to this paragraph. In addition, overhung shaft pumps operating in single volute casings shall be subject to analysis for shaft deflection in accordance with the terms of this paragraph.
- B. **Requirements:** The complete pumping unit, including rotating elements, frames, supports, and all related structural elements, including pump, motor and bearing supports, shall be subjected to a lateral rotordynamic analysis, including a

rotordynamic critical speed analysis, to identify and eliminate harmful resonant conditions.

The complete pumping unit rotating element, including pump, motor, intermediate shaft and flywheel rotors (if specified), and all other elements in the power train or powered via the power train, shall be designed to limit torsional stresses.

The torsional and rotordynamic analyses shall together be termed the pumping equipment's mass elastic design. The mass elastic design shall be the product of a registered design professional who has been responsible for the design of at least one successfully operating mass elastic design of comparable size and complexity in the recent past. The CONTRACTOR shall submit the qualifications of the proposed design professional as a part of the initial submittal information required under paragraph 11175-1.4.

Upon completion and receipt of certified results of the bump tests required for the motor rotor, frame and assembly specified under paragraph 11175-1.9H, the design professional shall review the data and submit a supplemental report either accepting the test results or recommending alterations to assembly structures to adjust for differences between calculated values used for the original analyses and actual values determined subsequent to motor fabrication.

Reports, calculations and recommendations resulting from the required analyses shall bear the design professional's original signature and professional registration seal. All reports, recommendations and calculations produced under this paragraph shall be submitted as specified in paragraph 11175-1.4. The format and documentation for the reports shall follow the requirements of ANSI/HI 9.6.4.

If the CONTRACTOR proposes the use of alternative methods for the required analyses, documentation shall be submitted justifying the substitution. The documentation shall include justification that product results will be equivalent to that specified and with an equivalent level of accuracy. The location and description of projects of an equivalent size where the procedure has been employed and the length of time these projects have been in actual service shall also be included.

- C. **Critical Speeds:** Process sensitivities are such that operation of variable speed pumps at infinitely variable speed within the specified operational conditions is an absolute requirement. The CONTRACTOR is advised and warned that any remedy imposing a locked-out speed interval or intervals will not be considered an acceptable remedy for identified critical speeds. The CONTRACTOR shall adjust component sizes, and/or provide appropriate energy absorbing devices or other approved remedies to eliminate critical speeds within the operating range required to meet specified performance requirements.

- D. **Methodology:**
 - 1. **Rotordynamic Analysis:** The rotor dynamic analysis shall follow the procedure prescribed in Corbo and Malanoski, 1998, and shall include the following features:
 - a. The procedure shall consider all speeds required to operate the

equipment within the envelope of continuous operating conditions specified.

- b. The procedure shall produce Campbell diagrams for both wet and dry conditions.
 - c. The procedure shall consider variations in assumed coefficients for seal and wearing ring clearances (Lomakin effect), bearing damping and stiffness, rotor imbalance (up to 10 percent of rotor disc weight at each disc position), impeller destabilizing forces, rotor shaft bending, hydraulic imbalance at not less than five operating conditions within the envelope of continuous operating conditions specified in addition to the specified operating conditions, and impeller vane/diffuser (cutwater) vane clearance. Unless specifically accepted by the OWNER, the range in variation of component characteristics shall comply with the ranges recommended in Corbo and Malanoski, 1998.
 - d. The final report shall include a three-dimensional graphic presentation of shaft distortion and rotor element performance at identified critical speeds within the pump's operating range.
2. **Torsional Vibration:** The methodology used for evaluation of the mass elastic system and shaft combined stresses shall follow the approach prescribed in Corbo and Malanoski, 1996, using either the Matrix-Eigenvalue or Holzer methods for determining natural frequencies. The computer analysis results shall be verified by hand calculations for the fundamental frequency and for mode shapes. Exciting frequencies to be considered during the analysis shall be 0.5, 1, and 2 times running speed, vane passing frequencies for the pump impeller/cutwater-diffuser vane combinations, line and twice line frequency, motor pole frequency and motor starting transients. Forcing function magnitudes used for the analysis shall be not less than 10 percent of the maximum transmitted torque. The analysis shall also include evaluation of control pulse frequencies induced by the variable frequency drive. The analysis report shall include a statement produced by the variable frequency drive manufacturer detailing all control pulse frequencies generated by the equipment between 1/4 and 18 times motor running speed.

The stress analysis procedure shall be based upon a finite element analysis technique using a digital computer program that has been successfully field calibrated with at least one installation of comparable size and complexity in the recent past. Unless otherwise justified by documentation supported by independent studies, the analysis procedure shall use the range of factors recommended in Corbo and Malanoski, 1996. The CONTRACTOR shall produce a Campbell-type interference diagram showing the relationship between operating range, natural frequencies and exciting frequencies.

The analysis shall include a time-integration study showing transient peak stresses resulting from startup, shutdown and motor control transients if synchronous drives are specified. The diagrams shall include calculated stresses throughout the range of frequencies considered in the analysis. Tomographic diagrams, displaying colorimetrically peak stresses at all

positions in the pump shaft and all frames, including roots at changes in section and keyways or other stress concentrating locations, shall be provided with the analysis report. The diagram shall indicate operating speeds identified that produce the peak stresses and shall be specific for speeds inducing identified peak stresses at keyways, changes in section and at connections to other components.

3. Shaft Radial Load and Deflection:

- a. Overhung Shaft Pumps: Shaft radial loads and deflection for overhung shaft pumps operating in single volute casings shall be calculated using the following relationship:

$$\Delta_{MAX} = \frac{R}{3E} \left[\frac{a^2c - abc}{I_c} + \frac{1}{I_a} \left(\frac{b^3 - 3a^2b}{2} + a^2 \right) \right]$$

Where:

Δ_{max} = deflection, inches, at the outboard (impeller side) face of the shaft seal

- E = modulus of elasticity, psi
 30 x 106 for carbon steel
 28 x 106 for 316 stainless steel
 Alternate materials: as accepted by OWNER
- a = shaft length, inches, from the centroid of the impeller profile (from inlet to discharge nozzle) to the centerline of the radial bearing
- b = shaft length, inches, from the centroid of the impeller profile (from inlet to discharge nozzle) to outboard (impeller side) face of shaft seal
- c = shaft length between centerline of bearings, inches
- I_a = moment of inertia of the shaft at section a, in⁴
- I_c = moment of inertia of the shaft at section c, in⁴
- R = radial force, pounds, at any specified operating condition or any operating condition within the envelope of specified operating conditions resulting in peak loads imposed on the shaft:

$$R = (K)(H)(D)(Y) + W$$

where:

K = Radial thrust factor. K shall vary with flow and specific speed in accordance with the following:

Q/Q _{BEP}	K, N _S = 2000	K, N _S = 3500
0.0	0.31	0.38
0.1	0.30	0.375
0.2	0.28	0.36
0.3	0.26	0.345
0.4	0.24	0.325
0.5	0.22	0.3
0.6	0.18	0.27
0.7	0.15	0.23
0.8	0.12	0.185
0.9	0.08	0.14
1.0	0.05	0.09
1.1	0.06	0.12
1.2	0.11	0.17
1.3	0.20	0.25

NOTES:

1. Q/Q_{BEP} in the table is the ratio of flow at the operating condition to flow developed by the pump at best efficiency
2. N_S in the table is specific speed, as defined in ANSI/HI 1.1 - 1.6
3. K for pumps with specific speeds between 2000 and 3500 shall be established by a straight line interpolation from the above values.
4. K for pumps with specific speeds greater than 3500 shall be established by a straight line extrapolation from the above values. The manufacturer is at liberty to use differing values of K from that above so long as they are greater than those listed in the table. Under no circumstances will lesser values of K be acceptable.

H = Head (psi) developed by the pump at any specified duty point, including operating conditions within the envelope of conditions specified

D = Mean impeller diameter, inches

Y = Impeller width, inches, at discharge, including shrouds

W = Impeller weight with wearing ring, pounds (W = 0 if vertical pump)

Radial loads calculated in accordance with the above procedure shall be used for bearing life calculations as required under paragraph 11175-1.9E.5.

Flexural stress calculations shall be based upon the loading criteria specified above and shall be incorporated into the combined stress calculations specified under paragraph 11175-1.9E.3.

- b. Impeller between Bearings Pumps: Shaft deflection for single volute pumps with the impeller mounted between bearings such as for split case centrifugal pumps shall be calculated in accordance with the following formula:

$$\Delta_{\max} = \frac{(R_x)(3L^2 - 4x^2)}{48EI}$$

Where:

Δ_{\max} = deflection, inches, at the face (impeller side) of the shaft seal

R = radial force, as defined above

L = distance between bearings, inches

E = modulus of elasticity for the shaft material, as defined above

I = shaft moment of inertia at the bearings, inches⁴

x = distance between bearing and seal face (impeller side), inches

4. Reference Documents: The Corbo and Malanoski documents referenced in paragraphs 11175-1.10D.1 and 11175-1.10D.2. are available from the City of San Diego, Metropolitan Wastewater Department, on an as-needed basis, to those with the need to know as determined by the CITY:
- a. Corbo and Malanoski, 1996 Practical Design Against Torsional Vibration. From Proceedings of the 25th Turbomachinery Symposium, Turbomachinery Laboratory, Texas A & M University, College Station, TX, pp.189-222, 1996.
- b. Corbo and Malanoski, 1998 Pump Rotordynamics Made Simple. From Proceedings of the 15th International Pump Users Symposium, Turbomachinery Laboratory, Texas A & M University, College Station, TX, pp.167-204, 1998.

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 1 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. However, where the individual pump sections and this Section are silent with respect to materials of construction of any component, material selection shall follow the requirements of Table H-1, API 610, Materials Class I-1.**
 - 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 API 610, Materials Class I-1 and paragraph 2.2A.1 above.
 - 4. **Stainless Steel Pump Impellers (where indicated):** Cast Type 316 stainless steel conforming to API 610, Materials Class S-8.
 - 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 inter-stage seals shall be Type 316 stainless steel conforming to API 610, Materials Class S-8 requirements.
 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 API 610, Materials Class S-5.
 10. **Discharge Heads and Suction Cans:** Carbon steel conforming to the requirements of API 610, Materials Class I-1.
 11. **Anchor Bolts, Nuts and Washers:** Materials shall be as specified in paragraph 11000-2.20.
- B. **General Quality:** Details of manufacture and assembly of equipment furnished under the individual pump sections and this Section shall follow the requirements of API 610 with respect to the following features (paragraph references, API 610):
1. Alignment aids (paragraph 2.1.24).
 2. Removal of rotating element (paragraph 2.1.25).
 3. Jackscrews for assistance in alignment on all base-plates and equipment supports (paragraph 5.3.7.3.4).
 4. Castings (paragraph 2.11.2).
 5. Welding (paragraph 2.11.3).
- 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 API 610, paragraph 2.6.2, Material class S-8. Maximum wearing ring clearances shall not exceed 150 percent of the values stated in Table 2-2, API 610. 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 shafts to allow complete withdrawal and removal of the pump backhead, frame and rotor without disturbing the motor 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. **Solenoid Valves:** Pumps shall include solenoid valves at the inlet of water, oil lubrication, and cooling water connections. Solenoid valves shall be continuous time rated for the voltage and service conditions indicated.
- B. **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.
- C. **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.
- D. **Variable Speed Drives:** NOT USED
- E. **Local Control Panels:** The NEMA rating of local control panels shall comply with the area designations of Section 16050, unless indicated otherwise.
- F. **Lifting Eyes:** Pumps and nozzles shall be provided with lifting eyes to permit removal and/or disassembly.

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 a bell intake velocity of 5.5 fps shall be assumed. 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 Uniform 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 shall have a single cartridge type mechanical seal cooled by product water routed from the backhead area into the stuffing box through a machined clearance. Pump/impeller shall be designed to provide positive pressure above atmospheric to the stuffing box area to allow seal flush line to function. Stationary portion of the seals shall have stainless steel construction. Rotating faces of the seal shall be of silicon carbide against carbon. Seal shall be manufactured by AES CONSTRUCTION MANAGERing -C.U.R.C. Type, or Chesterton 155, no exceptions. The seals shall be constructed to allow rebuilding of the seal utilizing repair parts.
- 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 ATHIS 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. Base-plates for horizontal pumps shall be fabricated and finished in accordance with paragraph 3.3, API 610. All base-plates 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.

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.

2.8 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by the following (or equal):
 - 1. **Self-Aligning, Self-Centering, Single Rotary Cartridge Type Mechanical Seals:**

Chesterton 155
AES

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. For all units with variable speed drives and any unit with pump nozzle size 12 inches in diameter and greater, the testing procedure shall be a plan developed jointly by the CONTRACTOR and the equipment manufacturer to demonstrate performance of each item of equipment at all specified operating conditions.

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 measurement results shall be included in the Owner's Manual.

3.6 Not Used.

****END OF SECTION****

SECTION 11220 – VERTICAL DRY-PIT NON-CLOG PUMP

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. **General:** The WORK of this Section includes providing non-clog vertical pumps for pumping unscreened municipal sewage. Provide two installed and one uninstalled vertical, close coupled slurry pumping units, specifically designed to pump slurries of light grit, debris and organic solids without clogging shall be supplied.
- B. **Unit Responsibility:** The CONTRACTOR shall cause the equipment specified under this Section, including the motors 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

1.3 SPECIFICATIONS AND STANDARDS

- A. Specifications and standards shall comply with Sections 11000 and 11175. Where this Section is silent on any subject, item or equipment, the requirements of Section 11175 shall govern.

1.4 QUALITY ASSURANCE

- A. All pumping equipment furnished under this Section shall be of a design and manufacture that has been used in similar applications, and it shall be demonstrated to the satisfaction of the City that the quality is equal to equipment made by that manufacturer specifically named herein.
- B. To insure a consistent high standard of quality, the manufacturer of this pumping equipment shall comply with the requirements of the ISO 9001 Quality and ISO 14001 Environmental Management Systems, and such compliance shall be verified by an independent certification agency approved by the International Organization for Standardization. Documentation shall be submitted for approval showing compliance with this requirement, and the equipment will not be released for shipment until approved.

- C. Pumps, complete with motor, coupling, baseplate, necessary guards, and all other specified accessories and appurtenances shall be furnished by the pump manufacturer to insure compatibility and integrity of the individual components, and provide the specified warranty for all components. The pump manufacturer accepts unit responsibility for each pump assembly.
- D. The pumps specified in this section shall be furnished by and be the product of one manufacturer.

1.5 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Submit manufacturer's installation instructions.
- C. The submittal data shall be prepared, in its entirety, by the equipment manufacturer. Shop drawings prepared by the manufacturers sales representative, fabrication shop or other than the listed manufacturers shall not be acceptable. No additions or modifications to the manufacturer's submittal will be accepted, with the sole exception of a cover sheet provided by the manufacturer's local representative.

1.6 OWNER'S MANUAL

- A. OWNER'S MANUAL requirements shall be as set forth in Sections 11000 and 11175.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include installation instructions, assembly views, lubrication instructions, and replacement parts lists.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle and protect under provisions of Section 11000.

1.9 SERVICES OF MANUFACTURER

Services of the manufacturer shall be provided in accordance with Section 11175 and as follows:

- A. **Inspection, Startup, and Field Adjustment:** Furnish the services of a representative of the pump manufacturer to assist in adjusting and testing the equipment furnished, to supervise the initial operation, and to make final adjustments as may be necessary to assure the City that the pumps are in satisfactory operating condition.

1.10 PUMPED FLUID

- A. **Pumped Fluid:** The fluid to be pumped is unscreened municipal wastewater. The fluid is anticipated to range between 64 degrees F and 78 degrees F and contain up to 2500 mg/L of solids consisting of grit, rags, and organic material with organic and inorganic materials, and petroleum products, including grease. Owing to the presence

of grit, the fluid is expected to be somewhat abrasive.

- B. **Installation Environment:** The pump will be installed in an dry well conforming to the requirements of this Section and furnished by the pump manufacturer in accordance with the unit responsibility requirements prescribed in Section 11175. Drive control equipment will be installed in a weather protected, conditioned space.
- C. **System Operation:** The pumps will be configured to control the wet well liquid surface elevation. The pumps will obtain the fluid to be pumped from a trench type wet well through the specified inlet piping. The pumps will be operated at constant speed

PART 2 – PRODUCTS

2.1 PERFORMANCE

- A. The pumps shall be designed for continuous operation and will be operated continuously under normal service. Hydraulic performance criteria is based on Wemco Pumps, 3x11S EVM, or a Yeomans Pump Series 9235-4103CSC (two installed units and one uninstalled unit) or an approved equal. Contract Drawings shows the Yoemans pump; any dimensional changes caused by the selection of another pump that impact the design intent will be the responsibility of the Contractor at no additional cost to the City.

B. OPERATION CRITERIA

	Flow GPM	TDH FT	Max. Pump RPM	Solids Passage	Min. Suction Dia.	Min. Disch. Dia.	Min.-Max Motor Size
Design Condition	160	71	1750	3"	3"	3"	10-15 hp

2.2 DESIGN

- A. The pumps shall be vertical, close coupled, horizontal suction via suction base elbow and horizontal discharge, and shall be completely open from suction to discharge with no wearing rings or impeller faceplates required. All flow path clearances within the pumps shall be equal to or greater than the discharge diameter, so that all solids which will pass through the discharge will pass through the pump.
- B. The impeller shall be an enclosed non-clog type or be a recessed vortex type mounted completely out of the flow path between the suction inlet and discharge connections, so that the solids pumped are not required to flow through the impeller. The impeller shall be keyed to the shaft and secured by an impeller bolt.

2.3 MATERIALS OF CONSTRUCTION

- A. The volute shall be manufactured of Cast Iron material, ASTM A48 CI 25
- B. The impeller shall be manufactured of Cast Iron material, ASTM A48 CI 25

C. The impeller backplate shall be manufactured of Cast Iron material, ASTM A48 Class 25

D. BEARING HOUSING

1. The bearing housing shall be of cast iron, ASTM A48CL-25.
2. The shaft shall be of ASTM A108, Grade 1045 (or equal) steel, and shall be protected throughout the packing area by a removable, hardened, stainless steel shaft sleeve conforming to ASTM A 582 Type 416.
3. Bearings shall be grease lubricated and shall be contained in dust and moisture proof housings.

E. SHAFT SEALING

1. Mechanical Seal with external flush for cooling seal faces.

F. MOUNTING

1. Vertical Pedestal Type
 - a. The pump manufacturer shall provide a pedestal base, which shall be rugged enough to support the entire weight of the pump, motor, and motor support bracket.
 - 1) The pedestal base shall have openings large enough to permit access to the suction line, and to the inspection port in the suction elbow.
 - 2) The pedestal base shall be constructed such that the support legs of the pedestal are of sufficient length to prevent the suction elbow from contacting the floor or level foundation upon which it stands.
 - b. The pump manufacturer shall provide a motor pedestal between the pump and the motor, which shall be rugged enough to support the entire weight of the motor.
 - 1) The motor pedestal shall have openings large enough to permit access to the packing or mechanical seal gland
 - c. The pump manufacturer shall provide and install a cast or fabricated suction elbow to provide a connection means between the pump suction and the supply piping, which shall include a sealed hand hole inspection port.

2.4 MOTOR

- A. Motor shall be immersible type, 10 HP, 3 Phase, 240 Volt, 1750 RPM, and shall be connected to the pump by the drive method specified. All motors shall be of nationally known manufacture and shall conform to NEMA standards and specifications. See

Section 16040 Electric Motors for additional requirements.

2.5 PAINTING

- A. All external surfaces of the pump and motor shall be coated as specified in Section 09800. All interior wetted ferrous surfaces of the pump shall be coated with fusion bond epoxy as specified in Section 09800.

2.6 NAMEPLATES, TOOLS, AND SPARE PARTS

- A. **Spare Parts:** The WORK includes the following spare parts for each pump:
 - (1) 2 sets special tools required for maintenance
 - (2) 1 set of wearing rings
 - (3) 1 mechanical seal, complete
 - (4) 1 lower bearing assembly
 - (5) 1 set of all washers, gaskets, and O-rings

2.7 MANUFACTURERS

- A. Pursuant to the limitations described in paragraph 11000-2.1D, candidate pump manufacturers include Wemco, Yeomans, Flygt, or equal.

2.6 OPTIONAL TESTING

- A. A certified shop test shall be performed on each pumping unit in accordance with the test code of the Hydraulic Institute protocol "A". Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency for capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test run. At least one point of the six shall be taken as near as possible to each specified condition.
- B. Results of the performance tests shall be certified by a Registered Professional CONSTRUCTION MANAGER and submitted for approval before final shipment.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. The pump manufacturer shall provide the complete pumping system and factory trained personnel to supervise installation and initial operation of all components. The pumps shall be aligned, connected and installed at the locations indicated and in accordance with the manufacturer's recommendations and the requirements of Section 11175. The installation shall be certified by the manufacturer.

****END OF SECTION****

**SECTION 14600 - HOISTS AND WALL MOUNTED CANTILEVER JIB CRANES,
GENERAL**

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for hoists and wall mounted cantilever jib cranes.
- 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 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 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoists)
 - 4. ANSI B30.16 Portal, Tower, and Pillar Cranes
 - 5. ANSI MH 27.1 Specifications for Underhung Crane and Monorail Systems
 - 6. ASTM A 36 Specification for Structural Steel
 - 7. CMA Crane Manufacturer's Association of America
 - 8. NEMA National Electrical Manufacturers Association

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000, the following shall be submitted:
 - 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, the following shall be submitted:
 - 1. Certification by CONTRACTOR and manufacturer that equipment complies with the indicated requirements: Steel painted, articulated (180 degrees max rotation), wall mounted jib crane designed to lift the combined weight of pump casing and motor; Type 316 stainless steel chain and hoist and locking mechanism when not in use.

1.6 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000 when listed in specific hoists and cranes sections.

PART 2 – PRODUCTS

2.1 PRODUCTS

- A. All items shall be new, of current design, from reputable manufacturers specializing in such products.

2.2 MANUFACTURERS

- A. Equipment shall be manufactured by one of the following (or equal). See Contract Drawings for additional requirements.
 - David Round
 - Wallace Cranes
 - Crane Authority

PART 3 -- EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Hoists and cranes shall be installed in accordance with the manufacturer's installation instructions, Section 11000, this Section, and the requirements shown on the plans.

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 14610 – DAVIT CRANES

PART 1 – GENERAL

- 1.1 Experience: manufacturer shall have a minimum of 5 years experience producing substantially similar equipment.
- 1.2 Quality Assurance: manufacturer shall be registered ISO 9001:2000 compliant with an independent certification agency approved by the International Organization for Standardization.

PART 2 – PRODUCTS

2.1 DAVIT CRANE

- A. Manufacturer: davit crane shall be as manufactured by Thern, Inc., Series 5122SS, or equal.
- B. Design Factor: designed with an ultimate design factor greater than 3:1 for all components including the lifting winch and base.
- C. Lift Capacity: davit crane shall have a fixed lift capacity of 500 pounds at all boom positions.
- D. Hook Reach: boom when horizontal shall have a minimum hook reach of 42 inches measured from mast center to hook center.
- E. Hook Height: hook height shall be adjustable to two positions, one at horizontal and the other at 45 degrees from vertical, with a minimum of 22 inches between the lowest position and the highest position.
- F. Boom Sheave: wire rope shall pass over a sheave at the end of the boom.
- G. Clearance: minimum height of the boom shall be 24 inches between mounting surface and the underside of the boom in all base configurations.
- H. Rotation: mast and boom shall rotate 360 degrees in the base.
- I. Fastening Pins: crane components shall be fastened together using stainless steel clevis style pins.
- J. Portability: davit crane shall fold down or break down into portable components, with total crane weight not to exceed 78 pounds.
- K. Winch Location: lifting winches shall be located such that the center point of the drive shaft is behind the centerline of the mast.
- L. Nametag: davit crane shall be labeled with a non-corrosive metal identification plate labeled or imprinted with the manufacturer's name, model number, serial number, capacity rating, and other essential information.

2.2 CRANE BASE

- A. Manufacturer: crane base shall be as manufactured by Thern, Inc., Series 522SS or equal.
- B. Interface: crane base shall allow for removal of the mast.
- C. Bearings: crane base shall have a Nylatron GSM bearing sleeve to support the mast at the top of the base.

2.3 CRANE AND BASE FINISH

- A. Material: crane boom, mast and base shall be fabricated from AISI 316 stainless steel, with electro-polish finish.

2.4 LIFTING WINCH

- A. Lifting Winch: winch shall have machine cut gears, an adjustable handle that mounts securely to the drive shaft, bronze bearings, and a positive load holding Weston style brake able to stop and hold the load automatically if the winch handle is released.
- B. Cable Anchor: lifting winch shall include a quick disconnect feature allowing quick attachment and detachment of wire rope equipped with a swaged ball anchor.
- C. Material: lifting winch shall be fabricated from type 304/17-4 stainless steel minimum, with electro-polish finish.

2.5 WIRE ROPE

- A. Wire Rope: wire rope construction shall be 7 x 19 type 304 stainless steel cable.
- B. Hooks: latch type hooks shall be used and shall be either non-rotating eye type or swivel type to allow 360 degree rotation under all load conditions. Hooks shall be heat treated drop forged type 316 stainless steel.

2.6 MANUFACTURERS

- A. Equipment shall be manufactured by the following (or equal). See Contract Drawings for additional requirements.

Thern

PART 3 -- EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Hoists and cranes shall be installed in accordance with the manufacturer's installation instructions, Section 11000, this Section, and the requirements shown on the plans.

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 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. Uniform Mechanical Code
2. Uniform Plumbing Code
3. Uniform 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:

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch)
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
ANSI/ASME B31.1	Power Piping
ANSI/AWWA C111	Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings

ANSI/AWWA C150	Thickness Design for Ductile Iron Pipe
ANSI/AWWA C153	Ductile Iron Compact Fittings, 3 In through 24 In and 54 In Through 64 In for Water Service
ANSI/AWWA C207	Steel Pipe Flanges for Water Works Service, Sizes 4 in. through 144 in.
ANSI/AWWA C213	Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
ANSI/AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 In Through 12 In for Water Distribution
ANSI/AWWA C905	Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In through 36 In
ANSI/AWS D10.9	Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing
ASTM A 123	Specification for Zinc Coatings on Iron and Steel Products
ASTM A 536	Ductile Iron Castings
ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement
ASTM D 2000	Classification System for Rubber Products in Automotive Applications

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted:

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:

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 D10.9. 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 D10.9 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 CONSTRUCTION MANAGER 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. Existing flanges where new insulating gaskets are required for the project may require boring the holes greater or replacement of the flanges at no additional cost to the CITY.
- F. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated and shall consist of insulating gaskets (retainer), insulating bolt sleeves, and double insulating washers. All insulating components shall be NEMA G-10 epoxy glass. Insulating gaskets (retainers) shall be full face, Type E and shall have a Buna-N (nitrile) O-ring type sealing element such as PSI Linebacker or equal.

Insulating flange kits shall be tested and inspected by the City's Corrosion CONSTRUCTION MANAGER. The City's Corrosion CONSTRUCTION MANAGER shall be contacted at (858) 614-5560 a minimum of 48 hours prior to the assembly of any insulating flange kits. Insulating flange kits shall be installed and tested in accordance with NACE SP0286-07. Insulating flange kits shall be tested using a minimum of two test methods. The first test method shall utilize a Gas Electronics Model 601 Insulator Checker specifically designed for testing insulating flanges. Additionally, insulating flanges shall be tested by measuring pipe-to-soil potentials on either side of the insulating joint as described in SP02186-07 Paragraph 9.2.2.

The installation of the insulating flange kit shall be considered complete when the testing above indicates that no shorts or partial shorts are present. Any insulating flange kit that is determined to be ineffective shall be repaired or replaced at the CONTRACTOR'S expense.

- 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 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 epoxy-coated at the factory.
- 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: 200 psi (4:1 safety factor)
 - (b) 12 inch diameter: 150 psi (4:1 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 or C905 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.

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 250 degrees F shall be flanged reinforced neoprene or butyl rubber spools, rated for working pressures up to 220 psi or reinforced flanged rubberized duck, as fabricated by general Rubber, Maxi Joint Style 1101. For temperatures above 250 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. Material selection shall be proposed by the manufacturer based on the application.

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 PIPE INSULATION (NOT USED)

2.10 AIR AND GAS TRAPS (NOT USED)

2.11 STEAM TRAPS (NOT USED)

2.12 GLASS LINING (NOT USED)

2.13 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.
PSI Products, Inc.

2. **Flange Gaskets:**

John Crane, Style 2160
Garlock, BLUE-GARD® Style 3000

3. **Steel Pipe Couplings:**

Gustin-Bacon (banded or grooved)
Victaulic Vic-Ring® Style 41 or 44 (banded)
Victaulic Style 77 or Zero-Flex® Style 07 (grooved)

4. **Ductile Iron Pipe Couplings:**

Gustin-Bacon
Victaulic Style 31

5. **Couplings for PVC Pipe:**

Gustin-Bacon
Victaulic Style 775

6. **Sleeve-Type Couplings:**

Dresser, style 38
Ford Meter Box Co., Inc., Style FC1 or FC3
Smith-Blair, Style 411

7. **Dismantling Joints:**

Romac Industries, Inc DJ400
Smith-Blair, Inc 970 Series

PART 3 -- EXECUTION

3.1 GENERAL

- A. Pipes, fittings, and appurtenances shall be installed in accordance with the manufacturer's installation instructions.

****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, copper pipe, solvent-welded PVC pipe, cast iron soil pipe, and corrosion-resistant cast iron pipe with fittings, gaskets, bolts, insulating connections, pipe insulation, 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:

ANSI/ASME B16.3	Malleable Iron Threaded Fittings, Classes 150 and 300
ANSI/ASME B16.4	Cast Iron Threaded Fittings, Class 125 and 250
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
ANSI B16.11	Forged Steel Fittings, Socket-Welding and Threaded
ANSI B16.12	Cast-Iron Threaded Drainage Fittings
ANSI/ASME B16.15	Cast Bronze Threaded Fittings, Classes 125 and 250
ANSI B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
ANSI B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ANSI/ASME B16.24	Cast Copper Alloy Pipe Flanges and Flanged Fittings
ASTM A 53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 74	Specification for Cast Iron Soil Pipe and Fittings
ASTM A 105	Specification for Forgings for Piping Components

ASTM A 106	Specification for Seamless Carbon Steel Pipe for High Temperature Service
ASTM A 269	Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
ASTM A 312	Specification for Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A 518	Specification for Corrosion-Resistant High-Silicon Iron Castings
ASTM B 42	Specification for Seamless Copper Pipe, Standard Sizes
ASTM B 43	Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings
ASTM B 88	Specifications for Seamless Copper Water Tube
ASTM C 599	Specification for Process Glass Pipe and Fittings
ASTM D 1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2996	Specification for Filament-Wound Reinforced Thermosetting Resin Pipe
ASTM D 4101	Specification for Propylene Plastic Injection and Extrusion Materials
ASTM F 441	Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 - 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 (NOT USED)

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.

2.8 CHLORINATED POLYVINYL CHLORIDE PRESSURE PIPE, SOLVENT-WELDED (NOT USED)

2.9 POLYPROPYLENE PIPE (NOT USED)

2.10 PROCESS GLASS PIPE (NOT USED)

- 2.11 FIBERGLASS REINFORCED PLASTIC PIPE (NOT USED)
- 2.12 CAST IRON SOIL PIPE (NOT USED)
- 2.13 CORROSION-RESISTANT CAST IRON SOIL PIPE (NOT USED)

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:** PVC 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.

3.2 CONTINUITY BONDS (Not Used)

****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. Divisions 11, 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:

ANSI A13.1	Scheme for the Identification of Piping Systems
ANSI Z535.1	Safety Color Code
MIL-STD-810	Environmental Test Methods and CONSTRUCTION MANAGERING Guidelines
NFPA	Guide to Hazardous Materials
NFPA 704	Hazard Identification System
UFC 79-3	Identification of the Health, Flammability and Reactivity of Hazardous Materials
29CFR 1910.106	Flammable and Combustible Liquids (OSHA)
29CFR 1910.145	Specification for Accident Prevention Signs and Tags (OSHA)
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):

CCR, Title 8, ' 537	Piping Systems Valving and Labeling (Cal-OSHA)
CCR, Title 8, ' 3321	Identification of Piping (Cal-OSHA)
CCR, Title 8, ' 5194	Hazard Communication (Cal-OSHA)

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 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 UFC 79-3 and 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 in accordance with Section 16050 and as indicated.

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 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 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."

<u>Fluid Abbreviation</u>	<u>Function & Identification</u>	<u>Identification Color</u>	<u>Remarks Suggested Tnemec Color or Equal</u>
BD	Bottom Drain	Brown	Banyonbark AC12 (dark brown)
BP	Bypass	See Remarks	Same color corresponding to fluid being bypassed
D	Drain	Brown	Banyonbark AC12 (dark brown)
F	Fire	Red	Safety Red,
FM	Forcemain	See Remarks	Same color corresponding to fluid being carried
FPW	Fire Protection Water	Red	Safety Red
F	Fire,		
FSW	Filter Surface Wash-Water	Purple	Reclaimed Purple R1217
LSP	Landscaping Sprinkler - Potable Water	Light Blue	Clear Sky EN17
LSR	Landscaping Sprinkler - Reclaimed Water	Purple	Reclaimed Purple R1217
OF	Overflow	See Remarks	Same color corresponding to fluid from which overflow comes
PD	Plant Drain	Brown	Banyonbark AC12 (dark brown)
PE	Primary Effluent	Grey	Grey IN05
PLI	Plant Influent	Grey	Grey IN05

<u>Fluid Abbreviation</u>	<u>Function & Identification</u>	<u>Identification Color</u>	<u>Remarks Suggested Tnemec Color or Equal</u>
POF	Plant Overflow	See Remarks	Same color corresponding to fluid from which overflow comes
PW	Potable Water	White	White WH01
W1	W1 - Potable Water		
RS	Raw Sewage	Grey	Grey IN05
SD	Sanitary Drain	Grey	Grey IN05
SDR	Storm Drain	Grey	Grey IN05
SPD	Sump Pump Discharge	Brown	Banyonbark AC12 (dark brown)
SS	Sanitary Sewer	Grey	Grey IN05
SVT	Sanitary Vent	Grey	Grey IN05

****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. Uniform Plumbing Code

PART 2 – PRODUCTS

2.1 PRESSURE AND VACUUM GAUGES

- A. **General:** Pressure gauges shall be installed on suction and discharge connections to pumps; on discharge connections from blowers and compressors; at each side of pressure reducing valves; and where otherwise indicated. Vacuum gauges and compound gauges, where indicated, shall be installed on vacuum pumps.
- B. **Gauge Construction:** Gauge assemblies shall include the following and mount off of the piping to reduce vibration or as indicted on the plans: Type 316 stainless steel nipple into piping; 1-inch stainless steel isolation ball valve; high-pressure rated flexible hose; 1-inch stainless steel ball valve; air release fitting; diaphragm seal and pulsation dampener; pressure gauge with safety blow-out relief (diaphragm seal and gauge filled with glycerin for isolating valve from sewage).
- 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 psi, and elastomer diaphragm for pressures of

15 psi 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.

2.2 SLEEVE PRESSURE GAUGES

- A. General: Sleeved pressure gauges shall be provided where indicated.
- B. Sensors shall be in-line ring-type, bolted directly between 600 lb R.F. flanges. The sensors shall have through-holes for positive alignment with pipeline flanges. Inside diameters of the sensors shall be the same at the mating pipes. Pressure sensing rings shall measure pressure for 360 degrees around the inside circumference of the pipe. Pressure shall be transmitted to the gauge by a locked-in, sealed ethylene glycol or silicone oil. The pressure indicators shall be local to the sensors. Pressure transmitters shall be connected by capillary tubing to the sensors.

2.3 MANUFACTURERS

A. Pressure and Vacuum Gauges

- 1. **Pressure and vacuum gauges shall be manufactured by one of the following (or equal):**

Ashcroft Industrial Instruments (Dresser)
Foxboro/Jordan, Inc.
Marsh Instrument Company
Marshalltown Instruments, Inc.
U.S. Gauge Div. of Ametek

- 2. **Diaphragm seals shall be of the following manufacture and model (or equal):**

- a. Stainless steel diaphragm seals and elastomer diaphragm seals for sewage, sludge and liquids containing solids.

Ashcroft®, model 101
Marshalltown, Series 225-01
U.S. Gauge (Ametek), SG

- b. Teflon diaphragm and elastomer diaphragm seals for chemical solutions, low pressure sewage, and chemical sludge.

Harrington Ind. Plastics, Inc.
Plast-O-Matic Valves, Inc.
Utilities Supply

B. Sleeve Pressure Gauges:

- 1. **Sleeve pressure gauges shall be manufactured by one of the following (or equal):**

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 installed to minimize the effect of water hammer and vibrations, and, where indicated, gauges shall be mounted independently, with flexible connectors.

*** *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.

1.2 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 15105 Check Valves
 - 4. Section 15109 Gate Valves

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following standards apply to the WORK of this Section:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
ANSI/ASME B1.20.1	General Purpose Pipe Threads (Inch)
ANSI/ASME B31.1	Power Piping
ASTM A 36	Specification for Structural Steel
ASTM A 48	Specification for Gray Iron Castings
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 536	Specification for Ductile Iron Castings
ASTM B 61	Specification for Steam or Valve Bronze Castings
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings

ASTM B 148	Specification for Aluminum-Bronze Castings
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems
ANSI/AWWA C502	Dry-Barrel Fire Hydrants
ANSI/AWWA C503	Wet-Barrel Fire Hydrants
ANSI/AWWA C504	Rubber-Seated Butterfly Valves
ANSI/AWWA C506	Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types
ANSI/AWWA C507	Ball Valves 6 Inches Through 48 Inches
AWWA C508	Swing-Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water and Sewage Systems
AWWA C550	Protective Interior Coatings for Valves and Hydrants
SSPC-SP-2	Hand Tool Cleaning
SSPC-SP-5	White Metal Blast Cleaning

1.4 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted:

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:

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.
- C. **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 of submerged valves, shall be epoxy coated conforming to Section 09800. Flange faces of valves shall not be epoxy coated.
- D. **Valve Operators:** Provide valves with hand wheels and extension rods and operating nuts as shown on the drawings (sheet M-2, detail 1). Hand wheel and 2" SQ nut shall be cast iron; universal joints shall be Type 316 stainless steel as fabricated by Belden or approved equal. 1 1/2" extension rod shall be Type 316 stainless steel, solid drive shaft.
- E. **Nuts and Bolts:** Nuts and bolts on valve flanges, bodies and supports shall comply with Section 05500.

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 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 C506, AWWA C508, and Section 15100.
- B. Proof-of-design tests shall be submitted in compliance with Section 15100 for all check valves size 10-inch and larger.

PART 2 – PRODUCTS

2.1 RUBBER FLAPPER SWING C VALVES

- A. The check valve shall be of the full body type, with a domed access cover and only two moving parts; flexible disc and disc accelerator. The valves shall be designed, manufactured and tested in accordance with American Waterworks Association Standards ANSI/AWWA C508. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited certifying body. Valves shall be provided with flanges in accordance with ANSI B16.1, Class 125.
- B. The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Optional body materials include ASTM A-351 Grade CF8M, stainless steel (sizes 3” through 8”). The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG. Optional disc materials include Viton. The disc accelerator shall be type 302 stainless steel.
- C. A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stem in a bronze bushing. The backflow device shall be of the rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operation.
- D. A mechanical indicator shall be provided to provide disc position indication on valves 4” and larger. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication.

- E. All check valve parts shall be fully serviceable without removing the main valve from the line. Valve rating shall be 175 psi working pressure for use on water or sewage.
- F. Provide manual backflow device.
- G. The valve manufacturer shall demonstrate a minimum of five years experience in the manufacture of resilient, flexible disc check valves with air and hydraulic cushions.
- H. Provide limit switch to monitor valve OPEN and CLOSED status.

2.2 MANUFACTURERS

- A. Check valves shall be manufactured by the following (or equal):
 - 1. Swing check valves (3-inch and larger):

Val-Matic Surge Buster with disk position indicator and backflow actuator accessories.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Valves shall be installed in accordance with Section 15100.

*** *END OF SECTION* ***

SECTION 15109 - GATE VALVES

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing epoxy-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. Buried valves shall be of the inside screw type and shall be designed for repacking under line pressure. Valves 14-inch and larger installed in vertical pipes with stems horizontal shall be fitted with bronze slides, tracks, rollers, and scrapers to assist the travel of the gate assembly. Quick-opening valves shall have quick opening levers and cams in lieu of handwheel operators. Where other operators are indicated, comply with Section 15101. Ferrous surfaces of the valves, 4-inch and larger and in contact with water shall be epoxy-coated conforming to Section 09800.

2.2 METAL-SEATED GATE VALVES (3-INCH AND LARGER)

- A. Not Used.
- B. **Solid Wedge Type:** Gate valves for other than water service shall be of the iron-body, bronze-mounted, solid wedge type with non-rising stem, opening counter-clockwise, and provided with a 2-inch square operating nut or handwheel, as indicated, except where operators are shown. Valves shall have flanged or mechanical joint ends.

2.3 KNIFE GATE VALVES (NOT USED)

2.4 RESILIENT-SEATED GATE VALVES (3-INCH AND LARGER) (NOT USED)

2.5 GATE VALVES (SMALLER THAN 3-INCH) (NOT USED)

2.6 MANUFACTURERS

A. Products of the type or size indicated shall be manufactured by one of the following (or equal):

1. Metal seated gate valves (3-inch and larger):

American-Darling Valve Co.
Clow Corporation
Kennedy Valve Mfg. Co. (ITT Grinnell)
Milwaukee Valve Company
Mueller Company
Stockham Valves and Fittings

2. Resilient-seated gate valves:

A-C Valves, Inc.
Clow Corporation
Kennedy Valve Mfg. Co., (ITT Grinnell)
Mueller Company
Stockham Valves and Fittings

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Gate valves shall be installed in accordance with Section 15100.

*** *END OF SECTION* ***

SECTION 15150 - INSTRUMENTS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes the general specification and requirements for the instrumentation and control WORK under this and other applicable Specifications.
- B. The WORK of this Section includes providing ultrasonic meters complete with sensor mounting hardware and transmitter to measure liquid levels.
- C. The WORK of the Section includes providing float switches.
- D. City will be responsible for all PLC programming.

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 16050 Basic Electrical Material and Methods

1.3 CODES

- A. 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. Uniform Fire Code
 - 2. National Electrical Code

1.4 SERVICES OF MANUFACTURER

- A. **Calibration, Testing and Startup:** A technical service representative of the manufacturer shall visit the site and perform the following on all flow meters and analyzers.
 - 1. Inspection, checking and calibrating the equipment.
 - 2. Startup and field testing for proper operation.
 - 3. Performing field adjustments to ensure that installation and operation comply with the Specifications.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Products delivered to the site for incorporation into the WORK of this Section 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 ULTRASONIC

- A. The meter shall be a noncontact, ultrasonic echo-time measuring device, suitable for 120 volt, 60 hertz power supply. It shall consist of a piezoelectric transducer element assembly and a remote transmitter unit interconnected by manufacturer-supplied coaxial cable.
- B. The system shall utilize 1500 volt peak minimum energy level on the transducer and shall be suitable for measuring liquid surfaces from 2 to 35 feet below the transducer. The meter shall incorporate a reference reflector to provide instantaneous sound velocity compensation and it shall utilize microprocessor circuitry to process echo times for elimination of stray echoes and, where indicated, to provide linearization functions.
- C. The ultrasonic level meter shall produce a narrow beam angle of not more than 7 degrees total included angle. The ultrasonic sensor system shall have temperature compensation circuitry operable over the range of minus 40 degrees C to plus 50 degrees C, and shall be encapsulated to ensure a Class 1, Division 1 hazard rating. The sensor shall be unaffected by condensation and, if required, shall be provided with an integral heater. The transmitter shall be housed in a NEMA 4X enclosure, have a six digit display for level and "echo-lost" indication, and shall produce a 4-20 mA output signal into 800 ohms, maximum. The entire system shall be accurate within plus or minus 0.1 foot of true liquid level.
- D. The meter shall be provided with flange or pipe mounting accessories as indicated for the particular installation conditions.
- E. **MANUFACTURERS:** Products of the type or model indicated shall be manufactured by:
 - 1. Pulsar, (no substitutions allowed).

- 2.2 **FLOAT SWITCH:** Float switches shall be 16A at 250V, SPDT, and shall consist of a fixed hermetically sealed microswitch. Process wetted materials shall be polypropylene and/or 316 stainless steel and rated for sewage service. Cable shall be made of oil resistant PVC. Shall be manufactured by MJK North America 7030 Series or approved equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. The **CONTRACTOR** shall employ installers who are skilled and experienced in the installation and connection of all elements, all instruments, all accessories, and all assemblies provided under this Contract.

- B. Ultrasonic level meters shall be rigidly mounted approximately 2 feet above maximum liquid level and accurately leveled in accordance with the manufacturer's written instructions.
- C. **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 match the existing conductors replaced. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat shrink plastic.

3.2 INSTRUMENT CABLE TESTS

- A. **General:** The following tests shall be performed on each instrumentation and control system cable. All tests shall be end to end tests of installed cables with the ends supported in free air, not adjacent to any grounded object. All test data shall be recorded on forms which are available from the CONSTRUCTION MANAGER. Complete records of all tests shall be made and delivered to the CONSTRUCTION MANAGER. Each form shall be signed by the CONSTRUCTION MANAGER or the CONSTRUCTION MANAGER's Representative who witnessed the testing.
- B. Continuity tests shall be performed by measuring wire/shield loop resistance of each signal cable as the wires, taken one at a time, are shorted to the channel shield. No loop resistance measurement shall vary by more than plus or minus 2 ohms from the calculated average loop resistance value.
- C. Insulation resistance tests shall be performed by using a 500 volt megohmmeter to measure the insulation resistance between each channel wire, between each channel wire and the channel shield, between individual channel shields in a multichannel cable, between each individual channel shield and the overall cable shield in a multichannel cable, between each wire and ground, and between each shield and ground. Values of resistance less than 1 megohms shall be unacceptable.

3.3 INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, STARTUP AND INSTRUCTION

- A. **Installation and Connection:** The CONTRACTOR shall install and connect all field mounted components and assemblies under the following criteria:
 - 1. All power and all signal wires shall be terminated with spade type lugs.
 - 2. All connectors shall be, as a minimum, water tight.
 - 3. After all installation and connections have been completed, a technical field representative of the CONTRACTOR shall check the WORK for polarity of electric power and signal connections, leaks at all process connections, and conformance with requirements. The technical field representative shall certify in writing to the CONTRACTOR that each loop and system meets requirements.

4. All wire and all cable shall be connected from terminal to terminal without splices, arranged in a neat manner and securely supported in cable groups. All wiring shall be protected from sharp edges and corners.
- B. **Calibration:** All analog instrumentation and all control system equipment shall be calibrated and tested after installation to verify that requirements are satisfied. The CONTRACTOR shall provide all necessary labor, tools, and equipment to calibrate and test each instrument in accordance with the manufacturer's instructions. Each instrument shall be calibrated at a minimum of three points using test equipment to simulate inputs and read outputs. All test equipment and all instruments used to simulate inputs and read outputs shall be suitable for the purpose intended and shall have an accuracy better than the required accuracy of the instrument being calibrated. Test equipment shall have accuracies traceable to the NIST as applicable. All analog instruments shall be calibrated and tested in place without removal. Test data, applicable accuracy requirements, all instrument manufacturer published performance specifications and all permissible tolerances at each point of calibration shall be entered on test forms available from the CONSTRUCTION MANAGER. These test forms shall verify compliance with all. A report shall be delivered to the CONSTRUCTION MANAGER for each instrument, certifying that the instrument has been calibrated in the presence of the CONSTRUCTION MANAGER or the CONSTRUCTION MANAGER's designated representative and meets contract and system requirements.
- C. **Analog Loop Tests:** The CONTRACTOR shall be responsible for loop checking and testing all instrumentation loops with this project. The CONTRACTOR shall coordinate all loop check functions with the CSP to ensure that a single total loop check is conducted. The intent of the loop checks is to confirm and document each loop's component specification conformance up to and including all field-situated CSP devices. The CSP will have all control room personnel present to witness and confirm loop check results at the CRT level. The CONTRACTOR shall provide all necessary labor, tools, and equipment to field test, inspect and adjust each instrument to its indicated performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or any published manufacturer performance specification for functional and operational parameters, whether or not indicated in the Contract Documents, shall be repaired or replaced, at the discretion of the CONSTRUCTION MANAGER at no additional cost to the OWNER.
1. At least 15 days before installation testing begins, the CONTRACTOR shall submit to the CONSTRUCTION MANAGER a detailed description, in duplicate, of the installation tests to be conducted to demonstrate correct installation of the instrumentation and control system and the anticipated dates the testing will occur.
 2. Controllers and electronic function modules, shall be tested and exercised by the CONTRACTOR to demonstrate correct operation, first individually and then collectively as functional analog networks. Each hardwired analog control network shall be tested to verify proper performance within indicated accuracy tolerances. Accuracy tolerances for each analog network are defined as the root mean square summation of individual component accuracy tolerances.

Individual component accuracy tolerances shall be as indicated by contract requirements, or by published manufacturer accuracy specifications, whenever contract accuracy tolerances are not indicated.

3. Each analog network shall be tested by applying simulated inputs to the first element(s). Simulated sensor inputs corresponding to 10 percent, 50 percent, and 90 percent of span shall be applied, and the resulting outputs read to verify compliance to network accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation of discrete devices. Temporary settings shall be made on controllers, alarms, etc., during analog loop tests. All analog loop test data shall be recorded on test forms, which include calculated root mean square summation system accuracy tolerance requirements for each output.
4. When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the CONSTRUCTION MANAGER or the CONSTRUCTION MANAGER's representative as a witness, with test data entered, shall be submitted together with a clear and unequivocal statement that all instrumentation has been successfully calibrated, fully inspected, and fully tested.

D. **7 Day Operational Testing:** The CONTRACTOR shall furnish his own personnel, electrical personnel, and any instrument manufacturers' representatives as required during the testing period to produce a fully operational system.

E. **Instruction:** The CONTRACTOR shall train the OWNER'S maintenance personnel in the maintenance, calibration and repair of all instruments provided under this contract.

1. The training shall be performed by qualified representatives of the instrument manufacturers and shall be specific to each instrument model provided. Instructors shall have at least 2 years of training experience.
2. Each training class shall be a minimum of 2 hours in duration and shall cover Operational Theory, Maintenance, Trouble Shooting/Repair, and Calibration of the instrument.
3. Proposed training material, including resumes for the proposed instructors and a detailed outline of each lesson shall be submitted to the CONSTRUCTION MANAGER at least 30 days in advance of when the lesson is to be given. The CONSTRUCTION MANAGER shall review the submitted data for suitability and provide comments which shall be incorporated into the course.
4. Within 10 days after the completion of each lesson the CONTRACTOR shall present to the CONSTRUCTION MANAGER the following:
 - a. A list of all OWNER personnel that attended the lesson.

- b. An evaluation of OWNER personnel knowledge through written testing or equivalent.
- c. A copy of text utilized during the lesson with all notes, diagrams, and comments

*** *END OF SECTION* ***

SECTION 16030 - ELECTRICAL TESTS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes testing, commissioning and demonstrating electrical WORK.
- B. The WORK of this Section includes circuit activation, equipment running and installation of temporary jumpers.
- C. The WORK of this Section includes correction of defects and retesting.

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 16050 Basic Electrical Materials and Methods

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. 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. NETA National Electrical Testing Association, Latest Edition

1.5 NOT USED

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted:
 - 1. Report of testing of electrical WORK.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT AND MATERIALS

- A. Test instruments shall be calibrated to references traceable to the National Bureau of Standards and shall have a current sticker showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required.

PART 3 -- EXECUTION

3.1 TESTING

- A. In addition to indicated testing requirements and acceptance criteria, testing shall include the following:
 - 1. **Lighting:** N/A
 - 2. **Power Instrumentation:** Demonstration that voltmeter and ammeter switches are functional and that meters, including kilowatt meters, are installed within catalog accuracy.
 - 3. Demonstration of mechanical and electrical interlocking by attempting to subvert the indicated sequence.
 - 4. Activation of ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in the ground current sensor circuit. Where not otherwise indicated, ground fault tripping shall occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amperes or less.
 - 5. **Cable Testing:** 480-volt circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the 480-volt equipment is terminated. Phase-to-phase A-B, B-C, A-C and phase-to-ground insulation resistance tests shall be performed on each 5 kv, 15 kv, and 25 kv cable prior to termination at equipment but subsequent to stress cone makeup. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected. Tests shall be performed with other equipment connected to the circuit. The cable must withstand the test high voltage without breakdown, and shall exhibit steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test. Test results shall identify equipment used and time of test. Cable operating at more than 2,000 volts shall be tested in accordance with ICEA publications S-68-61, S-61-402, S-19-81, and S-68-516. Cable testing and reporting shall be performed by an organization recommended by the Manufacturer of the cable to be tested. The testing organization shall have a record of at least one prior successful project of comparable size and complexity. Testing shall verify the quality of cable terminations. Test results for medium and high voltage cable shall be submitted to the CONSTRUCTION MANAGER 30 days prior to the time schedule for equipment energization.

6. Functional test and testing of electrical components shall be performed prior to subsystem testing and commissioning. Compartments and equipment shall be cleaned before commencement of functional testing. Functional testing shall include:

Visual and physical check of cables, busswork, circuit breakers, transformers, and connections associated with new and modified equipment.

Setting of protective relays in conformance with results of the Short Circuit Study and testing of relays to assure that relays will trip at the current value and time required by the Study.

Circuit breakers which are specified with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Short Circuit Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified and 7 copies shall be submitted to the CONSTRUCTION MANAGER.

7. Complete ground testing of all grounding electrodes prior to operating the equipment utilizing a three-point ground test.
- B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated to the CONSTRUCTION MANAGER and after process control devices have been adjusted. The WORK of this Section includes adjusting limit switches and level switches prior to testing and setting pressure switches, flow switches, and timing relays.
 - C. After initial settings have been completed, each subsystem shall be operated in the manual mode. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify proper start and stop sequence of pumps, proper operation of valves, proper speed control, and similar parameters.
 - D. Subsystems, in the context discussed here, mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, and similar equipment.

3.2 COMMISSIONING

- A. Commissioning during the 7-day test shall not be attempted until all subsystems have been found to operate satisfactorily; commissioning shall only be attempted as a function of normal plant operation in which plant process flows and levels are routine and equipment operates automatically in response to flow and level parameters or computer command, as applicable. Simulation of process parameters shall be considered only upon receipt of a written request by the CONTRACTOR.

****END OF SECTION****

SECTION 16040 - ELECTRIC MOTORS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing electric motors with 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 16050 Basic Electrical Materials and Methods

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. National Electrical Code

1.4 SPECIFICATIONS AND STANDARD

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings.
2. AFBMA 11 Load Ratings and Fatigue Life for Roller Bearings.
3. ANSI/IEEE 112 Standard Test Procedure for Polyphase Induction Motors and Generators.
4. IEEE 841 Standard for Petroleum and Chemical Industry—Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 500 HP
5. NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies
6. NEMA ICS 6 Enclosures for Industrial Controls and Systems.

7. NEMA MG 1 Motors and Generators.
8. UL 674 Motors and Generators, Electric, for Use in Hazardous Locations, Class I, Groups C and D, Class II, Groups E, F and G.
9. UL 1004 Motors, Electric

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted:

1. Machine name and submitted data on driven machine.
2. Motor manufacturer.
3. Motor type, model and dimensioned drawing.
4. Nominal horsepower.
5. NEMA design.
6. Frame size.
7. Enclosure.
8. Winding insulation class and treatment.
9. Rated ambient temperature.
10. Service factor.
11. Voltage, phase, and frequency rating.
12. Full load current at rated horsepower and indicated voltage.
13. Starting code letter, or locked rotor kVA, and current.
14. Special winding configuration.
15. Rated full load speed.
16. Power Factor at full load, $\frac{3}{4}$ load and $\frac{1}{2}$ load.
17. Details of water cooling (if any) for thrust bearings.
18. Motor efficiencies.
19. Name plate drawing with data filled in.
20. Wiring diagram, internal and typical external connections.

21. Port and connection detail for vibration sensor where it is applicable.
 22. Factory tests including sound level, SCT, CIT, vibration, polarization.
- B. The following shall be submitted:
1. **Bill of Material:** Complete Bills of Material with catalog data sheets and manuals for all equipment and devices comprising the variable frequency drive system. Where catalog cuts and other brochures depicting product characteristics are supplied, annotate to show product to be used on this project.
 2. **List of Spare Parts:** A complete list of recommended spare parts. Include item descriptions, recommended quantities, and unit costs. The recommended list should be based on a maintenance plan where the OWNER will remove and replace failed items to the lowest replaceable module/component level.
 3. **Operation, Maintenance and Installation Instructions:** Furnish with the equipment at delivery Operation and Maintenance Manuals, installation instructions, and other documentation necessary for the installation, start-up, operation and maintenance of the system.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. **Conformance:** Electric motors driving identical machines shall be identical.
- B. **Rating:** The nominal rated motor horsepower shall be adequate for the driven machine without infringing upon the indicated motor service factor, unless more restrictive motor requirements are specified for a specific equipment item.
- C. **Minimum Motor hp:** The motor horsepower shall be not less than the minimum indicated for each driven machine. If the minimum horsepower is not adequate, the motor with the next larger horsepower, circuit breakers, magnetic starters, motor feeder conductors and conduit shall be provided.

2.2 DESIGN REQUIREMENTS

- A. **General:** Electric motors shall comply with ANSI/NEMA MG 1.
- B. **NEMA Design:** Except as otherwise indicated, electric motors shall be NEMA Design B, constant speed squirrel-cage induction motors designed for normal starting torque with low starting current. In no case shall starting torque or breakdown torque be less than the value indicated in ANSI/NEMA MG 1.
- C. **Motor Voltage Ratings:** Motors shall be rated 240 volts, 3-phase, 60-HZ.
- D. **Insulation (Heavy Duty Motors):** Motors shall include Class F insulation, rated to operate at an ambient temperature of 50 degrees C without exceeding Class B temperature rise limits at the motor's nominal rating

- E. **Motor Type:** Except as otherwise indicated, all motors shall be totally enclosed, fan cooled (TEFC) with a service factor of 1.15.
- F. **High Efficiency Motors:** Motors with a nameplate rating of 5 hp and above shall be "high efficiency" units with efficiencies determined by the test set forth in ANSI/IEEE 112, Method B with stray load loss adjustment as modified by NEMA MG 1-12.53(a) and (b).
- G. **Efficiency Index:** Efficiency index, nominal efficiency, and minimum efficiency shall be defined in accordance with ANSI/NEMA MG 1-12.53.b. Motor nameplate data shall include the nominal efficiency value.
- H. **Motors for VFD Drives:** NOT USED
- I. **Stator Windings and Resistance Temperature Detectors:** Stator windings shall be copper.
- J. **Thrust Value:** The motor supplier shall be responsible to provide motors that comply with system thrust value from pumps. System thrust value shall be obtained from pump manufacturer.

2.3 MOTOR BEARINGS

- A. **General:** Bearings shall comply with Section 11000.
- B. **Bearing Life:** Except as otherwise indicated, motors shall be heavy duty and shall include bearings with a minimum L-10 life of 100,000 hours.
- C. **Vertical Motors Over 2 hp:** Vertical motors larger than 2 hp shall be furnished with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall comply with the manufacturer's recommendations.

2.4 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 include gaskets.
- B. **Lifting Devices:** All motors weighing 50 lbs or more shall include lifting devices esigned for installation and removal.
- C. **Terminal Boxes:** Motors shall have extra large terminal boxes to accommodate stress cone terminations as recommended by cable manufacturers.
- D. **Nameplate:** Motors shall include a permanent, non-corrosive nameplate indelibly stamped or engraved with NEMA Standard motor data, including bearing description and lubrication instructions, insulation class, ambient temperature, and power factor at full load.

2.5 MANUFACTURER

- A. Motors shall be manufactured by U.S. Motors, or OWNER approved equal.

2.6 IMMERSIBLE MOTOR

A. Design

1. Motors shall be of the explosion-proof design, approved by Factory Mutual for uses in Class I, Groups C&D, hazardous locations.
2. The motors shall be of the immersible type, suitable for full-load, continuous operation either completely dry or fully submerged in the pumped liquid of up to 65 foot depths. Motors shall be of the "air-filled" type, to optimize efficiency, with stator and rotor housed in a watertight chamber containing only air. Motors of the "oil-filled" type, with stator and rotor immersed in oil or motors which circulate the pumped media through internal cooling media channels, ports, or jackets are not acceptable.
3. Motors shall incorporate a separate heat-exchanger circuit, with a shaftmounted cooling pump circulating oil from a jacket surrounding the stator housing to a heat-exchanger surface cast into the pump backplate. The circulating oil shall transfer excess motor heat directly to the pumped media inside the pump volute, without the need of submergence for adequate motor cooling at any continuous power output up to and including rated powers in ambient of 40 deg-C. Alternately, motors shall dissipate heat directly (by convection) from the exposed stator housing to surrounding ambient air, without the need of submergence for adequate motor cooling at any continuous power output up to and including rated power in ambient of 40 deg-C.
4. Motor stator windings and leads shall be insulated with moisture-resistant Class F insulation for operation at temperatures up to 155 degrees Celsius.
5. Motors shall have the stator varnish applied by the "vacuum-pressure impregnation" method to ensure thorough and complete varnish penetration. The stator shall be heat-shrink fitted into the stator housing.
6. Motor cable-entry sealing assembly shall consist of the following five components to ensure a positive, redundantly watertight seal:
 - a. The sealing components shall be mechanically isolated from cable strains by a two-piece restraining clamp, which will securely grip the cable above the moisture-sealing components and bear any mechanical forces applied to the cable.
 - b. The cable moisture seal shall consist of an elastomer grommet, prevented from extruding past the cable by stainless-steel retaining washers on either side. The grommet shall be compressed tightly against the cable outside diameter (and the entry assembly inner diameter) by a screwed follower gland.
 - c. Each individual conductor shall be interrupted by a solid-copper isolation dam to prevent wicking of moisture through the conductor strands.

- d. The cable insulation shall be sealed by an epoxy poured into the cable entry and totally encapsulating the stripped-back insulation and the individual copper dams. This poured epoxy seal shall also function as a redundant seal for the cable outside diameter.
 - e. The cable free end shall be sealed from moisture-entry during shipping, storage, and prior to connection to the control panel by a plastic sleeve securely clamped over the cable end.
7. Motors which use only a compress-grommet gland, or only a poured epoxy seal, without benefit of redundancy of both types together, are not equal or acceptable. Shaft sealing shall be by independently-mounted, tandem mechanical seals contained in an oil chamber that is formed as an intrinsic part of the motor frame and allows the seals to be completely submerged in and lubricated by the oil bath.
- a. The mechanical seal nearest the bearing shall utilize carbon/ceramic faces, and shall isolate the seal cooling oil from the motor frame.
 - b. The mechanical seal nearest the impeller shall be a stainless steel or rubber bellows-type construction firmly attached to the rotating face and clamped to the shaft, to prevent contaminants from contacting the stainless-steel spring which loads the seal face. The seal faces shall be a solid tungsten-carbide rotating face running against a solid silicon-carbide stationary face. Seals with both faces of similar materials, or seals with bonded, soldered, or converted face surfaces are not equal or acceptable.
 - c. The mechanical seal nearest the impeller shall be contained in a seal chamber formed by the impeller flange and a recess cast into the motor frame. To prevent debris from entering the chamber and to prolong the mechanical seal life, a flush port shall be provided so that an optional external water flush can be supplied directly into the seal chamber.
 - d. The mechanical seal nearest the impeller shall be isolated from contaminants in the pumped media by a labyrinth-fit between the backside of the impeller and the backplate, as well as by pump-out grooves cast into the impeller back shroud and into the backplate, to minimize debris reaching the shaft seal.
 - e. Both inner and outer seals shall be dimensionally interchangeable with standard off-the-shelf, inch-size, John Crane mechanical seals, or equal, to allow second-source availability of seals from local distributors for emergency repairs.
8. The thrust bearings shall be designed to take the full axial load of the impeller.

9. Protection Devices. The motor shall be provided with the following protection devices:
 - a. Two normally closed thermal sensors embedded in the stator windings, wired in series, will open a protective circuit if winding temperature exceeds rated operating temperature. These sensors automatically reset when winding temperature has cooled to a safe operating temperature.
 - b. A conductivity probe to monitor the moisture content of the oil in the chamber between the outer and the inner mechanical seals. The probe shall be wired to a separate protective circuit, which, when connected to a conductivity-sensitive relay in the control panel, will trip an alarm if moisture content of the oil indicates a failure of the outer mechanical seal.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Motors shall be installed in accordance with the manufacturer's installation instructions and written requirements of the manufacturer of the driven equipment. The supplied equipment shall be fully compatible with the pump, variable frequency drive and other equipment at the job site. The motor manufacturer representative and contractor shall provide a pre-service test plan and operation of the motor in all normal modes of operation to test start, stop, acceleration, and acceleration of motor and sustained operation at full and minimum speed. OWNER will accept the installation only after functional test indicates compliance with these specifications.

3.2 WARRANTY

- A. Warranty period shall cover 24 months from date of startup, not to exceed 30 months from date of shipment. During this period, repairs, including parts and labor, shall be provided at no cost to the OWNER.

*** *END OF SECTION* ***

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 2 -- GENERAL

2.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing the following:

1. Raceways, Fittings and Supports
2. Concrete Pads, Underground Ducts, Manholes and Pull-Boxes
3. Conductors, Wire and Cable
4. Wiring Devices
5. Disconnect Switches
6. Electrical Identification
7. Pushbuttons
8. Cabinets and Enclosures
9. Process Control Devices

2.2 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 03300 Cast-In-Place Structural Concrete
3. Section 05500 Miscellaneous Metalwork
4. Section 09800 Protective Coating
5. Section 15034 Gauges
6. Section 16030 Electrical Tests

2.3 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).

2.4 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. California Building Code - 2010
2. National Electrical Code - 2010

2.5 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. Federal Specifications:

FS W-C-596E/GEN(1)	Connector, Plug, Receptacle and Cable Outlet, Electrical Power
FS W-S-896E/GEN(1)	Switches, Toggle (Toggle and Lode), Flush Mounted (ac)
FS WW-C-581E	Conduit, Metal, Rigid, and Intermediate; And Coupling, Elbow, and Nipple, Electrical Conduit: Steel, Zinc Coated
WW-C-581E	Intermediate; and Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated

2. Commercial Standards:

ANSI C80.1	Rigid Steel Conduit, Zinc Coated, Specification For
ANSI/IEEE 386	Separable Insulated Connector Systems for Power Distribution Systems Above 600V
ANSI C37.46	Specifications for Power Fuses and Fused Disconnecting Switches
NEMA TC2	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
NEMA ICS 6	Enclosures for Industrial Controls and Systems
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA WC7	Cross-Linked-Thermosetting Insulated Wire and Cable for the Transmission and Distribution of Electric Energy
ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Tinned Soft or Annealed Copper Wire for Electrical Purposes
ASTM B189	Lead Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes
ICEA S-68-516	Ethylene-Propylene-Rubber-Insulated Wire
IEEE 383	Type Test of Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations

UL 44	Rubber-Insulated Wires and Cable
UL 83	Thermoplastic-Insulated Wires and Cable
UL 67	Underwriters Laboratories, Electric Panelboards
UL 489	Molded-Case Circuit Breakers and Circuit Breaker Enclosures
UL 50	Cabinets and Boxes

2.6 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted:

1. General

Shop drawings including the following:

Complete material list stating manufacturer and name of each item or class of material.

Front, side, and rear elevations and top views.

Location of conduit entrances and access plates.

Identification of conductors not indicated on drawings.

Identification numbers of conductors.

Manufacturers' equipment drawings.

Details of shielded power cable termination.

Component data.

Connection, terminal and internal wiring diagrams, and conductor sizes.

Layout drawings indicating arrangement, dimensions and weights.

Methods of anchoring.

Finish.

Nameplates.

Temperature limitations, as applicable.

Manufacturer's product data including the following:

Catalogue cuts, bulletins, brochures, or photocopies of applicable pages for mass produced, non-custom manufactured products stamped to indicate the project name, applicable Specification section and paragraph, model number, ratings and options.

Lists of the following:

Materials, equipment, apparatus and fixtures proposed for use; with the list including sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

Test reports of the following:

Factory-fabricated products.

Currents resulting from DC high potential testing.

- B. General Requirement
 - 1. All equipment furnished by the contractor shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated (UL).
 - 2. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal/OSHA Safety Orders (Title 8, CCR), State Building Standards, and Applicable local codes and regulations.
- 2.7 OWNER'S MANUAL
- A. The following shall be included in the OWNER'S MANUAL:
 - 1. Manufacturer's installation instructions.
 - 2. Manufacturer's maintenance procedures.
- 2.8 PROJECT RECORD DRAWINGS
- A. The following shall be included in the PROJECT RECORD DRAWINGS:
 - 1. Accurate location of conductors including depths and routing of concealed below-grade electrical WORK.
 - 2. Accurate location of electrical WORK (raceway and conductors) where the location differs substantially from the locations indicated.
- 2.9 AREA DESIGNATIONS
- A. **General:** For purposes of delineating electrical enclosure and installation requirements, certain areas are classified as defined below. Electrical installations within these areas shall conform to the indicated code requirements for the area indicated.
 - B. **General Purpose Locations:** NOT USED
 - C. **Outdoor Locations:** NOT USED
 - D. **Damp Location:** NOT USED
 - E. **Splash Locations:** NOT USED
 - F. **Corrosive Locations:** PS-13 is classified as a corrosive location. Areas indicated as "corrosive" locations shall have stainless steel threaded hardware; electrical hardware, fittings, and raceway systems shall be PVC-coated. Enclosures shall be NEMA Type 4X 316 stainless steel or equal unless shown otherwise.
 - G. **Hazardous Locations:** NEC "Hazardous (Classified) Locations" shall be as indicated and shall comply with NFPA 820. See plans for locations.

2.10 FACTORY TESTING (NOT USED)

2.11 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.

2.12 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. Products shall not be damaged, marred, or splattered with water, foam, plaster, or paint. Moving parts shall be kept clean and dry.
- C. **Replacement:** Damaged materials or equipment, including face plates of panels and switchboard sections, shall be replaced or refinished by the manufacturer at no expense to the OWNER.

2.13 REGULATORY REQUIREMENTS

- A. In addition to other indicated regulatory requirements, the WORK of this Section shall comply with the requirements of SSPWC Subsection 209-1.

2.14 UTILITY REQUIREMENTS

- A. The WORK of this Section includes compliance with the requirements of San Diego Gas and Electric Company and payment of related charges.

PART 3 -- PRODUCTS

3.1 GENERAL

- A. **Listing:** Electrical equipment and materials shall be listed for the intended purpose by an independent testing laboratory including Underwriters Laboratories (UL) or an independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.
- B. **Unlisted Products:** When a product is not available with a testing laboratory listing for the intended purpose, special testing (if any) required by the authority having jurisdiction shall be included in the original contract price.
- C. **Project/Site Conditions:** Unless otherwise indicated, equipment and materials shall be sized and rated for the ambient conditions in San Diego but not less than an ambient temperature of 40 degrees C at sea level without exceeding the manufacturer's stated tolerances.

- D. **Product Qualifications:** Equipment and materials shall be new and shall bear the UL label, where UL requirements apply. Equipment and materials shall be the products of reputable manufacturers specializing in the products indicated in this Section. Similar items in the project shall be products of the same manufacturer. Equipment and materials shall be of industrial grade and standard of construction and shall be of sturdy design and manufacture; and shall be capable of reliable, trouble-free service.
- E. **Area Classification:** Dry well area is classified as damp and corrosive area. All product and installation specified herein or plans for dry well area shall comply with damp and corrosive application.

3.2 RACEWAY, FITTINGS AND SUPPORTS

- A. **Raceway:** Raceway shall comply with the following:

1. **Rigid Steel Conduit:** N/A
2. **Intermediate Metal Conduit:** N/A.
3. (NOT USED).
4. **Plastic Coated Rigid Steel Conduit and Fittings:** Plastic coated conduit shall be rigid steel conduit with PVC jacket and shall conform to Federal Specification WW-C-581E, ANSI C80.1, and to Underwriter's Laboratories specifications. The zinc surfaces of the conduit shall remain intact and undisturbed on both the inside and the outside of the conduit through the preparation and application processing. A PVC coating shall be bonded to the galvanized outer surface of the conduit. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of 40 mils. A PVC jacketed coupling shall be provided with each length of conduit. A PVC sleeve equal to the OD of the conduit shall extend 1-1/2 inches from each end of coupling.

Fittings used with plastic coated conduit shall be similarly coated to the same thickness as the conduit and shall be provided with type 304 stainless steel hardware. Conduit and fittings shall be manufactured by the same company. Minimum size shall be 3/4 inch.

5. **Electrical Metallic Tubing:** N/A.
6. **Flexible Metal Conduit:** N/A.
7. **Liquidtight Flexible Steel Conduit:** N/A.
8. **Explosion proof Flexible Conduit:** Explosionproof flexible conduit shall be suitable for use in Class I, Division 1, Groups C and D hazardous areas complying with NEC and shall be watertight.

9. **Rigid Nonmetallic Conduit:** Rigid nonmetallic conduit shall be NEMA TC2, type EPC-40-PVC, high impact, polyvinylchloride (PVC). Fittings used with PVC conduit shall be PVC solvent weld type. Nonmetallic conduits shall be UL listed for applications indicated. Minimum size shall be 1 inch.
 10. **Wireways:** N/A.
 11. **Cable Trays:** N/A.
 12. **Metallic Insulation Bushings:** Metallic insulated bushings shall have ground terminals and smooth and well-rounded surfaces to protect the conductor insulation. The conduit threads shall be deep, clean and easily attached to the conduits. The bushing shall be O-Z/Gedney, Thomas and Betts, or equal.
- B. **Boxes and Fittings:** Boxes and fittings shall comply with the following:
1. **Sheet Metal Boxes:** Boxes and fittings shall be UL approved 316 stainless steel.
 2. **Cast Ferrous Alloy Boxes:** N/A.
 3. **Floor Boxes:** N/A.
 4. **Welded Sheet Steel Boxes:** N/A.
 5. **Explosion proof Boxes and Seal Fittings:** In areas specified as Class I, Division 1 or 2, hazardous, boxes and fittings shall be NEMA 7, Groups C and D, explosionproof. Seal fittings for conduit systems in hazardous atmosphere locations shall be hot-dip galvanized cast ferrous alloy. Sealing compound shall be hard type and UL listed for explosionproof sealing fittings.
 6. **Hubs:** Threaded hubs for connection of conduit to junction, device or terminal boxes shall be made of stainless steel and shall have insulated liner and insulating bushings. The hubs shall utilize a neoprene O-ring and shall ensure a watertight connection.
- C. **Raceway Supports:** Raceway supports shall comply with the following:
1. **Conduit Supports:** Stainless steel framing channel shall be used.
 2. **Ceiling Hangers:** Unless otherwise indicated hanger rods shall be 1/2-inch full-threaded rods and shall meet ASTM A193. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.
 3. **Structural Attachments (Racks):** Structural attachments shall be constructed from stainless steel framing channel as specified.

3.3 CONCRETE PADS, UNDERGROUND DUCTS, MANHOLES AND PULL-BOXES

- A. **General:** The WORK of this Section includes concrete pads, manholes, pull-boxes and concrete required for encasement, installation, or construction and shall be 2500-psi concrete conforming to the requirements of Section 03300 and the following:
1. Consolidation of encasement concrete around duct banks shall be by hand puddling, and no mechanical vibration will be permitted.
 2. A workability admixture consisting of a hydroxylated carboxylic acid type in liquid form shall be used in encasement concrete, admixtures containing calcium chloride shall not be used.
 3. Concrete for encasement of conduit or duct banks shall contain an integral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete.
- B. **Concrete Pads:** N/A.
- C. **Concrete-Encased Ducts:** Where an underground distribution system is indicated, it shall be constructed of multiple runs of single bore non-metallic ducts, concrete encased, with steel reinforcing bars, with underground manholes and pullboxes.
- D. **Manholes and Pull-Boxes:** N/A.

3.4 CONDUCTORS, WIRE AND CABLE

- A. **General:** The type, size and number of conductors shall comply with the indicated requirements. Number and types of communication, paging, and security cables shall be as required for the particular equipment provided.

Conductors, including ground conductors, shall be copper. Insulation shall bear the manufacturer's trademark, type, voltage rating, and conductor size.

- B. **Color Coding:** Color coding shall comply with the following:
1. **Control Conductors:** Control conductors color coding shall be manufacturer's standard.
 2. **Power Conductors:** Single-conductor power conductors shall have the following colors for 600V or less:

		<u>120/208V</u>	<u>480/277V</u>
Phase A	Black	Brown	
Phase B	Red	Orange	
Phase C	Blue	Yellow	
Ground	Green	Green	
Neutral	White	Grey	

Color coding tape shall be used where colored insulation is not available. Branch circuit switch shall be yellow. Insulated ground wire shall be green, and neutral shall be gray. Color coding and phasing shall be consistent throughout the site, but bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.

General purpose ac control conductors shall be pink. General purpose dc control conductors shall be blue.

Cables sized No. 4 AWG and larger may be black with colored 3/4-inch vinyl plastic tape applied in 3-inch lengths around the cable at each end. The cables shall be tagged at terminations and in pull boxes, handholes and manholes.

C. **Power and Control Conductors and Cable, 600 Volts:** Conductors and cable shall comply with the following:

1. **Single Conductors:** Single conductor cable shall be stranded and shall be installed in conduits for power and control circuits.

Conductors shall comply with the following characteristics:

Voltage:	600 volts.
Conductor:	Coated, Class B, stranded, annealed copper per ASTM B8.
Insulation:	XHHW, 90 degrees C dry, 75 degrees C wet, composite of ethylene propylene rubber (EPR) and chlorosulfonated polyethylene (CSPE) per ICEA UL 44 and NEMA WC-7.
Jacket:	Chlorosulfonated polyethylene (CSPE).
Flame resistance:	IEEE 383.

2. **Multiconductor Cable:** Multiconductor cable shall be used for power and control circuits installed in cable tray. Cables shall be UL labeled, Type TC, designed for cable tray installation in accordance with NEC 340. The type of insulation, number of conductors, and size of conductor shall comply with the indicated requirements.

Multiconductor power cable shall contain three or four conductors, as indicated, plus an equipment grounding conductor.

Multiconductor power cables shall comply with the following:

Voltage:	600 volts.
Conductors:	Annealed copper, stranded, per ASTM B8, coated per ASTM B33.

Insulation: THWN/THHN, 90 degrees C dry, 75 degrees C wet, ethylene propylene rubber (EPR) or a composite of EPR and chlorosulfonated polyethylene (CSPE) per ICEA S-68-516 and UL 44.

Jacket: Polyvinylchloride (PVC).

Flame resistance: IEEE 383.

Unless otherwise indicated, multiconductor control cable shall be size 14 AWG and shall comply with the following:

Voltage: 600 volts.

Conductors: Annealed copper, stranded, per ASTM B8, coated per ASTM B33.

Insulation: THWN/THHN, 90 degrees C dry, 75 degrees C wet, ethylene propylene rubber (EPR) or a composite of EPR and chlorosulfonated polyethylene (CSPE) per ICEA S-68-516 and UL 44.

Jacket: Polyvinylchloride (PVC).

Flame resistance: IEEE 383.

D. **Direct Burial:** N/A.

E. **Medium Voltage Power Conductors and Cable (5 KV-15 KV):** N/A.

F. **Signal Cables:** Signal cables shall comply with the following:

1. **General:** Signal cable shall be provided for instrument signal transmission, alarm, communication and any circuit operating at less than 100 volts. Cables shall be color coded black and white for pairs or black, white and red for triads. Circuit shielding shall be provided in addition to cable shielding.
2. **Single Circuit:** Cable shall consist of one pair or triad, No. 16 AWG conductors with 15 mils of 90 degree C polyvinylchloride (PVC) insulation, 4 mils nylon conduit or jacket, twisted on a 2-inch lay, and covered with a 100 percent 1.35 mil aluminum-Mylar tape shield with No. 18 AWG 7-strand tinned copper drain wire and a 45 mil PVC jacket overall. Cable shall be UL listed, Type TC, rated 600 volts.

3. **Multiple Circuit:** Cable shall consist of four or more pairs or triads which are made up of No. 18 AWG conductors with 15 mils of 90 degree C PVC insulation, 4 mils nylon jacket, twisted on a staggered lay 1-1/2 to 2-1/2 inches, and covered with a 100 percent 1.35 mil aluminum-Mylar tape shield with No. 22 AWG 7-strand tinned copper drain wire. Overall cable shield shall be 2.35 mil aluminum-Mylar tapes with a No. 20 AWG 7-strand tinned copper drain wire. Cable shall be UL listed, Type TC, 600 volts.
 4. **Thermocouple Extension:** N/A.
 5. **Communication, Paging and Security System:** N/A.
 6. **Modbus Cable:** N/A/
- G. **Portable Cord:** Portable cord shall be UL listed, Type SO for sizes No. 10 AWG and smaller. Cords with conductors larger than No. 10 AWG shall be UL listed, Type G. Cords shall contain an equipment grounding conductor.
1. Cables shall comply with the following:

Conductors:	Flexible rope stranded per ASTM B189 and B33. Conductors shall be coated except ground conductors may be uncoated.
Insulation:	Insulation shall be ethylenepropylene (EPR) as per ICEA S-68-516 and rated for continuous operation at 90 degrees C.
Jacket:	Heavy-duty neoprene as per ICEA S-68-516.
- H. **Splicing and Terminating Materials:** Splicing and terminating materials shall comply with the following:
1. **600 Volt Conductor and Cable Connectors:** Connectors shall be compression type of correct size and UL listed for the specific application. Connectors shall be tin-plated high conductivity copper. Connectors for wire sizes No. 10 AWG and smaller shall be nylon self-insulated, ring tongue or locking-spade terminals. Connectors for wire sizes 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, dimple, screw-type connectors are not acceptable.
In-line splices and taps shall be used only where indicated, or shown on the shop drawings. When used, they shall be of the same construction as other connectors. Splices shall be compression type, made with a compression tool die designed for the purpose. Splice shall be covered with a heat-shrinkable sleeve or boot.
 2. **5 KV and 15 KV Cable Terminators:** N/A.

3.5 WIRING DEVICES

- A. **General:** Wiring devices shall be UL approved for the current and voltage indicated and shall comply with NEMA WD-1. Devices shall contain provisions for back wiring and side wiring with captively held binding screws.

Devices shall be brown, except those located in finished areas shall be ivory.

Special purpose devices shall be the color indicated.

Receptacles and switches shall conform to Federal Specifications W-C-596E and W-S-896E, respectively, and the indicated standards.

- B. **Switches:** Switches shall comply with the following:

1. **General Purpose (Indoor, Clean Areas):** General purpose switches shall be quiet AC type, specification grade, and shall comply with rated capacities as required. Switches shall match receptacles in color.

2. **Switches For Hazardous Areas:** Switches for control of lighting and small single-phase power loads in hazardous areas shall consist of a factory assembled and sealed combination general purpose type switch in an explosion-proof housing. The switch shall be rated in accordance with NEC for the area in which it is to be installed. The external operating mechanism shall consist of a wing-type handle having the "ON" and "OFF" positions visible from the front.

3. **Switches For Outdoor and Corrosive Areas:** Switches shall be heavy-duty industrial type 20-ampere pressswitch type with weatherproof/corrosion resistant neoprene plate. CONTRACTOR shall provide abuse-resistant nylon handles, and switches with corrosion-resistant steel nickel plate bridge.

- C. **Device Plates:** Device plates shall be provided with switches. In noncorrosive indoor areas, receptacle device plates shall be made of sheet steel, zinc electroplated with chrome finish.

Device plates in corrosive or outdoor areas shall be corrosion-resistant/marine-duty type. Device plates for explosionproof equipment shall be factory provided with the equipment.

Device plates shall include engraved laminated phenolic nameplates with 1/8-inch white characters on black background.

Nameplates for switches shall identify panel and circuit number and area served.

Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single phase.

- D. **Plug Strips:** N/A.

3.6 DISCONNECT SWITCHES

- A. Disconnect switches shall be externally operated with quick-make/quick-break mechanisms. The handle shall be interlocked with the switch cover by means of a defeatable interlock device. The switch shall be lockable in the "off" position. Switches shall have nameplates with manufacturer, rating, and catalog number. Heavy-duty switches shall have arc suppressors, pin hinges, and shall be horsepower rated at 600-volts. Heavy-duty switches shall be provided for all motor circuits above 3 horsepower. In smaller motor circuits switches shall be general duty. Switch enclosure shall be NEMA 4X.

3.7 ELECTRICAL IDENTIFICATION

- A. **Nameplates:** Nameplates shall be fabricated from white-center, black-face laminated plastic engraving stock. Nameplates shall be fastened securely, using fasteners of brass, cadmium plated steel, or stainless steel, screwed into inserts or tapped holes, as required. Engraved characters shall be block style of adequate size to be read easily at a distance of 6 feet with no characters smaller than 1/8-inch high.
- B. **Conductor and Equipment Identification:** Conductor and equipment identification devices shall be either imprinted plastic-coated cloth marking devices or shall be heat-shrink plastic tubing, imprinted split-sleeve markers cemented in place.
- C. **Identification Tape (Buried):** Identification tape for protection of buried installation shall be a 6-inch wide green polyethylene tape imprinted "CAUTION - ELECTRIC UTILITIES BELOW".

3.8 PUSHBUTTONS

- A. Remote-mounted pushbuttons shall be NEMA rated heavy duty, oiltight type with synthetic rubber boots and any special gasketing required to make the completed station watertight. Provide NEMA Type 4 pushbutton for above ground indoor unit and NEMA Type 4X constructed of stainless steel or glass polyester for dry well area.
- B. Install provisions for locking pushbuttons in the OFF position wherever lockout provisions are indicated. Locking provision shall be 316 stainless steel.

3.9 MANUFACTURERS

- A. Products of the type or model number indicated shall be manufactured by one of the below listed manufacturers (or equal):
 - 1. Unions:
Appleton UNF or UNY
Crouse-Hinds UNF or UNY
 - 2. Device Boxes:
Appleton FD
Crouse-Hinds FD

3. Sealing Compound:
Chico A
4. Watertight Seals:
O.Z. Gedney Co., Type CSMC
Thunderline Corp.
Link Seal
5. Lighting and Receptacle Branch Circuit Conductors:
Okoseal-N, Series 116-67-XXXX
6. Single Power and Control Conductors and Cable, 600V:
Okonite-Okolon, Series 112-11-XXXX
Anaconda
Durasheath EP
7. Multiconductor Cables:
Okonite-Okolon, Series 202-11-3XXX
Anaconda
Durasheath EP
8. Direct Burial Cables:
Okonite
CLX
9. Medium Voltage Power Conductors and Cable (5-15 KV) Installed In Raceway: N/A
10. Armored Cable:
Okoguard, Series 571-23-3XXX
Anaconda
Duralox Unishield EP
11. Single Circuit Signal Cable:
Okoseal-N Type P-OS
12. Multiple Circuit Signal Cable:
Okoseal-N Type SP-OS
13. Thermocouple Extension:
Okonite P-OS, Type PLTC
14. Portable Cords:
Okocord
15. Compression Tool Die For Splicing:
Thomas and Betts Corp.
16. Heat Shrinkable Moisture Seal Caps:
Raychem Corp. "Thermofit"

17. 120V Receptacles (Indoor, Clean Areas):
 Hubbell IG-5362
 Arrow-Hart 6766
 G.E. 4107-1 (Brown)
18. 120V Receptacles (Outdoor, Process or Corrosive Areas):
 Hubbell 53CM62/53CM21
 General Electric GE5262-C
19. 240V Duplex Receptacles (Gray):
 Hubbell 5462
 General Electric G.E. 4188-9
20. 240V Single Receptacles (Black):
 Hubbell 9308
 General Electric G.E. 4138-3
21. Three Phase Receptacles (60 amps):
 Crouse-Hinds Catalog No. AREA 6424
 Hubbell Hubbellock
22. Three Phase Receptacles (30 amps):
 Crouse-Hinds Catalogue No. AREA 3423
 Bryant Cat. 7223FR
 Russell Stoll No. JRFA6344
23. Toggle Switches:
- | | Hubbell | Bryant Hubbell | Bryant | | |
|------------------------|----------------|-----------------------|---------------|---------|---------------------|
| Single Pole
(ivory) | 1221 | (brown) | 4901 | (brown) | 1221I (ivory) 4901I |
| Three Way | 1223 | | 4903 | | 1223I 4903I |
| Double Pole | 1222 | | 4902 | | 1222I 4902I |
| Momentary | 1556 | | 4821 | | 1556I 4821I |
24. Switches (Hazardous Areas):
 Crouse-Hinds EFSC2129
 Appleton EFSC175-F1
25. Electrical Identification:
 Nameplates
 Formica Type ES-1

 Imprinted Plastic Coated Cloth
 Brady
 Thomas & Betts
26. Device Plates:
 Crouse-Hinds
 Appleton
27. Plug Strips:
 Plugmold

28. Manholes and Pullboxes:
Brooks
Quikset
29. Flexible Conduit:
American Brass
Anaconda
Electroflex
30. Cable Trays:
P-W
Cope
31. Compression Connectors:
Burndt "Hi Lug"
Thomas & Betts "Shure Stake"
32. Spring Connectors (Wire Nuts):
3M "Scotch Lok"
Ideal "Wing Nuts"
33. Insulating Tape:
Scotch No. 33
Plymouth "Slip knot"
34. High Temperature Insulating Tape (Polyvinyl):
Plymouth
3M
35. Pre-Insulated Fork Tongue Lugs:
Thomas & Betts RC Series
Burndy
36. Epoxy Resin Splicing Kits:
3M Scotchcoat 82 Series
Burndy "Hy Seal"
37. Stress Cone Material For Make-up Of Medium Voltage Shielded Cable:
G & W
3M
duPont
38. Stainless Steel Covers:
Sierra S-line
Hubbell
39. Products For Cast Boxes:
Switches at outdoor locations
Crouse-Hinds DS 128
Mackworth Rees Style 3845
Joy Flexitite

Switches at damp locations
Mackworth Rees Style 3496
Joy Flexitite

Switches at dry locations
Crouse-Hinds DS 32G
Pyle National SCT-10k

Receptacles at outdoor locations
Crouse-Hinds
Hubbell

Receptacles at damp or dry locations
Crouse-Hinds DS 23G
Pyle National N-1

Receptacles at corrosive locations
Crouse-Hinds "Ark Gard"
Appleton DTQ
Hubbell 52CM21 or 5221

40. Cast Boxes Required for Pull or Junction Boxes:
Floor boxes with checker plate covers
O-Z Type "YR",
Surface boxes
O-Z type "YH"
41. Floor Type Outlet Boxes:
Hubbell Catalog B-2530 with S-2530 cover plate
Steel City (Russell & Stoll) Catalog 78AL and 889
42. Power Outlet Boxes:
Hubbell Cat. No. SC-3098
Steel City Cat. No SFH40RG
43. Telephone Outlet Boxes:
Hubbell Cat. No. SS-309-T
Steel City Cat. No SFL10
44. Insulated Bushings:
O-Z Type A and B
Thomas & Betts
Steel City
Appleton
Efcor
Gedney

- 45. Insulated Grounding Bushings:
 - O-Z Type BL
 - Thomas & Betts
 - Steel City
 - Efcor
 - Gedney

- 46. Erickson Couplings:
 - Appleton Type EC
 - Thomas & Betts
 - Steel City
 - Efcor
 - Gedney

- 47. Liquid-tight Fittings:
 - Appleton Type ST
 - Thomas & Betts
 - Crouse-Hinds
 - Efcor
 - Gedney

- 48. Hubs:
 - Appleton Type HUB
 - Thomas & Betts
 - Myers Scrutite
 - Efcor

- 49. Sealing Fittings:
 - Appleton Type EYS
 - O-Z Type FSK

- 50. Expansion Couplings:
 - O-Z Type D
 - Crouse-Hinds Type

PART 4 -- EXECUTION

4.1 GENERAL

- A. **Field Control of Location and Arrangement:** The Drawings diagrammatically indicate the location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined in the field based on the physical size and arrangement of equipment, finished elevations, and obstructions. Locations shown on the Drawings shall be adhered to as closely as possible. 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.

- B. **Installation:** The CONTRACTOR shall make all necessary provisions throughout the site to receive the work as construction progresses and shall furnish and install adequate backing, supports, inserts, and anchor bolts for the hanging and support of all electrical fixtures, conduit, panelboard, and switches, and shall furnish and install sleeves through walls, floors, or foundations where electrical lines are required to penetrate.

Conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, locations of concealed conductors shall be as indicated on the shop drawings.

- C. **Workmanship:** Materials and equipment shall be installed in accordance with printed recommendations of the manufacturer. The installation shall be accomplished by workmen skilled in this type of work and installation shall be coordinated in the field with other trades so that interferences are avoided.

- D. **Tests:** The WORK of this Section includes tests required by the authority having jurisdiction. Tests shall be performed in the presence of the CONSTRUCTION MANAGER. The WORK includes testing equipment, replacement parts and labor necessary to repair damage resulting from damaged equipment or from testing and correction of faulty installation. The following tests shall be performed:

Insulation resistance tests.
Operational testing of equipment.

- E. **Field Quality Control:** Conduit shall be provided with a number tag at each end and in each manhole and pullbox. Trays shall be identified by stencils at intervals not exceeding 50 feet, at intersections, and at each end.

4.2 RACEWAY, FITTINGS AND SUPPORTS

- A. **General:** Except as otherwise indicated, conduit installed in direct contact with earth and in concrete slabs on grade shall be corrosion-protected.

Conduit shall be left exposed until inspected by the CONSTRUCTION MANAGER.

Raceways shall be installed as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for the purpose intended. Factory elbows shall be used for all 3/4-inch conduits. Bends in larger sizes of metallic conduit shall be accomplished by field bending or by the use of factory elbows.

Conduit may be cast integral with horizontal and vertical concrete slabs, providing one-inch clearance is maintained between conduit surface and concrete surface. If said clearance cannot be maintained, the conduit shall be installed exposed below elevated slabs; provided, that in the case of slabs on grade, conduit shall be installed below the slab and shall be encased with a minimum cover of 3 inches of concrete.

Non-metallic conduit may be cast integral with horizontal slabs with placement criteria as stated in the previous paragraph. Non-metallic conduit may be run beneath structures or slabs on grade, without concrete encasement. In these instances conduit shall be placed at least 12 inches below the bottom of the structure or slab. Non-metallic conduit may be buried 24 inches minimum below grade, with a 3-inch concrete cover, in open areas or where otherwise not protected by concrete slab or structures.

Top of concrete cover shall be colored red. Non-metallic conduit shall be permitted only in concealed locations as described above. The use of direct burial thinwall duct will be permitted only as indicated for underground ducts.

Where a run of concealed PVC conduit becomes exposed, a transition to plastic coated rigid steel conduit is required. Such transition shall be accomplished by means of a factory elbow or a minimum 3-foot length of rigid steel conduit, either terminating at the exposed concrete surface with a flush coupling. Piercing of concrete walls by non-metallic runs shall be accomplished by means of a short steel nipple terminating with flush couplings.

1. Application:

Embedded or encased in non-hazardous areas	Schedule 40 PVC
Exposed in corrosive areas	Plastic coated, rigid steel
Dry well/Pump room area	Plastic coated, rigid steel

2. Conduit Runs Between Boxes: The number of directional changes of the conduit shall be limited to total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 400 feet, less 100 feet or fraction thereof, for every 90 degrees of change in direction. Bends and offsets shall be avoided where possible but, where necessary, shall be made without flattening or kinking, or shall be factory preformed bends. Turns shall be made with cast metal fittings or conduit bends. Welding, brazing or otherwise heating of conduit is not acceptable.

3. Junction and Pull Boxes: Cast junction or pull boxes shall be installed where required for pulling cable and as necessary to meet the indicated requirements. Pull boxes used for multiple conduit runs shall not combine circuits of different motor control centers, switchboards, or switchgear.

4. Conduit Terminations: The WORK of this Section includes conductors required to interconnect incoming annunciator, control and instrumentation except as otherwise indicated.

Two- and 3-conductor shielded cables installed in conduit runs which exceed 2,000 feet may be spliced in pullboxes. These cable runs shall have only one splice per conductor.

Control conductors shall be spliced or terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment. 120/208-volt and 480-volt branch circuit conductors may be spliced in suitable fittings at locations required. 5-kV conductors shall be spliced or terminated only at equipment terminals indicated.

Solid conductors shall be terminated at equipment terminal screws such that conductor is tightly wound around screw and does not protrude beyond screw head. Stranded conductors shall be terminated directly on equipment box lugs such that all conductor strands are confined within lug. Use forked-tongue lugs where equipment box lugs have not been provided.

Splices in 600-volt wire which are not pre-insulated shall be insulated with three layers of tape each half lapped except that splices in below grade pull boxes or in any box subject to flooding shall be made watertight using an epoxy resin splicing kit.

Splices to motor leads in motor terminal boxes shall be taped with varnished cambric tape and with high temperature tape on the exterior.

Shielded power cable shall be terminated with pre-assembled stress cones in a manner approved by the cable manufacturer. The CONTRACTOR shall submit the proposed termination procedure as described for shop drawings.

Control devices, such as solenoid operated valves that are normally supplied with conductor pigtails shall be terminated as described for control conductors.

Conduit entering NEMA 1 type sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the box or cabinet and shall have an insulating grounding or bonding bushing installed over the conduit end. Conduit entering other boxes shall be terminated with a threaded hub. Cast boxes and nonmetallic enclosures shall have threaded hubs. Joints shall be made with standard couplings or threaded unions. Metal parts of nonmetallic boxes and plastic 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 conduit shall be cut square, reamed, and threaded with straight threads. Rigid steel conduit shall be made up tight and without thread compound. Exposed male threads on rigid steel conduit shall be coated with zinc-rich paint.

PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the box and shall be terminated with a threaded male terminal adapter having a neoprene O-ring. Joints shall be made with standard PVC couplings.

Conduit entering field equipment enclosures shall enter the bottom or side of the box. Where conduit comes from above, it shall be run down beside the enclosure and a tee conduit and drip leg installed.

5. **Matching Existing Facilities:** When new conduit is added to areas which are already painted, the conduit and its supports shall be painted to match the existing facilities. Where new conduit is used to replace existing conduit, the existing conduit and supports shall be removed, resulting blemishes shall be patched and repainted to match original conditions. Similarly, if existing conduits are to be reused and rerouted, resulting blemishes shall be corrected in the same manner. Coating system shall comply with Section 09800.
6. **Conduit Support:** Exposed rigid steel or plastic coated conduit shall be run on supports spaced not more than 10 feet apart and shall be constructed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling. Exposed PVC conduit shall be run on supports spaced not more than 3 feet apart for conduits up to 1 inch, 5 feet apart for conduits 1 1/4 inches to 2 inches and 6 feet apart for conduits 2 1/2 inches and larger. No conduit shall approach closer than 6 inches to any object operating above 30 degrees C. PVC conduit shall not be provided where it will be damaged by heat.

Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors. Individual conduit supports shall use cast-in-place anchors, die-cast, rustproof alloy or expansion shields. Wooden plugs, plastic inserts or gunpowder-driven inserts are not acceptable.

7. **Conduit Penetrations:** Unless otherwise indicated, conduit routed perpendicular through floors, walls or other concrete structures shall pass through cast-in-place openings wherever possible. In cases where cast-in-place openings are not possible, appropriate size holes shall be bored through the concrete to accommodate the conduit passage. The size and location of the holes shall not impair the structure's integrity. After completion, grout or calk around conduit and finish to match existing surroundings. Unless otherwise protected, conduits that rise vertically through the floor shall be protected by a 3 1/2-inch high concrete pad with a sloping top.

Conduits entering manholes and handholes shall be horizontal. Conduits shall not enter through the concrete bottom of handholes and manholes. Wherever conduits penetrate outdoor concrete walls or ceilings below grade, watertight seal shall be installed.

8. **Conduit Separation:** Signal conduits shall be separated from AC power or control conduits. The separation shall be a minimum of 12 inches for metallic conduits and 24 inches for nonmetallic conduits.
9. **Conduit Seals For Hazardous or Corrosive Areas:** Conduit passing from a hazardous or corrosive area into a nonhazardous or noncorrosive area shall be provided with a sealing fitting which shall be located at the boundary in accordance with NEC.

Seal fittings for conduit systems in hazardous atmosphere locations shall be stainless steel. Sealing compound shall be UL listed, non-hardening type for corrosive areas. Sealing compound shall not be poured in place until electrical installation has been otherwise accepted.

10. **Plastic Coated Conduit:** Plastic coated conduit shall be made up tight with strap wrenches. Conduit threads shall be covered by a plastic overlap which shall be coated and sealed in accordance with manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. 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. Painted fittings are not acceptable.
11. **Liquidtight Flexible Conduit:** The length of flexible liquidtight conduit shall not exceed 15 times the trade diameter of the conduit. The length of liquidtight conduit shall not exceed 36 inches.
12. **Conduit Fittings:** Fittings shall comply with the same requirements as the raceway with which they will be used. Fittings having a volume less than 100 cubic inches for use with rigid steel conduit, shall be cast or malleable non-ferrous metal. Fittings larger than one inch shall be "mogul size." Fittings shall be of the gland ring compression type. Covers of fittings, unless in "dry" locations, shall include gaskets. Surface-mounted cast fittings, housing wiring devices in outdoor and damp locations, shall have mounting lugs.
Erickson couplings shall be used at all points of union between ends of rigid steel conduits which cannot be coupled. Running threads and threadless couplings shall not be used. Couplings shall be 3-piece type.
Transition fittings to mate steel to PVC conduit, and PVC access fitting, shall be as furnished or recommended by the manufacturer of the PVC conduit.

B. **Cable Tray:** N/A.

4.3 CONDUCTORS, WIRE AND CABLE

- A. **General:** Pulling wire and cable into conduit or trays shall be completed without damaging or putting undue stress on the cable insulation. The cable pulling compound shall be polymer-based and UL approved. It shall be non-toxic, non-flammable, non-corrosive and compatible with all cable types. The product shall dry to a thin semi-liquid film that will not clog the conduit. The cable pulling lubricant shall be AquaGel II by Ideal Industries, or equal. Raceway construction shall be complete, cleaned, and protected from the weather before cable is installed.

Whenever a cable leaves a raceway, a cable support shall be provided.

When flat bus bar connections are made with unplated bar, the contact areas shall be "scratch-brushed" before connection. Bolts shall be torqued to the bus manufacturer's recommendations.

- B. **600 Volt Conductor and Cable:** Conductors in panels and electrical equipment, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, spread into trees and connected to their respective terminals. Lacing shall be made up with plastic cable ties. Lacing is not necessary in plastic panel wiring duct. Conductors crossing hinges shall be bundled into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.

Slack shall be provided in junction and pull boxes, handholes and manholes. Slack shall be sufficient to allow cables or conductors to be routed along the walls of the box. Amount of slack shall be equal to largest dimension of the box. Where plastic panel wiring duct is installed for wire runs, lacing is not required. Plastic panel wiring duct shall not be used in manholes and handholes.

Stranded conductors shall be terminated. Conductors shall be terminated directly on the terminal block. Compression lugs and connectors shall be installed using manufacturer's recommended tools.

Lighting and receptacle circuits may be in the same conduit in accordance with derating requirements of the NEC. However, lighting and receptacle circuits shall not be installed in conduits with power or control conductors.

Solid wire shall not be lugged nor shall electrical spring connectors be used on any except for solid wires in lighting and receptacle circuits. Lugs and connectors shall be installed with a compression tool.

Terminations at 460 volt motors shall be made by bolt-connecting the lugged connectors. Connections shall be insulated and sealed with factory-CONSTRUCTION MANAGER kits. Motor connection kits shall consist of heat-shrinkable, polymeric insulating material over the connection area and a high dielectric strength mastic to seal the ends. Bolt connection area shall be kept free of mastics and fillers to facilitate rapid stripping and re-entry. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations.

In-line splices and tees shall be made with tubular compression connectors and insulated as for motor terminations, except that conductors No. 10 AWG and smaller may be spliced using self-insulating connectors. Splices and tees in underground handholes or pull boxes shall be insulated using Scotch-cast epoxy resin splicing kits. Terminations at devices with 120V pigtail leads, at solenoid valves, 120 volt motors, and other devices furnished with pigtail leads shall be made using self-insulating tubular compression connectors.

Conductor and cable markers shall be provided at splice points.

- C. **Signal Cable:** Circuits shall be installed as individually shielded twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever 3-wire circuits are required. Terminal blocks shall be provided at instrument cable junctions, and circuits shall be identified at such junctions unless otherwise indicated. Signal circuits shall be installed without splices between instruments, terminal boxes, or panels.

Shields are not acceptable as a signal path, except for circuits operating at radio frequencies and utilizing coaxial cables.

Common ground return conductors for two or more circuits are not acceptable.

Unless otherwise indicated, shields shall be bonded to the signal ground bus at the control panel and isolated from ground and other shields at other locations.

Terminals shall be installed for running signal leads and shield drain wires through junction boxes.

Spare circuits and the shield drain wire shall be terminated on terminal blocks at both ends of the cable run and be electrically continuous through terminal boxes. Shield drain wires for spare circuits shall not be grounded at either end of the cable run.

Terminal boxes shall be installed at instrument cable splices. If cable is buried or in raceway below grade at splice, an instrument stand shall be provided as specified with terminal box mounted approximately 3 feet above grade.

Cable for paging, telephone, and security systems shall be installed and terminated in compliance with the manufacturer's recommendations.

- D. **Portable Cord:** Portable cord feeding permanent equipment, such as pendant cords, pumps, cranes, hoists, and portable items shall have a wire mesh cord grip of flexible stainless steel wire to take the tension from the cable termination. Connection of portable cords to permanent wiring shall be accomplished with the use of terminals. In-line taps and splices shall be used only where indicated.
- E. **Testing:** Testing shall comply with the requirements of Section 16030 and the following:
 - 1. **Signal Cable:** Each signal pair or triad shall be tested for electrical continuity. Any pair or triad exhibiting a loop resistance of less than or equal to 50 ohms shall be deemed satisfactory without further test. For pairs with greater than 50 ohm loop resistance, the expected loop resistance shall be calculated considering loop length and intrinsic safety barriers if present. Loop resistance shall not exceed the calculated value by more than 5 percent. Each shield drain conductor shall be tested for continuity. Shield drain conductor resistance shall not exceed the loop resistance of the pair or triad. Each conductor (signal and shield drain) shall be tested for insulation resistance with all other conductors in the cable grounded. Instruments used for continuity measurements shall have a resolution of 0.1 ohms and an accuracy of better than 0.1 percent of reading plus 0.3 ohms. A 500 volt megohmmeter shall be used for insulation resistance measurements.
 - 2. **5-15 KV Cable:** N/A.

4.4 WIRING DEVICES

- A. **General:** Boxes shall be independently supported by stainless steel brackets, expansion bolts, toggle bolts, or machine or wood screws as appropriate. 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.

Unless otherwise indicated, receptacles and switches installed in sheet steel boxes shall be flush mounted and shall be located 18 inches above the floor unless otherwise indicated.

Switch boxes and receptacles installed in cast device boxes shall be mounted 48 inches above the floor.

4.5 EQUIPMENT ANCHORING

- A. Freestanding or wall-hung equipment shall be anchored in place by methods that will meet seismic requirement in the area where project is located. Wall-mounted panels that weigh more than 500 pounds or which are within 18 inches of the floor shall be provided with fabricated steel support pedestal(s). Pedestals shall be of welded steel angle sections. If the supported equipment is a panel or cabinet and enclosed with removable side plates, it shall match supported equipment in physical appearance and dimensions. Transformers hung from 4-inch stud walls and weighing more than 300 pounds, shall have auxiliary floor supports.
- B. Anchoring methods and leveling shall comply with the printed recommendations of the equipment manufacturers.

4.6 CONDUCTOR AND EQUIPMENT IDENTIFICATION

- A. The completed electrical installation shall include adequate identification to facilitate proper control of circuits and equipment and to reduce maintenance effort.
- B. Control and instrumentation wire and cable shall be assigned a unique identification number. Numbers shall be assigned to conductors having common terminals. Identification numbers shall appear within 3 inches of conductor terminals. "Control" shall be defined as any conductor used for alarm, annunciator, or signal purposes or any connect switch or relay contacts or any relay coils.
 - 1. Multiconductor cable shall be assigned a number which shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath free-standing equipment. It is expected that the cable number will form a part of the individual wire number. All individual control conductors and instrumentation cable shall be identified at pull points as described above.
 - 2. The instrumentation cable numbers shall incorporate the loop numbers shown.
 - 3. Refer to Section 13300.1.12 for numbering details.
- C. Spare conductors shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
- D. Nameplates shall be provided for panelboards, panels, starters, switches, and pushbutton stations. In addition to the name plates indicated, control devices shall be equipped with standard collar-type legend plates, as required.
- E. Terminal strips shall be identified by imprinted, varnished, marker strips attached under the terminal strip.
- F. Three-phase receptacles shall be consistent with respect to phase connection of receptacle terminals. Errors in phasing shall be corrected at the bus, not at the receptacle.

- G. Toggle switches which control loads out of sight of switch, and all multi-switch locations of more than 2 switches, shall have suitable inscribed finish plates.
- H. Empty conduits shall be tagged at both ends to indicate the destination at the far end. Where it is not possible to tag the conduit, destination shall be identified by marking an adjacent surface.
- I. Identification tape shall be installed directly above buried raceway. Tape shall be installed 8 inches below grade and parallel with raceway. Identification tape shall be installed for buried raceway not under buildings or equipment pads except identification tape is not required for protection of street lighting raceway.

** END OF SECTION **

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A
NOTICE OF EXEMPTION

NOTICE OF EXEMPTION

(Check one or both)

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

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

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

PROJECT NO.: 276595

PROJECT TITLE: Pump Station 13 Rehabilitation Project

PROJECT LOCATION-SPECIFIC: The project is located at an existing pump station west of the intersection of Tourmaline Street and La Jolla Boulevard within the Pacific Beach Community Plan.

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

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: Mayoral approval for the replacement of two existing 10-horsepower dry pit pumps and the upgrade of piping, electrical gear and controls. The project would also include the installation of two new submersible 10-horsepower solid handling pumps, guide rails, access hatches and shafts for the submersible pumps over the wet well. The project includes the installation of mechanical bypass during construction and modification of the pump station roof slab for the required opening. The project would also include the partial demolition and redesign of the pump station roof. Additionally, improvements would include installation of a new access hatch, valve rod access boxes and a new ventilation system.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego, Public Works E&CP Dept/David Manella, 600 B Street, Suite 800 (MS 908A), San Diego, CA 92101 (619) 533-6682.

EXEMPT STATUS: (CHECK ONE)

- () MINISTERIAL (SEC. 21080(b)(1); 15268);
() DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a));
() EMERGENCY PROJECT (SEC. 21080(b)(4); 15269 (b)(c))
(X) CATEGORICAL EXEMPTION: EXISTING FACILITIES (15301)
() STATUTORY EXEMPTIONS:

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review which determined that all rehabilitation would occur within the previously developed pump station and no new environmental impacts would occur. Therefore, the project would qualify to be categorically exempt from CEQA pursuant to Sections 15301 (Existing Facilities) which allows for the restoration and rehabilitation of deteriorated and damaged structures, facilities, and mechanical equipment. Therefore, the project is exempt from CEQA pursuant to Section 15301 (existing facilities); and the exceptions listed in CEQA Section 15300.2 would not apply.

LEAD AGENCY CONTACT PERSON: JEFF SZYMANSKI

TELEPHONE: (619) 446-5324

IF FILED BY APPLICANT:

- 1. ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING.
2. HAS A NOTICE OF EXEMPTION BEEN FILED BY THE PUBLIC AGENCY APPROVING THE PROJECT?
() YES () NO

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

Signature of Jeff Szymanski, Associate Planner
SIGNATURE TITLE
CHECK ONE:

May 15, 2011
DATE

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

DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

APPENDIX B
FIRE HYDRANT METER PROGRAM

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

1. **PURPOSE**

- 1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

- 2.1 All authorities and references shall be current versions and revisions.
- 2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15
- 2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986
- 2.4 California Code of Regulations, Titles 17 and 22
- 2.5 California State Penal Code, Section 498B.0
- 2.6 State of California Water Code, Section 110, 500-6, and 520-23
- 2.7 Water Department Director

Reference

- 2.8 State of California Guidance Manual for Cross Connection Programs
- 2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention
- 2.10 American Water Works Association Standards for Water Meters
- 2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

- 3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

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- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. **POLICY**

- 4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.
- 4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.
- 4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:
 - a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.
 - b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:
 - 1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

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2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
13. The outlet shall have a 2 ½ "National Standards Tested (NST) fire hydrant male coupling.
14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).

4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.

4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.

4.6 **Conditions and Processes for Issuance of a Fire Hydrant Meter**

Process for Issuance

- a. Fire hydrant meters shall only be used for the following purposes:
 1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
 - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
 - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
 - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
 - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
 - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
 - g. After the fees have been paid and an account has been created, the

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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as "Hotline"), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter's relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a "Notice of Discontinuation of Service" (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

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for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

- a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

- b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. FEE AND DEPOSIT SCHEDULES

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. UNAUTHORIZED USE OF WATER FROM A HYDRANT

8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.

8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.

8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.

8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

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- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

Water Department Director

- Tabs: 1. Fire Hydrant Meter Application
2. Construction & Maintenance Related Activities With No Return To Sewer
3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index: Construction Meters
Fire Hydrant
Fire Hydrant Meter Program
Meters, Floating or Vehicle Mounted
Mobile Meter
Program, Fire Hydrant Meter

Distribution: DI Manual Holders



Application For Fire Hydrant Meter

(EXHIBIT A)

For Office Use Only

2797 Caminito Chollas • San Diego, California 92105-5097
METER SHOP 619 527 7449
FAX 619 527 3125

NS Req:	Fac #:
Date:	By:

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:
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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
-------------------------------------	--

CIS 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-xxx.

Sincerely,

City of San Diego Water Department



Fire Hydrant Meter Relocate/Removal Request

(EXHIBIT D)

For Office Use Only

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

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

Materials Typically Accepted by Certificate of Compliance

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. CONSTRUCTION MANAGERing fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

APPENDIX D
SAMPLE CITY INVOICE

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#:			Contact 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	\$53.00	\$59,360.00						
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	Bonds	LS	1	\$16,000.00	\$16,000.00						
11	Field Orders	AL	1	80,000	\$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-Encrease 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 (5% 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 E
LOCATION MAP

SEWER PUMP STATION 13 IMPROVEMENTS

SENIOR ENGINEER
Hossein Azar

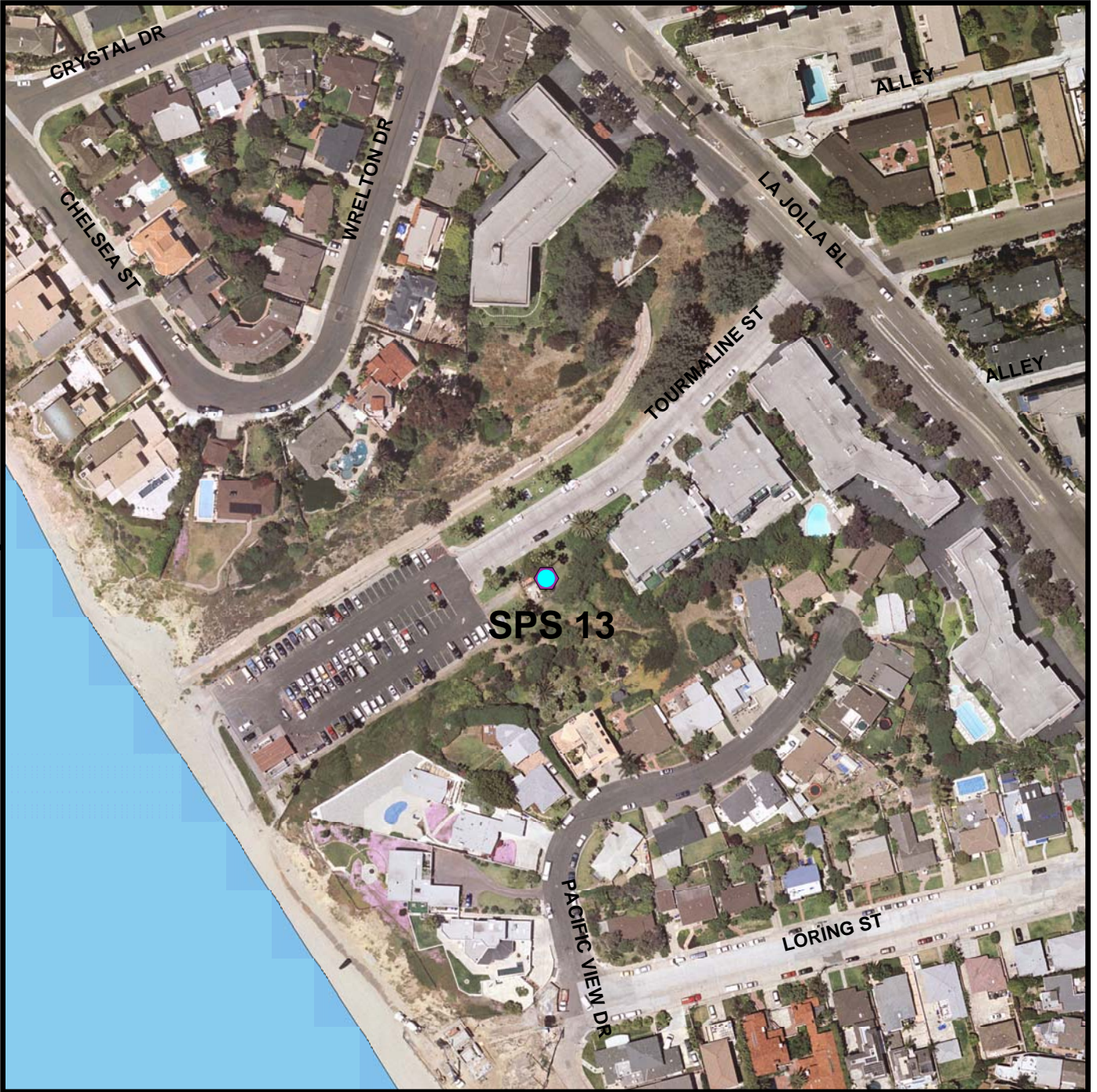
PROJECT MANAGER
David Manela

PROJECT ENGINEER
Silvia Rendón

CONSTRUCTION PROJECT
INFORMATION LINE
619-533-4207



Division Name -



No Scale

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APPENDIX F
HYDROSTATIC DISCHARGE FORM

APPENDIX

Hydrostatic Discharge Requirements Certification (Discharge Events < 500,000 gpd)

All discharge activities related to this project comply with the Regional Water Quality Control Board (RWQCB) Order No. 2002-0020, General Permit for Discharges of Hydrostatic Test Water and Potable Water to Surface Water and Storm Drains as referenced by (http://www.swrcb.ca.gov/rwqcb9/board_decisions/adopted_orders/2002/2002_0020.shtml), and as follows:

Discharged water has been dechlorinated to below 0.1 (mg/l) level; and effluent has been maintained between 6 and 9 (PH) based on:							<i>is discharge within acceptable limits?</i>		<i>Comment</i>
Event #	Discharge Date & Amount (GAL)	Discharge Time	Meter Readings (at source)	Test Results (Chlorine / PH)	Name of Personnel Conducting Tests (print)	*signature of personnel	yes	no	
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						
	Date	Start:	Start:						
	Amt:	End:	End:						

**By signing, I certify that all of the statements and conditions for hydrostatic discharge events are correct.*

Project Name: _____

Work Order No.(s): _____

Have any thresholds have been exceeded? Per Order No. 2002-0020, would this be a reportable discharge and must be reported **within 24 hours** of the event? [Reportable discharge would include violation of maximum gallons per day, any upset which exceeds any effluent limit]

APPENDIX G
DISCHARGE POINTS AND FLOW DATA

**CITY OF SAN DIEGO
M E M O R A N D U M**

DATE: August 7, 2012

TO: Silvia Rendon, Assistant Civil Engineer, Engineering & Capital Projects
Department

FROM: Matthew Wedeking, Associate Civil Engineer, Public Utilities Department

SUBJECT: Pre-Approval Discharge Flow Rate for Construction of Pump Station 13
Improvements

Discharge for this project is proposed to MH B13S379. The pipe downstream of this manhole is an 8-inch diameter line. Based on capacity evaluation of this line, the total flow that can be discharged to MH B13S379 is 300 GPM. This includes the existing flows to Pump Station 13 as well as any groundwater that may need to be discharged during the construction of this project.

This is only a pre-approval for capacity. Before discharge begins Industrial Waste needs to approve the discharge, and the capacity will be re-evaluated at that time.



Matthew Wedeking

Pump Station 13

By: MWA/whl/br - 2012.08.08
W:\Info\HM\Regional\Regional\Discharge Approval\Pre-Approval\Pump Station 13 Construction 120807PS13.pdf

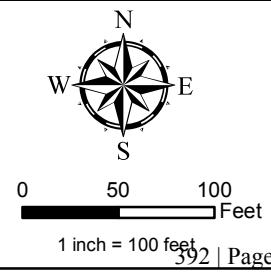


**Proposed Discharge Point
MH B13S379**

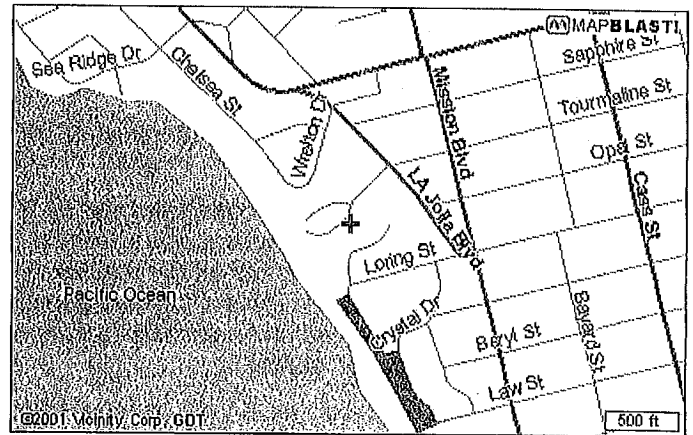
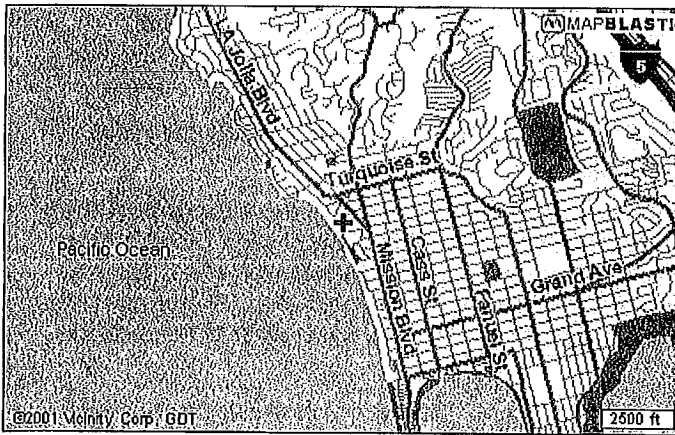
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- Legend**
- Manholes
 - Mains
 - Forced Mains



SPS-13 LOCATION



STATION BASIC DATA

Station:	SPS-13	Address:	633 Tourmaline Street
Criticality:	1	Year Built:	1963
Thomas Brothers:	1247-G5	Eng. Drawing #:	10606-5-8-D
Field Book:	B-13S	Alarm System:	Telemetry, Phone line
Building #:	91	Generator:	Mobile 150KVA, Quick Connect
		SDG&E Outage Block:	Circuit: 0056, Block: 65A

<u>Pump Data</u>		<u>Motor Data</u>		<u>Valve Data</u>	
Units:	2	Units:	2	Isolation:	
Manufacturer:	Wemco	Manufacturer:	US Motors	Units:	4
Size:	4"	Mount:	Vertical	Manufacturer:	Dezurik
Fig. No.:	DVPL	Frame:	256UP, 215T	Type:	Plug
GPM:	100	Volts:	240	Size:	4"
Total Head:	65 Feet	Amps:	27	Length (Fig-Fig):	9"
Pump Sealing:	Mechanical	Horsepower:	10 (hp)	Check:	
Impeller Diameter:	9"	Motor Speed:	1,800 (rpm)	Units:	2
Rotation:	CW	Phase:	3	Manufacturer:	Rich
Type:	Vertical			Type:	Swing
				Size:	4"
				Length (Fig-Fig):	12"

Station Fill Times			
	Flow (GPM)	Empty to High Water Alarm Time (Hours)	High Water Alarm to Overflow Time (Hours)
Low Flow:	3	8	6
Average Flow:	6	4	3
Peak Flow:	56	0.43	0.35
Wet Well Operating Volume:		374 gallons (pumps on to pumps off)	
Total Wet Well, Piping, and Manhole Retained Volume:		2,600 gallons (station empty to spill level)	

APPENDIX H
HAZARDOUS LABEL/FORMS

INCIDENT/RELEASE ASSESSMENT FORM ¹

If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

Questions for Incident Assessment:

	YES	NO
1. Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?	<input type="checkbox"/>	<input type="checkbox"/>
2. Did anyone, other than employees in the immediate area of the release, evacuate?	<input type="checkbox"/>	<input type="checkbox"/>
3. Did the release cause off-site damage to public or private property?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the release greater than or equal to a reportable quantity (RQ)?	<input type="checkbox"/>	<input type="checkbox"/>
5. Was there an uncontrolled or unpermitted release to the air?	<input type="checkbox"/>	<input type="checkbox"/>
6. Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?	<input type="checkbox"/>	<input type="checkbox"/>
7. Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?	<input type="checkbox"/>	<input type="checkbox"/>
8. Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?	<input type="checkbox"/>	<input type="checkbox"/>
10. Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment?	<input type="checkbox"/>	<input type="checkbox"/>

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

Call 911 in an emergency

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a “no” response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

¹ This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

NON REPORTABLE RELEASE INCIDENT FORM

1. RELEASE AND RESPONSE DESCRIPTION

Incident # _____

Date/Time Discovered	Date/Time Discharge	Discharge Stopped <input type="checkbox"/> Yes <input type="checkbox"/> No
Incident Date / Time:		
Incident Business / Site Name:		
Incident Address:		
Other Locators (Bldg, Room, Oil Field, Lease, Well #, GIS)		
Please describe the incident and indicate specific causes and area affected. Photos Attached?: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Indicate actions to be taken to prevent similar releases from occurring in the future.		

2. ADMINISTRATIVE INFORMATION

Supervisor in charge at time of incident:	Phone:
Contact Person:	Phone:

3. CHEMICAL INFORMATION

Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Clean-Up Procedures & Timeline:	
Completed By:	Phone:
Print Name:	Title:

EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM

A	BUSINESS NAME	FACILITY EMERGENCY CONTACT & PHONE NUMBER () -	
B	INCIDENT DATE MO DAY YR	TIME OES NOTIFIED (use 24 hr time)	OES CONTROL NO.
C	INCIDENT ADDRESS LOCATION	CITY / COMMUNITY	COUNTY ZIP
D	CHEMICAL OR TRADE NAME (print or type)		CAS Number
E	CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A <input type="checkbox"/>	CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a) <input type="checkbox"/>	
F	PHYSICAL STATE CONTAINED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	PHYSICAL STATE RELEASED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	QUANTITY RELEASED
G	ENVIRONMENTAL CONTAMINATION <input type="checkbox"/> AIR <input type="checkbox"/> WATER <input type="checkbox"/> GROUND <input type="checkbox"/> OTHER	TIME OF RELEASE	DURATION OF RELEASE — DAYS — HOURS — MINUTES
H	ACTIONS TAKEN		
I	KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information)		
J	<input type="checkbox"/> ACUTE OR IMMEDIATE (explain) _____ <input type="checkbox"/> CHRONIC OR DELAYED (explain) _____ <input type="checkbox"/> NOTKNOWN (explain) _____		
K	ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS		
L	COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)		
M	CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete. REPORTING FACILITY REPRESENTATIVE (print or type) _____ SIGNATURE OF REPORTING FACILITY REPRESENTATIVE _____ DATE: _____		

EMERGENCY RELEASE FOLLOW-UP NOTICE REPORTING FORM INSTRUCTIONS

GENERAL INFORMATION:

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

BASIC INSTRUCTIONS:

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

SPECIFIC INSTRUCTIONS:

Block A: Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

Block B: Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

Block C: Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

Block D: Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

Block E: Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

Block F: Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

Block G: Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

Block H: List any additional pertinent information.

Block I: Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

MAIL THE COMPLETED REPORT TO:

**State Emergency Response Commission (SERC)
Attn: Section 304 Reports
Hazardous Materials Unit
3650 Schriever Avenue
Mather, CA 95655**

NOTE: Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.

APPENDIX I
MUNICIPAL SCADA MANUAL

**The Municipal SCADA Manual is available for review upon request.
Please contact Project CONSTRUCTION MANAGER for a copy of Manual:
Silvia Rendon
SRendon@saniego.gov.
(619) 533-4246**

City of San Diego

CITY CONTACT: Claudia Abarca - Contract Specialist, Email: cabarca@sandiego.gov
Ph No. (619) 533-3439 - Fax No. (619) 533-3633



ADDENDUM "A"

FOR

SEWER PUMP STATION 13

BID NO.: K-13-5717-DBB-3
SAP NO. (WBS/IO/CC): B-00476
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 2
PROJECT TYPE: BP

BID DUE DATE:

2:00 PM
APRIL 16, 2013
CITY OF SAN DIEGO
PUBLIC WORKS DEPARTMENT
1010 SECOND AVENUE, SUITE 1400, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

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

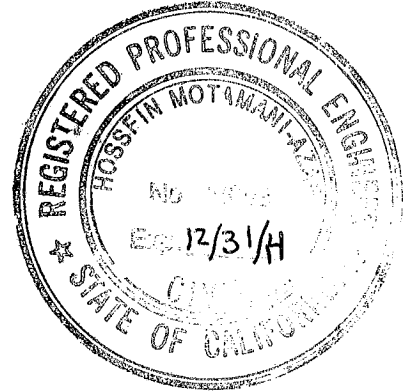
Vanessa M. Wilbat
Registered Engineer/Architect

04/05/2013 Seal:
Date



Hossein Motamanifard
For City Engineer

4-5-2013 Seal:
Date



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. Will the City be providing Construction Staking for this job?

A1. Yes.

Q2. Is the Ultrasonic level controller sole sourced as Pulsar in Section 15150 of the technical specifications?

A2. Yes, Pulsar is the standard for all City of San Diego pump stations.

Q3. Will the Contractor be able to use the existing City power supplier at the pump station to power the temporary bypass pumps?

A3. Contractor shall provide its own power supply.

C. VOLUME 1

1. To the CITY SUPPLEMENTS, PART 1 – GENERAL PROVISIONS (A), SECTION 6 – PROSECUTION, PROGRESS, AND ACCEPTANCE OF WORK, Subsection 6-2.1, Moratoriums, **ADD** the following:

6-2.1 Moratoriums. To the City Supplements, ADD the following:

Do not work in the areas where there is currently a moratorium issued by the City. The areas subject to moratorium are listed here:

- a) SPS13- 633 Tourmaline Street San Diego, CA 92109, On Memorial Day, Fourth of July and Labor day. No construction activities shall be scheduled 24 hours preceding and immediately following the Holiday.

D. VOLUME 2

1. TO the BIDDING DOCUMENTS, EQUAL BENEFITS ORDINANCE CERTIFICATION OF COMPLIANCE, page 9, **DELETE** in its entirety and **SUBSTITUTE** with page 4 of 4 of this Addendum.

Tony Heinrichs, Director
Public Works Department

Dated: *April 5, 2013*
San Diego, California

TH/bd/rir

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:	Contact Name:
Company Address:	Contact Phone:
	Contact Email:

CONTRACT INFORMATION

Contract Title:	Start Date:
Contract Number (if no number, state location):	End Date:

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
 - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
 - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm’s equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at www.sandiego.gov/administration.

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm’s compliance status with the EBO. The City may request supporting documentation.

- I affirm **compliance** with the EBO because my firm (*contractor must select one reason*):
- Provides equal benefits to spouses and domestic partners.
 - Provides no benefits to spouses or domestic partners.
 - Has no employees.
 - Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.
- I request the City’s approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)]

Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

Name/Title of Signatory	Signature	Date
-------------------------	-----------	------

FOR OFFICIAL CITY USE ONLY

Receipt Date:	EBO Analyst:	<input type="checkbox"/> Approved	<input type="checkbox"/> Not Approved – Reason:
---------------	--------------	-----------------------------------	---

(Rev 02/15/2011)

4/17/13 CW

City of San Diego

CONTRACTOR'S NAME: WIER CONST. CORP.
 ADDRESS: 2255 BARMAN DR., ESCONDIIDO, CA 92029
 TELEPHONE NO.: 760 743 6776 FAX NO.: 760 746 5224
 CITY CONTACT: Claudia Abarca - Contract Specialist, Email: CAbarca@sandiego.gov.
Phone No. (619) 533-3439, Fax No. (619) 533-3633
 DManela/BD/RIR



CONTRACT DOCUMENTS

FOR

SEWER PUMP STATION 13

VOLUME 2 OF 2

BID NO.:	<u>K-13-5717-DBB-3</u>
SAP NO. (WBS/IO/CC):	<u>B-00476</u>
CLIENT DEPARTMENT:	<u>2011</u>
COUNCIL DISTRICT:	<u>2</u>
PROJECT TYPE:	<u>BP</u>

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.
- BID DISCOUNT PROGRAM (The WHITEBOOK, SLBE-ELBE Program Requirements, Section IV(2))

**THIS BIDDING DOCUMENT TO BE SUBMITTED IN ITS ENTIRETY
 REFER TO VOLUME 1 COVER PAGE 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.

1. Bid/Proposal.....	3
2. Bid Bond	6
3. Non-Collusion Affidavit to be executed by Bidder and Submitted with Bid under 23 USC 112 and PCC 7106.....	7
4. Contractors Certification of Pending Actions.....	8
5. Equal Benefits Ordinance Certification of Compliance.....	9
6. Proposal (Bid).....	10
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 "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

IF A SOLE OWNER OR SOLE CONTRACTOR SIGN HERE:

- (1) Name under which business is conducted _____
- (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:

- (1) Name under which business is conducted _____

BIDDING DOCUMENTS

- (2) Name of each member of partnership, indicate character of each partner, general or special (limited):

- (3) Signature (Note: Signature must be made by a general partner)

Full Name and Character of partner

- (4) Place of Business (Street & Number) _____

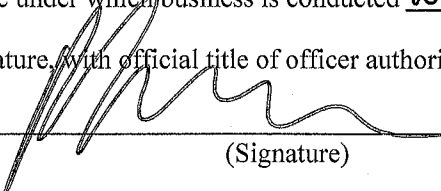
- (5) City and State _____ Zip Code _____

- (6) Telephone No. _____ Facsimile No. _____

IF A CORPORATION, SIGN HERE:

- (1) Name under which business is conducted WIER CONST. CORP.

- (2) Signature, with official title of officer authorized to sign for the corporation:

x 

(Signature)

BRIAN J. WIER

(Printed Name)

V.P.

(Title of Officer)

(Impress Corporate Seal Here)

- (3) Incorporated under the laws of the State of Ca.

- (4) Place of Business (Street & Number) 2255 BARHAM DR.,

- (5) City and State ESCONDIDO, Ca. Zip Code 92029

- (6) Telephone No. 760 743 6776 Facsimile No. 760 746 5224

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: WIER CONST. COMP.	Contact Name: BRIAN J. WIER
Company Address: 2255 BARNHAM DR.	Contact Phone: 7607430776
ESCONDIDO, CA. 92029	Contact Email: brian@wierconstruction.com

CONTRACT INFORMATION

Contract Title: SEWER PUMP STATION 13	Start Date:
Contract Number (if no number, state location): K-13-5717-DBB-3	End Date:

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
 - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
 - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm's equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at www.sandiego.gov/administration.

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm's compliance status with the EBO. The City may request supporting documentation.

- I affirm **compliance** with the EBO because my firm (*contractor must select one reason*):
- Provides equal benefits to spouses and domestic partners.
 - Provides no benefits to spouses or domestic partners.
 - Has no employees.
 - Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.
- I request the City's approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)]

Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

BRIAN J. WIER, V.P.		4/10/13
Name/Title of Signatory	Signature	Date

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

THE FOLLOWING SECTIONS MUST BE FILLED IN BY ALL PROPOSERS:

In accordance with the "NOTICE INVITING BIDS", the bidder holds a California State Contractor's license for the following classification(s) to perform the work described in these specifications:

LICENSE CLASSIFICATION A, B, CB, C27, HAZ

LICENSE NO. 481419 EXPIRES 10/30/13

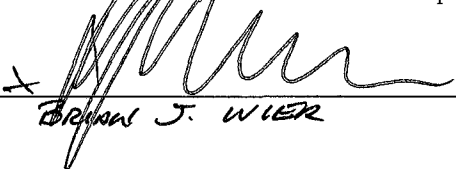
This license classification must also be shown on the front of the bid envelope. Failure to show license classification on the bid envelope may cause return of the bid unopened.

TAX IDENTIFICATION NUMBER (TIN): [REDACTED]

E-Mail Address: brian@wierconstruction.com

THIS PROPOSAL MUST BE NOTARIZED BELOW:

I certify, under penalty of perjury, that the representations made herein regarding my State Contractor's license number, classification and expiration date are true and correct.

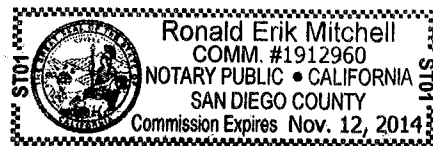
Signature  Title V.P.
Brian J. Wier

SUBSCRIBED AND SWORN TO BEFORE ME, THIS 16th DAY OF April, 2013.

Notary Public in and for the County of SAN DIEGO, State of CA



(NOTARIAL SEAL)



BIDDING DOCUMENTS

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

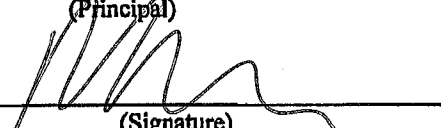
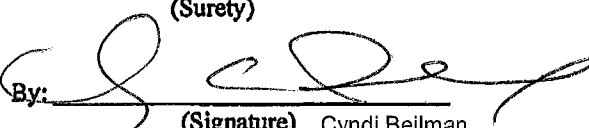
That Wier Construction Corporation as Principal, and
Philadelphia Indemnity Insurance Company as Surety, are
held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10%
OF THE TOTAL BID AMOUNT** for the payment of which sum, well and truly to be made, we
bind ourselves, 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

Sewer Pump Station 13

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time
and in the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form
of agreement bound with said Contract Documents, furnishes the required certificates of insurance,
and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null
and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond
by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in
such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 15th day of April, 2013

<p><u>Wier Construction Corporation</u> (SEAL) (Principal) By:  (Signature)</p>	<p><u>Philadelphia Indemnity Insurance Company</u> (SEAL) (Surety) By:  (Signature) Cyndi Beilman Attorney-in-Fact</p>
--	--

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

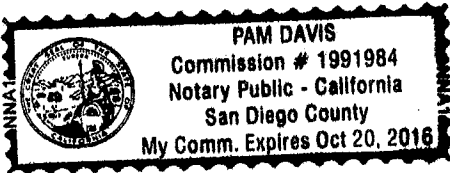
CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA

County of San Diego

On April 15, 2013 before me, Pam Davis, Notary Public
Date Here Insert Name and Title of the Officer

personally appeared Cyndi Beilman
Name(s) of Signer(s)



Place Notary Seal Above

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 *Pam Davis*
Signature of Notary Public Pam Davis

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: _____

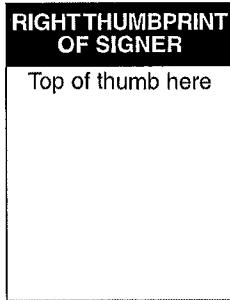
Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

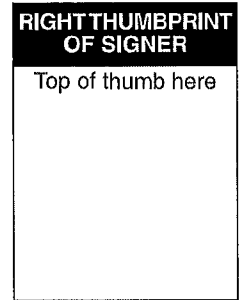
- Individual
- Corporate Officer — Title(s): _____
- Partner — Limited General
- Attorney in Fact
- Trustee
- Guardian or Conservator
- Other: _____



Signer Is Representing: _____

Signer's Name: _____

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



Signer Is Representing: _____

PHILADELPHIA INDEMNITY INSURANCE COMPANY

231 St. Asaph's Rd., Suite 100
Bala Cynwyd, PA 19004-0950

Power of Attorney

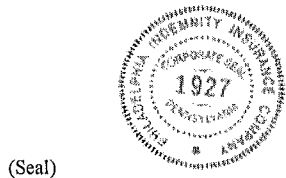
KNOW ALL PERSONS BY THESE PRESENTS: that **PHILADELPHIA INDEMNITY INSURANCE COMPANY** (the Company), a corporation organized and existing under the laws of the Commonwealth of Pennsylvania, does hereby constitute and appoint: **CYNDI BEILMAN, ANNE WRIGHT AND DANA MICHAELIS OF SURETY ASSOCIATES OF SOUTHERN CALIFORNIA INSURANCE SERVICES** its true and lawful Attorney(s) in fact with full authority to execute on its behalf bonds, undertakings, recognizances and other contracts of indemnity and writings obligatory in the nature thereof, issued in the course of its business and to bind the Company thereby, in an amount not to exceed \$5,000,000.00.

This Power of Attorney is granted and is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of PHILADELPHIA INDEMNITY INSURANCE COMPANY at a meeting duly called the 1st day of July, 2011.

RESOLVED: That the Board of Directors hereby authorizes the President or any Vice President of the Company to: (1) Appoint Attorney(s) in Fact and authorize the Attorney(s) in Fact to execute on behalf of the Company bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof and to attach the seal of the Company thereto; and (2) to remove, at any time, any such Attorney-in-Fact and revoke the authority given. And, be it

FURTHER RESOLVED: That the signatures of such officers and the seal of the Company may be affixed to any such Power of Attorney or certificate relating thereto by facsimile, and any such Power of Attorney so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with the respect to any bond or undertaking to which it is attached.

IN TESTIMONY WHEREOF, PHILADELPHIA INDEMNITY INSURANCE COMPANY HAS CAUSED THIS INSTRUMENT TO BE SIGNED AND ITS CORPORATE SEAL TO BE AFFIXED BY ITS AUTHORIZED OFFICE THIS 15TH DAY OF NOVEMBER 2012.

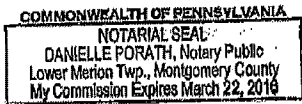


Sean Sweeney

President

Sean S. Sweeney, President
Philadelphia Indemnity Insurance Company

On this 15th day of November 2012, before me came the individual who executed the preceding instrument, to me personally known, and being by me duly sworn said that he is the therein described and authorized officer of the **PHILADELPHIA INDEMNITY INSURANCE COMPANY**; that the seal affixed to said instrument is the Corporate seal of said Company; that the said Corporate Seal and his signature were duly affixed.



Notary Public:

Danielle Porath

residing at:

Bala Cynwyd, PA

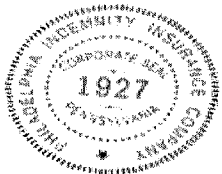
(Notary Seal)

My commission expires:

March 22, 2016

I, Craig P. Keller, Executive Vice President, Chief Financial Officer and Secretary of PHILADELPHIA INDEMNITY INSURANCE COMPANY, do hereby certify that the foregoing resolution of the Board of Directors and this Power of Attorney issued pursuant thereto are true and correct and are still in full force and effect. I do further certify that Sean S. Sweeney, who executed the Power of Attorney as President, was on the date of execution of the attached Power of Attorney the duly elected President of PHILADELPHIA INDEMNITY INSURANCE COMPANY,

In Testimony Whereof I have subscribed my name and affixed the facsimile seal of each Company this 15th day of April 2013.



Craig P. Keller

Craig P. Keller, Executive Vice President, Chief Financial Officer & Secretary
PHILADELPHIA INDEMNITY INSURANCE COMPANY

BIDDING DOCUMENTS

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23 UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106

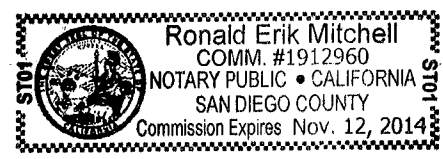
State of California)
County of SAN DIEGO) ss.

BRIAN J. WIEL, being first duly sworn, deposes and says that he or she is VICE PRESIDENT 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]
BRIAN J. WIEL
Title: V.P.

Subscribed and sworn to before me this 10th day of April, 2013
[Signature]
Notary Public

(SEAL)



BIDDING DOCUMENTS

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 10 years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

DATE OF CLAIM	LOCATION	DESCRIPTION OF CLAIM	LITIGATION (Y/N)	STATUS	RESOLUTION/REMEDIAL ACTION TAKEN

Contractor Name: WIEN CONST. CORP.

Certified By BRIAN J. WIEN Name Title V.P.

[Signature] Signature Date 4/16/13

USE ADDITIONAL FORMS AS NECESSARY

BIDDING DOCUMENTS

PROPOSAL (BID)

The Bidder agrees to the construction of **SEWER PUMP STATION 13**, for the City of San Diego, in accordance with these contract documents for the prices listed below. The Bidder guarantees the Contract Price for a period of 120 days (90 days for federally funded contracts and contracts valued at \$500,000 or less) from the date of Bid opening to Award of the Contract. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent e.g., bond and insurance.

Item	Quantity	Unit	Payment Reference	NAICS	Description	Unit Price	Extension
BASE BID							1,591,950
1	1	LS	9-3.1	237110	General Construction	1,591,950	1,591,950 yw
2	1	LS	306-1.1.6	237110	Shoring	2,875	2,875
3	1	LS	701-13.9.5	541330	Water Pollution Control Program Development	777	777 yw
4	1	LS	701-13.9.5	237990	Water Pollution Control Program Implementation	4,025	4,025
5	1	LS	9-3.4.1	237110	Mobilization	5,025	5,025 yw
6	1	LS	9-3.1	238910	Demolition	27,600	27,600
7	2	EA	9-3.1	237110	Vertical Recessed Impeller Pumps/Motors	\$ 32,200	\$ 64,400
8	1	EA	9-3.1	237110	Vertical Recessed Impeller Pumps/Motors Spare	\$ 32,200	\$ 32,200
9	1	EA	704-4	237110	Sewage Bypass and Pumping Plan	\$ 48,990	\$ 48,990
10	1	LS	304-3.4	238990	Chain Link Fence with Gate	52,340	52,340
11	1	LS	306-1.6	237110	Rock Trap	12,880	12,880
12	1	LS	9-3.1	238210	Electrical	41,860	41,860
13	1	LS	9-3.1	237310	Site Repair	34,638	34,638
14	1	LS	2-4.1	237110	Bonds (Payment and Performance)	11,500	11,500
15	1	AL	9-3.5		Field Orders - Type II		\$25,000.00
16	1	AL	9-3.1	237110	Special Inspection - Type I		\$10,000.00
17	1	AL	7-5.3	237110	Permits - Type I		\$5,000.00
18	1	AL	9-3.1	541330	Soils Investigation - Type I		\$12,000.00
ESTIMATED TOTAL BASE BID							\$ 566,840 yw
							596,190 CSW

BIDDING DOCUMENTS

TOTAL BID PRICE FOR BID (Items 1 through 18 inclusive) amount written in words:

FIVE HUND. NINETY-SIX THOUS. ONE HUND. NINETY DOLLAR

The Bid shall contain an acknowledgment of receipt of all addenda, the numbers of which shall be filled in on this Bid form.

List the Addenda received and being acknowledged: A

If an addendum or addenda has been issued by the City and not noted as being received by the Bidder, the Bid shall be rejected as being non-responsive.

The names of all persons interested in the foregoing proposal as principals are as follows:

CATHY J. WIER - PRES., SEC., TREAS.

BRIAN J. WIER - VICE PRES.

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.

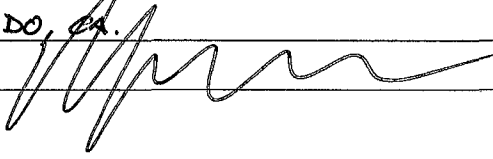
Bidder: WIER CONST. CORP., BRIAN J. WIER, V.P.

Title: V.P.

Business Address: 2255 BARNUM DR., ESCONDIDO, CA. 92029

Place of Business: ESCONDIDO, CA.

Place of Residence: ESCONDIDO, CA.

Signature: X 

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.

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>ALLIED STEEL</u> Address: _____ City: <u>RIVERSIDE</u> State: <u>CA</u> Zip: _____ Phone: _____	<u>CONST.</u>	<u>MISC. METAL</u>	<u>16,225</u>	<u>—</u>	<u>—</u>	
Name: <u>WHISTON</u> Address: _____ City: <u>SAN DIEGO</u> State: <u>CA</u> Zip: _____ Phone: _____	<u>DESTROYED SWPPP CONST.</u>	<u>SWPPP</u>	<u>1,200</u>	<u>SLBE</u>	<u>12WCD668 SAN DIEGO</u>	
Name: <u>SASC</u> Address: _____ City: <u>LANES</u> State: <u>CA</u> Zip: _____ Phone: _____	<u>CONST.</u>	<u>BONDS</u>	<u>10,000</u>	<u>SLBE</u>	<u>10W10081 SAN DIEGO</u>	

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.

0.2546
CN

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>HURRICANE FENCE</u> Address: City: <u>RAMONA</u> State: <u>CA</u> Zip: _____ Phone: _____	CONST.	S.S. FENCE	45,517	SLBE	12HP0031 SAN DIEGO	
Name: <u>TITAN ELECT.</u> Address: City: <u>SANTEE</u> State: <u>CA</u> Zip: _____ Phone: _____	CONST.	ELECT.	36,400	SLBE ELBE	13TE0820 S. D.	
Name: <u>CA² CONST.</u> Address: City: <u>CHULA VISTA</u> State: <u>CA</u> Zip: _____ Phone: _____	CONST.	DEMOL CONC. COATINGS	42,700	SLBE	12LL0785 SAN DIEGO	

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.

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)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED
Name: <u>HURRICANE FENCE</u> Address: City: <u>PAUNONA</u> State: <u>CA</u> <i>CJW</i> Zip: _____ Phone: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						

⓪ 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):

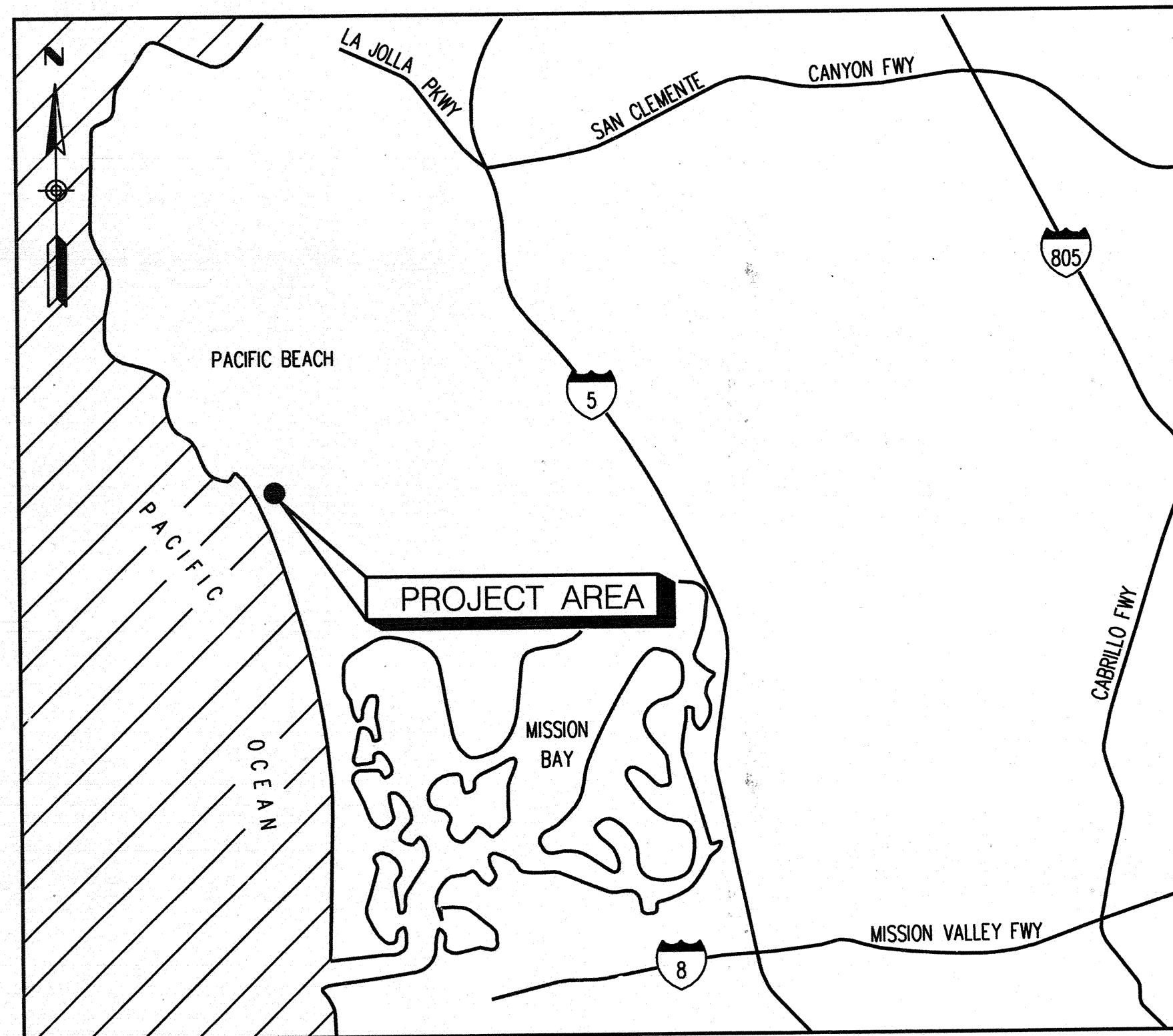
- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local 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 | | |

Ⓛ As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

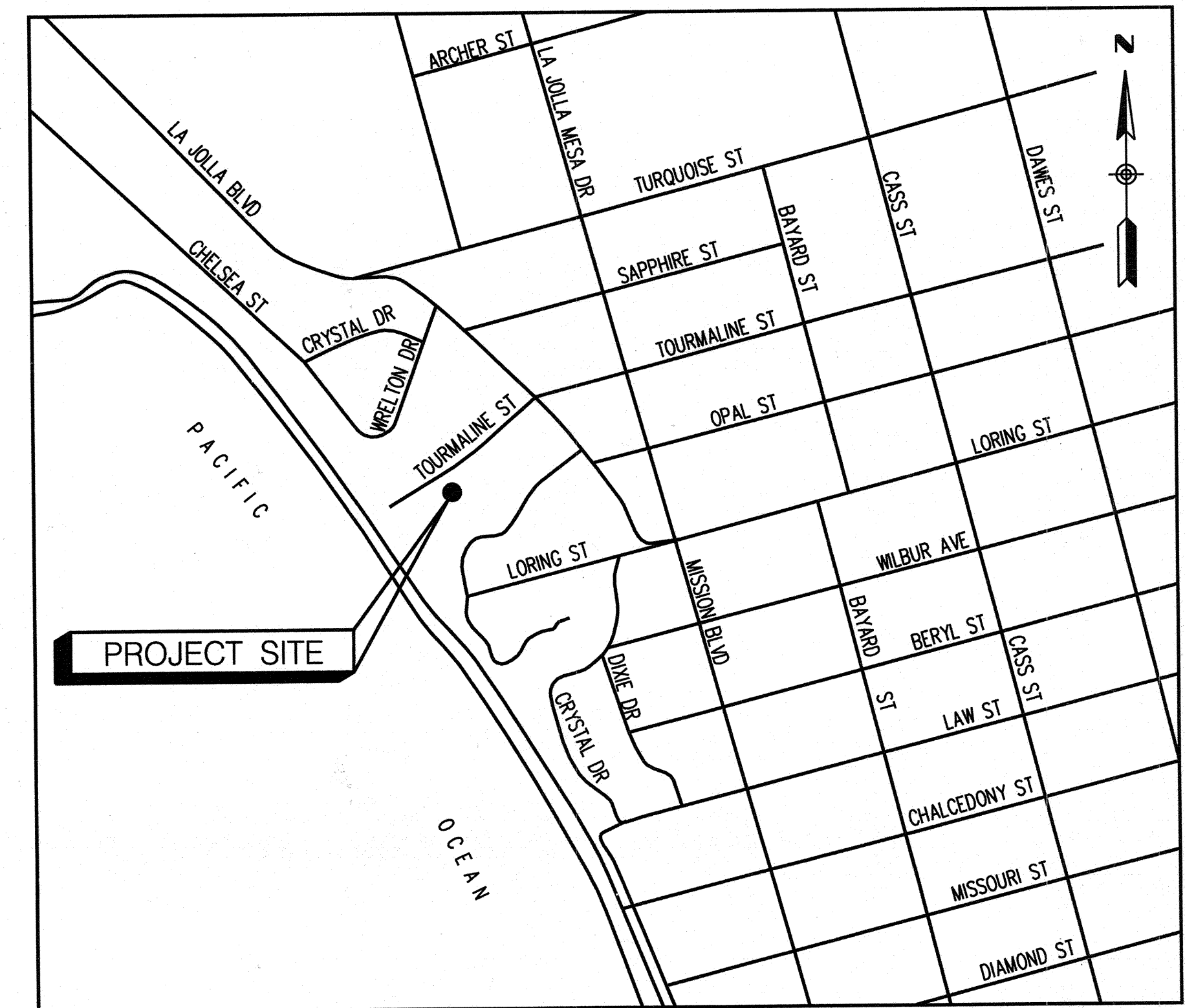
- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| State of California's Department of General Services | 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.

CONSTRUCTION DRAWINGS FOR PW/ENGINEERING & CAPITAL PROJECTS DEPARTMENT CITY OF SAN DIEGO



KEY MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

SEWER PUMP STATION 13 IMPROVEMENTS

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Eric R. Lovins
(ENGINEER'S NAME)

2/19/2013
DATE

LEE & RO, INC.
10640 SCRIPPS RANCH BLVD, SUITE 150
SAN DIEGO, CA 92131
PHONE: (858) 558-4411

TEMP BMP CS/SWP:	LOW	SPEC. NO. 5717	G-1
SEWER PUMP STATION 13 IMPROVEMENTS			
COVER SHEET			
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 01 OF 22 SHEETS			WBS B-00476
APPROVED BY <i>Hossein Akbar</i>	DATE 2-21-13	SUBMITTED BY <i>David Manela</i>	
FOR CITY ENGINEER		ASSOCIATE ENGINEER	
DESCRIPTION ORIGINAL	BY LRI	APPROVED	DATE FILMED
		PROJECT ENGINEER <i>Silvia Rendon</i>	
		230-1689 LAMBERT COORDINATE	
		1870-6250 CCS83 COORDINATE	
CONTRACTOR	DATE STARTED	37021-01-D	
INSPECTOR	DATE COMPLETED		

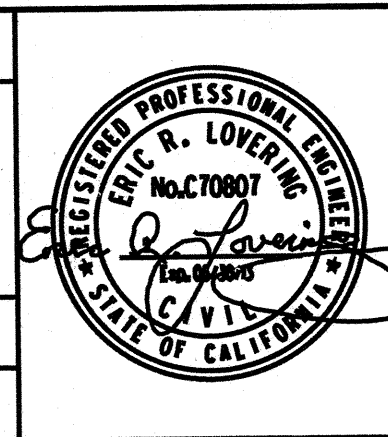
CONSTRUCTION CHANGE / ADDENDUM			
CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.

CONSULTANT

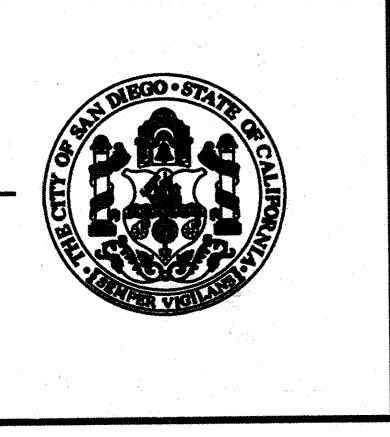
LEE & RO, Inc.
San Diego, California

SCALE

HORIZONTAL
VERTICAL



**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



WARNING

0 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

SEWER PUMP STATION 13 IMPROVEMENTS

DRAWING INDEX

CITY OF SAN DIEGO	SHEET	DESCRIPTION
DRAWING NO.	NO.	DESCRIPTION
<u>GENERAL</u>		
37021-01-D	G-1	COVER SHEET
37021-02-D	G-2	DRAWING INDEX, UTILITY CONTACTS, PROJECT DATA, & SCOPE OF WORK
37021-03-D	G-3	STANDARDS, LEGENDS, GENERAL NOTES, & ABBREVIATIONS SHEET 1 OF 2
37021-04-D	G-4	STANDARDS, LEGENDS, GENERAL NOTES, & ABBREVIATIONS SHEET 2 OF 2
<u>CIVIL</u>		
37021-05-D	C-1	TEMPORARY BY-PASS PUMPING SCHEME
37021-06-D	C-2	SITE PLAN & DETAILS
37021-07-D	C-3	EXISTING COMFORT STATION MANHOLE PROFILE AND DEMOLITION DETAIL
<u>DEMOLITION</u>		
37021-08-D	D-1	DEMOLITION TOP SLAB AND FLOOR PLAN
37021-09-D	D-2	DEMOLITION SECTIONS
37021-10-D	D-3	DEMOLITION ELECTRICAL PLAN
<u>STRUCTURAL</u>		
37021-11-D	S-1	STRUCTURAL NOTES SHEET 1 OF 2
37021-12-D	S-2	STRUCTURAL NOTES SHEET 2 OF 2
37021-13-D	S-3	STRUCTURAL IMPROVEMENTS TOP SLAB & WET WELL PLAN
37021-14-D	S-4	STRUCTURAL IMPROVEMENTS TOP SLAB & WET WELL SECTIONS
37021-15-D	S-5	STRUCTURAL IMPROVEMENTS ALUMINUM PLATFORM AND MISCELLANEOUS DETAILS
37021-16-D	S-6	STRUCTURAL IMPROVEMENTS MISCELLANEOUS PIPE SUPPORTS
<u>MECHANICAL</u>		
37021-17-D	M-1	MECHANICAL IMPROVEMENTS TOP SLAB, WET WELL & DRY WELL PLAN & CRANE COVERAGE PLAN
37021-18-D	M-2	MECHANICAL IMPROVEMENTS TOP SLAB, WET WELL & DRY WELL SECTIONS & CRANE COVERAGE DETAILS
37021-19-D	M-3	MECHANICAL DETAILS & PUMP OPERATIONAL INFORMATION
<u>ELECTRICAL</u>		
37021-20-D	E-1	ELECTRICAL LEGENDS, SYMBOLS & ABBREVIATIONS
37021-21-D	E-2	ELECTRICAL IMPROVEMENTS WET WELL PLAN
37021-22-D	E-3	MODIFIED SINGLE LINE DIAGRAM AND DETAILS

INDEX OF DISCIPLINES

G	GENERAL
C	CIVIL
D	DEMOLITION
S	STRUCTURAL
M	MECHANICAL
E	ELECTRICAL
I	INSTRUMENTATION

UNDERGROUND UTILITIES

THE CONTRACTOR SHALL, AT LEAST THREE (3) WORKING DAYS PRIOR TO THE START OF WORK, NOTIFY THE FOLLOWING UTILITIES AND REQUEST THAT THEIR UNDERGROUND FACILITIES 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.

UNDERGROUND SERVICE ALERT	1-800-227-2600, 1-800-422-4133
SAN DIEGO GAS & ELECTRIC	1-800-227-2600, 811
AT&T	1-800-227-2600, 811
COSD NEIGHBORHOOD CODE COMPLIANCE DIVISION	1-619-236-5500
UNDERGROUND WATER/SEWER MARKOUT	1-619-527-3477
CITY IRRIGATION SYSTEMS AND WIRING	1-619-235-1179
STREET DIVISION/STREET LIGHTS	1-619-527-7500
WIRELESS COMMUNICATIONS	1-619-236-6081
SAN DIEGO FIRE DEPARTMENT DISPATCH	1-858-573-1300
SAN DIEGO POLICE DEPARTMENT DISPATCH	1-619-531-2000
ENVIRONMENTAL SERVICES	1-858-492-5055

CONTRACTOR'S RESPONSIBILITIES

- PURSUANT TO SECTION 4216 OF THE GOVERNMENT CODE, AT LEAST 2 WORKING DAYS PRIOR TO COMMENCING ANY EXCAVATION, THE CONTRACTOR SHALL CONTACT THE REGIONAL NOTIFICATION CENTER (UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA) AND OBTAIN AN INQUIRY IDENTIFICATION NUMBER.
- THE CONTRACTOR SHALL NOTIFY SDG&E AT LEAST 10 WORKING DAYS PRIOR TO EXCAVATING WITHIN 10' OF SDG&E UNDERGROUND HIGH VOLTAGE TRANSMISSION POWER LINES. (i.e., 69 KV & HIGHER)

STORM WATER PROTECTION

- THIS PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT ORDER NO. R9-2007-0001 AND IS REQUIRED TO DEVELOP AND IMPLEMENT A "WATER POLLUTION CONTROL PLAN (WPCCP)".

WATER POLLUTION CONTROL NOTES

THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS NOTED IN THE GREENBOOK 2012 CITY SUPPLEMENT ("WHITEBOOK") SEC 701- WATER POLLUTION CONTROL.

PROJECT DIRECTORY

ENGINEER
LEE & RO, INC.
10640 SCRIPPS RANCH BLVD, SUITE 150
SAN DIEGO, CA 92131
PH: (858) 558-4411

SURVEY
AGUIRRE & ASSOCIATES
8265 COMMERCIAL STREET, SUITE 1
LA MESA, CA 91942
PH: (619) 464-6978

PROJECT DATA

PROJECT NAME: PUMP STATION NO. 13 IMPROVEMENTS
PROJECT ADDRESS: SEWER PUMP STATION NO. 13
633 TOURMALINE STREET
SAN DIEGO, CA 92109

PROJECT MANAGER: DAVID MANELA (619) 533-6682
SUBMITTAL DATE: DECEMBER 18, 2012

ZONE: RS-1-5
OWNER: CITY OF SAN DIEGO



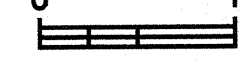
ASSESSOR'S PARCEL NUMBER: 415-220-14 (PUEBLO LOT 1783, MAP 839, POR. LOT 1)

PLAN FILE NO: TBD
PERMIT NO(S): TBD

SUMMARY OF WORK

THE WORK IN THIS CONTRACT COMPRISES OF THE FOLLOWING BUT IS NOT LIMITED TO:

- WET WELL MODIFICATIONS INCLUDING EXTENSION OF WALLS AND RELINING WORK.
- DEMOLITION AND REPLACEMENT OF EXISTING DRY-PIT, 10 HP PUMPS WITH NEW 10 HP, SOLIDS HANDLING, IMMERSIBLE PUMPS (INSTALL 1 DUTY, 1 STANDBY, AND PROVIDE 1 SPARE).
- REMOVAL AND REPLACEMENT OF EXISTING SUCTION AND DISCHARGE PIPING AND VALVING.
- PARTIAL DEMOLITION AND REDESIGN OF PUMP STATION ROOF, INSTALLATION OF NEW ACCESS HATCH, VALVE ROD ACCESS BOXES, AND NEW VENTILATION SYSTEM.
- PROVIDE NEW ELECTRICAL, INSTRUMENTATION, AND CONTROLS TO MAKE THE SYSTEMS COMPLETE AND FUNCTIONAL.
- INSTALLATION OF DROP MANHOLE TO SERVE AS A ROCK TRAP.
- PROVIDE, OPERATE, AND MAINTAIN TEMPORARY PUMPING FACILITIES DURING CONSTRUCTION.

CONSULTANT			WARNING
 LEE & RO, Inc. San Diego, California			0 1  IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.
SCALE		HORIZONTAL VERTICAL	
TEMP BMP CS/SWP: LOW SPEC. NO. 5717		G-2	
SEWER PUMP STATION 13 IMPROVEMENTS DRAWING INDEX, UTILITY CONTACTS, PROJECT DATA, & SCOPE OF WORK			
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 02 OF 22 SHEETS		WBS B-00476	
APPROVED: <i>Hosin Agar</i> 2.21.13 FOR CITY ENGINEER DATE		SUBMITTED BY: <i>David Manela</i> DAVID MANELA ASSOCIATE ENGINEER	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LRI	[Signature]	[Date]
PROJECT ENGINEER		SILVIA REMDON PROJECT ENGINEER	
CONTRACTOR		DATE STARTED	
INSPECTOR		DATE COMPLETED	
230-1689 LAMBERT COORDINATE		1870-6250 CCS88 COORDINATE	
37021-02-D			

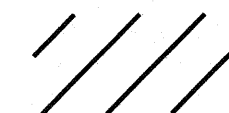


REFERENCE DRAWINGS

- 1. TOURMALINE CANYON PUMP STATION PROJECT, 10606-D
- 2. MUNICIPAL SCADA UPGRADES - PACKAGE 'A', 26437-D

BENCHMARK

POINT NO. 140 PER ROS 14492
 A BRASS DISK IN 2" IRON PIPE ON CENTER MEDIAN OF
 LA JOLLA BLVD. 225 FEET NORTH OF TOURMALINE ST.
 ELEVATION = 87.78'
 DATUM = NGVD 29

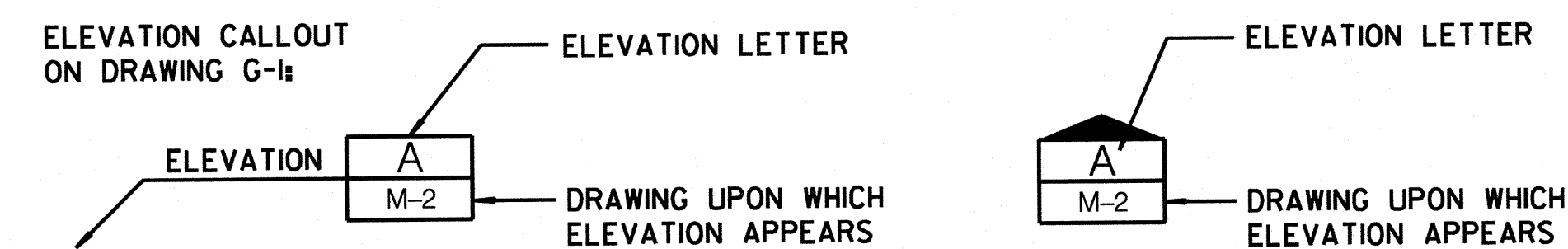
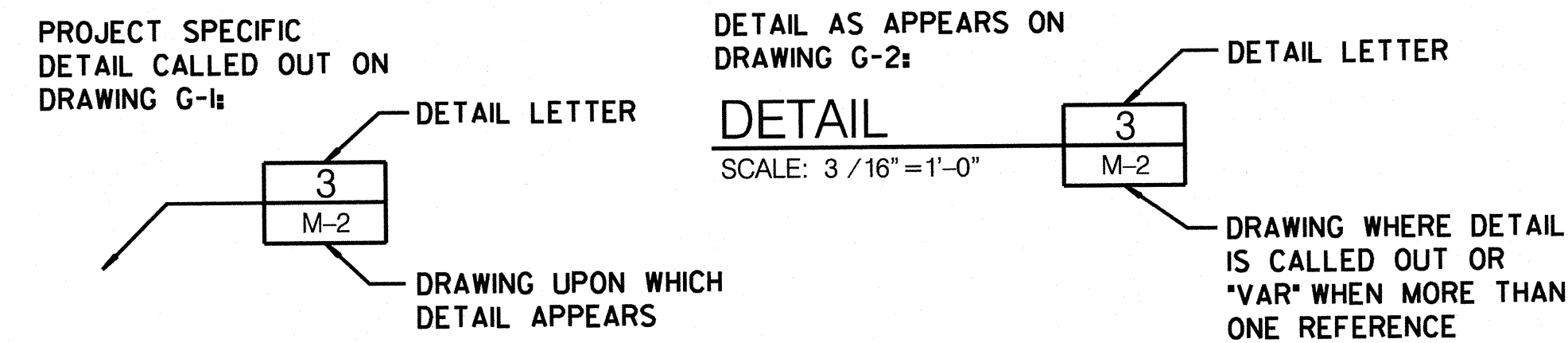
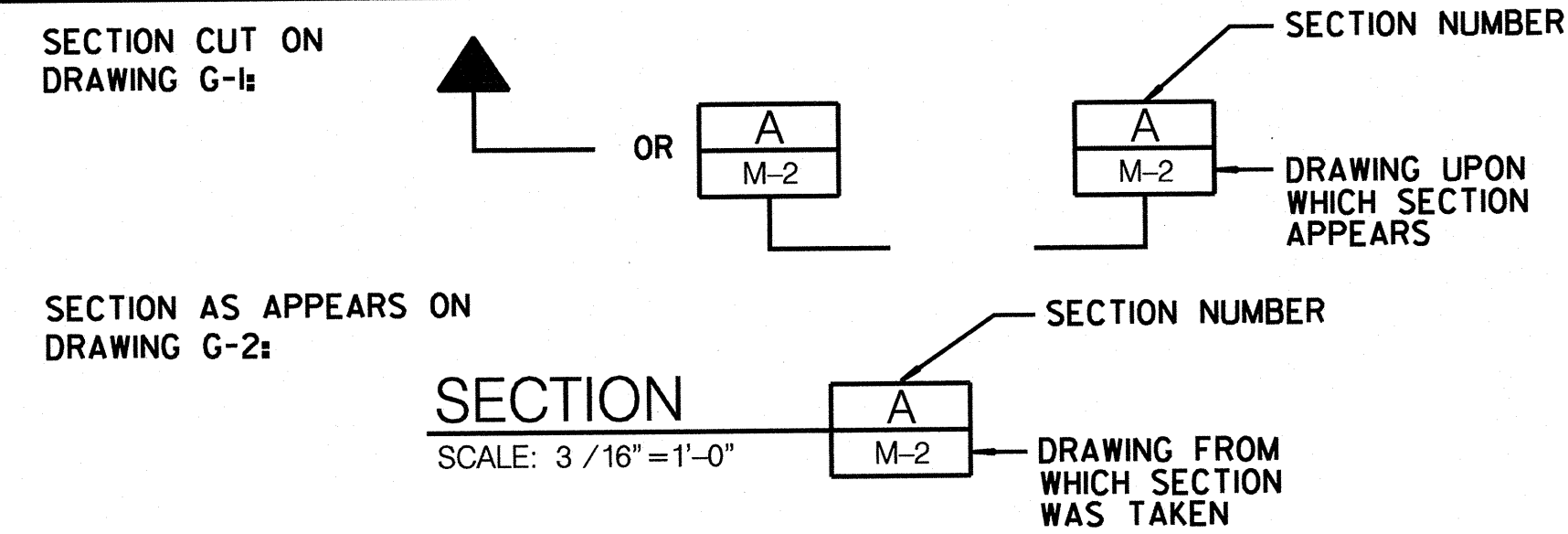
WORK TYPE DESIGNATIONS

-  OR (D) - DEMOLITION
-  OR (E) - EXISTING
-  OR (N) - NEW WORK

ABBREVIATIONS

AB	ANCHOR BOLT	MFR	MANUFACTURER
ABAND	ABANDON	MH	MANHOLE
AC	ASPHALT CONCRETE	MIN	MINIMUM
AD	AREA DRAIN		
AL	ALUMINUM	(N)	NEW
ASSY	ASSEMBLY	NG	NATURAL GAS
BFG	BELOW FINISHED GRADE	OC	ON CENTER
BTWN	BETWEEN		
		PL, P	PLATE
C, C	CENTERLINE	POC	POINT OF CONNECTION
CB	CATCH BASIN	PROP	PROPOSED
CFM	CUBIC FEET PER MINUTE	PW	POTABLE WATER
CO	CLEAN OUT		
CONC	CONCRETE	REINF	REINFORCING/REINFORCEMENT
COND	CONDUIT	REQ'D	REQUIRED
		RT	RIGHT
(D)	DEMOLISH	S	SURVEY LINE
DG	DECOMPOSED GRANITE	SCH	SCHEDULE
DI	DUCTILE IRON	SD	STORM DRAIN
DIA	DIAMETER	SDG&E	SAN DIEGO GAS AND ELECTRIC
		SDMH	STORM DRAIN MANHOLE
EG	EXISTING GROUND	SDR	SUMP DRAIN
EL, ELEV	ELEVATION	SDRMH	SUMP DRAIN MANHOLE
ELEC	ELECTRICAL	SLV	STREET LIGHT VAULT
(E), EX, EXIST	EXISTING	SMH	SEWER MANHOLE
EV	ELECTRICAL VAULT	SST	STAINLESS STEEL
EW	EACH WAY	STR	STRUCTURAL
		SVT	SANITARY VENT
FD	FLOOR DRAIN	SWR	SEWER
FF	FILTER FEED, FINISHED FLOOR		
FG	FINISHED GRADE	T&B	TOP AND BOTTOM
FH	FIRE HYDRANT	TC	TOP OF CURB
FL	FLOW LINE	TEL	TELEPHONE
FM	FLOW METTER	TEMP	TEMPORARY
FPW	FIRE PROTECTION WATER	TG	TOP OF GRATE
FRP	FIBER REINFORCED PLASTIC	TP	TOP OF PIPE
FS	FINISHED SURFACE	TYP	TYPICAL
GS	GROUND SHOT	UMH	UTILITY MANHOLE
HP	HIGH PRESSURE/HORSE POWER	UNK	UNKNOWN
HWL	HIGH WATER LEVEL	UV	UTILITY VAULT
HWLA	HIGH WATER LEVEL ALARM		
		VCP	VITRIFIED CLAY PIPE
IE	INVERT ELEVATION		
IRR	IRRIGATION	W	WATER
		W/	WITH
		WM	WATER METER
LLV	LONG LEG VERTICAL		
LWL	LOW WATER LEVEL		
LWLA	LOW WATER LEVEL ALARM		

SECTION AND DETAIL IDENTIFICATION



TRAFFIC CONTROL GENERAL NOTES

1. COMPLY WITH STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION, SECTION 7-10.1 THRU 7-10.4.
2. PLANS SHALL BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL A MINIMUM OF 10 WORKING DAYS PRIOR TO THE START OF WORK.
3. IT IS THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING WORK ON CITY PROPERTY TO INSTALL AND MAINTAIN THE TRAFFIC CONTROL DEVICES TO INSURE THE SAFE MOVEMENT OF TRAFFIC AND PEDESTRIANS THROUGH OR AROUND THE WORK AREA AND PROVIDE MAXIMUM PROTECTION AND SAFETY TO CONSTRUCTION WORKERS.
4. THE CONTRACTOR SHALL HAVE ALL SIGNS, DELINEATORS, BARRICADES, ETC. PROPERLY PLACED PRIOR TO COMMENCING CONSTRUCTION.
5. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY SHORING, BRACING, BARRICADES AND PROTECTIVE MEASURES, ETC., REQUIRED TO SAFELY PROTECT THE ENTIRE CONSTRUCTION SITE PERIPHERY, CONSTRUCTION PERSONNEL, CITY STAFF, AND THE PUBLIC. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ALL OF THE ABOVE 24 HOURS PER DAY DURING THE PERIOD OF CONSTRUCTION.

SEWER PUMP STATION 13 IMPROVEMENTS

G-3

SEWER PUMP STATION 13 IMPROVEMENTS

STANDARDS, LEGENDS, GENERAL NOTES, & ABBREVIATIONS SHEET 1 OF 2

CITY OF SAN DIEGO, CALIFORNIA
 ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
 SHEET 03 OF 22 SHEETS

WBS B-00476

APPROVED: *Herz Agar* 2.21.13
 FOR CITY ENGINEER DATE

SUBMITTED BY: *DAVID MANELA*
 ASSOCIATE ENGINEER

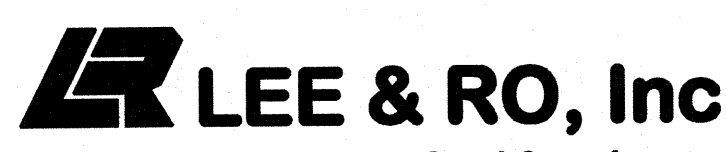
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			

SIL VIA RENDON
 PROJECT ENGINEER
 230-1689
 LAMBERT COORDINATE
 1870-6250
 CC883 COORDINATE

CONTRACTOR _____ DATE STARTED _____
 INSPECTOR _____ DATE COMPLETED _____

37021-03-D

CONSULTANT



LEE & RO, Inc.
 San Diego, California

SCALE: HORIZONTAL
 VERTICAL



WARNING

0 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CIVIL LEGEND

	CENTERLINE
	CURB LINE
	MANHOLE - PLAN
	MAJOR CONTOUR
	MINOR CONTOUR
	RECLAIMED WATER VALVE
	WATER METER
	SIGN
	SEWER MANHOLE
	SPRINKLER WITH CONCRETE APRON
	WATER VALVE
	CHAINLINK FENCE
	PROPERTY LINE
	LINE STOP
	EXISTING TREE OR TREE CLUSTER

MATERIAL SYMBOLS

	CONCRETE
	GRASS
	EARTH
	CHECKERED PLATE
	GRATING

MECHANICAL LEGEND

	90° ELBOW
	TEE
	PLUG VALVE
	SWING CHECK VALVE
	GATE VALVE
	BALL VALVE
	SUMP PUMP

GENERAL PIPING NOTES

- LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
- SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
- LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN IS ONLY APPROXIMATE. THE CONTRACTOR SHALL DESIGN PIPING SUPPORT SYSTEMS IN ACCORDANCE WITH THE SPECIFICATIONS. MAXIMUM SPACING SHALL BE AS SPECIFIED.
- ALL JOINTS SHALL BE WATERTIGHT. WALL PIPES WITH THRUST COLLARS AS SPECIFIED SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO BACKFILL.
- ALL FLEXIBLE CONNECTORS OR FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED.
- SYMBOLS, LEGENDS, AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE PLANS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS PIPING COMPONENTS ARE NECESSARILY USED IN THE PROJECT.
- NUMBER AND LOCATION OF UNIONS SHOWN ON PLANS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
- WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE, UNLESS OTHERWISE SPECIFIED. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE SHALL BE JOINED TO THE COUPLING ADAPTER.

SEWER PUMP STATION 13 IMPROVEMENTS

G-4

TEMP BMP CS/SWP#	LOW	SPEC. NO.	5717
SEWER PUMP STATION 13 IMPROVEMENTS			
STANDARDS, LEGENDS, GENERAL NOTES, & ABBREVIATIONS SHEET 2 OF 2			
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 04 OF 22 SHEETS			WBS B-00476
APPROVED FOR CITY ENGINEER	DATE	SUBMITTED BY	
<i>Hegi</i>	2.21.13	<i>David Wanel</i>	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LRI		
CONTRACTOR			DATE STARTED
INSPECTOR			DATE COMPLETED
			230-1689 LAMBERT COORDINATE
			1870-6250 CCS83 COORDINATE
			37021-04-D

CONSULTANT

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San Diego, California

SCALE

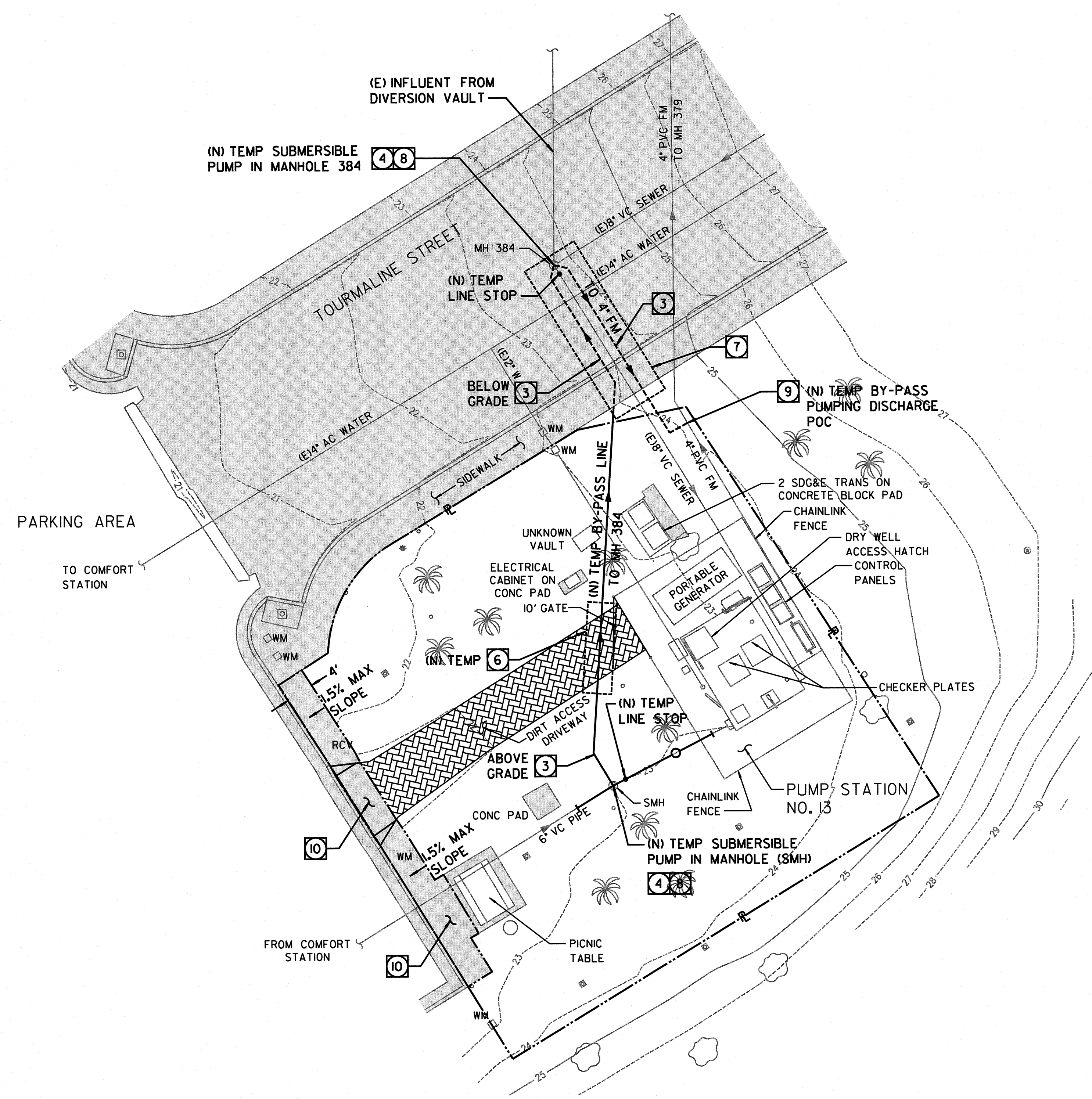
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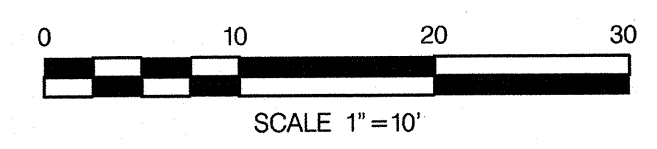
WARNING

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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



TEMPORARY BY-PASS PUMPING SCHEME 126
SCALE: 1" = 10'



NOTES:

- 1 BY-PASS PUMPING IS SCHEMATIC AS SHOWN AND IS FOR ILLUSTRATION PURPOSES ONLY. THE CONTRACTOR SHALL ADOPT AND ADJUST HIS/HER MEANS AND METHODS AS NECESSARY, WITH PRIOR APPROVAL FROM THE CITY, TO PERFORM BY-PASS PUMPING OPERATIONS. AFTER BY-PASS OPERATIONS ARE COMPLETE, ALL TEMPORARY DEVICES AND EQUIPMENT SHALL BE REMOVED TO THE EXTENT POSSIBLE. REFER TO SECTION 02999-TEMPORARY HANDLING OF SEWAGE FLOW, SECTION 01014-WORK SEQUENCE, AND APPENDIX G OF THE TECHNICAL SPECIFICATIONS.
- 2 CONTRACTOR SHALL PROTECT ALL EXISTING UNDERGROUND UTILITIES DURING PREPARATION OF THE SITE AND WHILE PERFORMING BY-PASS PUMPING OPERATIONS. CONTRACTOR SHALL RESTORE PAVEMENT AND/OR VEGETATION IMPACTED BY BY-PASS PUMPING TO THEIR ORIGINAL CONDITION. CONTRACTOR SHALL RESTORE LANDSCAPING TO ORIGINAL CONDITION ONCE BYPASS ACTIVITIES ARE COMPLETE.
- 3 PROVIDE TEMPORARY BY-PASS PUMPING PIPELINE IF REQUIRED FOR CONTRACTOR'S BY-PASS SCHEME.
- 4 CONTRACTOR TO PROVIDE HYDRAULIC CALCULATIONS FROM LICENSED ENGINEER TO SUPPORT THEIR BY-PASS PUMPING SCHEME.
- 5 BY-PASS PLAN SHALL ADDRESS KEEPING THE STATION FULLY OPERATIONAL AND PREVENT HYDRAULIC SURGE FROM DAMAGING THE FORCEMAIN DURING BY-PASS OPERATIONS.
- 6 PIPES AND/OR TRENCHING MUST BE COVERED WITH TRAFFIC RATED PIPE AND HOSE RAMP. ACCESS TO PUMP STATION SHOULD BE MAINTAINED AT ALL TIMES.
- 7 CONTRACTOR SHALL RESTORE AC PAVEMENT ON STREET AND SIDEWALK TO THEIR ORIGINAL CONDITION ONCE BY-PASS ACTIVITIES ARE COMPLETE.
- 8 PROVIDE TEMPORARY POWER FOR SUBMERSIBLE PUMPS BY EITHER SDG&E SERVICE OR PORTABLE ENGINE GENERATOR SET. CONTRACTOR SHALL BE RESPONSIBLE FOR PERMITTING, ALL FEES, AND ANY OTHER COSTS ASSOCIATED WITH TEMPORARY POWER SUPPLY. REFER TO TECHNICAL SPECIFICATIONS SECTIONS 02999-TEMPORARY HANDLING OF SEWAGE FLOW AND 01014-WORK SEQUENCE.
- 9 CONTRACTOR TO DETERMINE MOST SUITABLE POC LOCATION UPON APPROVAL OF CITY.
- 10 CONTRACTOR SHALL PLACE CONCRETE SIDEWALK AND DRIVEWAY PER CITY OF SAN DIEGO STD DWG SDG-162. CONTRACTOR SHALL RESTORE (E) RECYCLED WATER METER AND VALVE TO THEIR ORIGINAL CONDITION.

TEMP BMP CS/SWP	LOW	SPEC. NO.	5717	C-1
SEWER PUMP STATION 13 IMPROVEMENTS				
TEMPORARY BY-PASS PUMPING SCHEME				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 05 OF 22 SHEETS			WBS	B-00476
APPROVED FOR CITY ENGINEER	DATE	SIGNED BY		
<i>Heidi Ann</i>	2-21-13	DAVID MANELA ASSOCIATE ENGINEER		
DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	LRI			
PROJECT ENGINEER			230-1689	
LAMBERT COORDINATE			1870-6250	
CCS88 COORDINATE			37021-05-D	
CONTRACTOR	DATE STARTED	INSPECTOR		

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SCALE

HORIZONTAL	
VERTICAL	



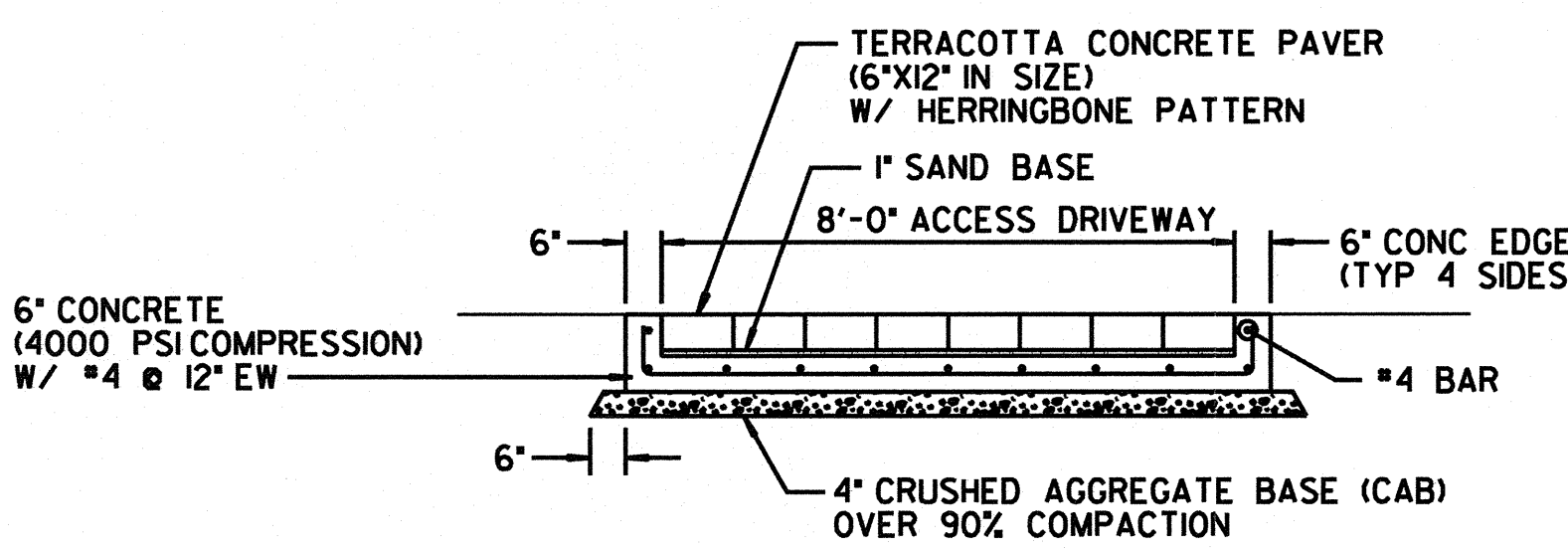
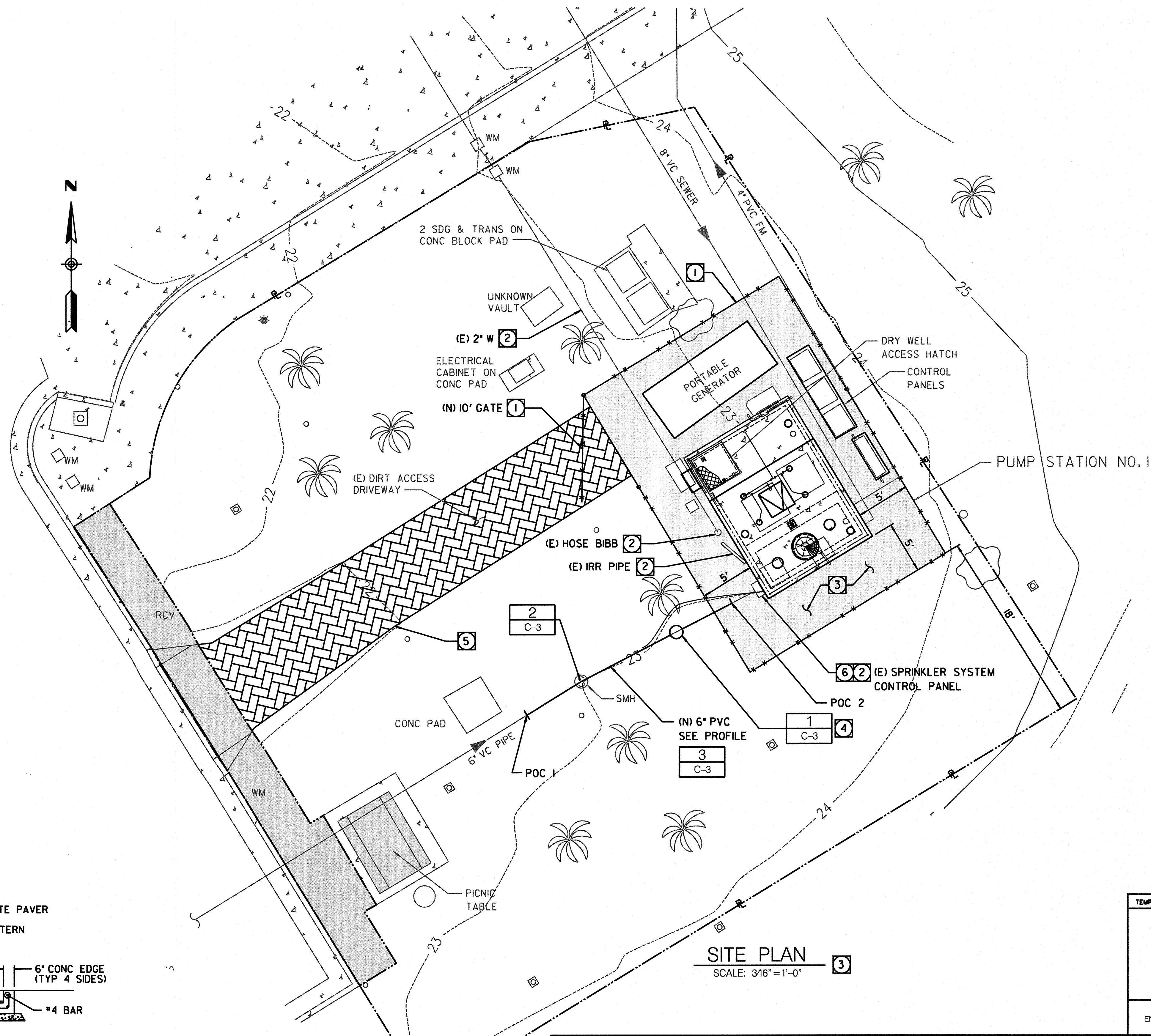
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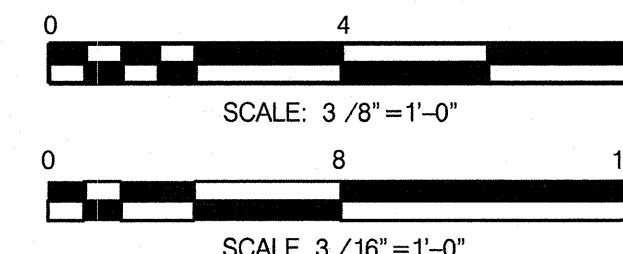
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

NOTES:

- 1 INSTALL APPROX. 120 LF OF PERIMETER FENCE AND 10' WIDE ACCESS GATE PER TECHNICAL SPECIFICATIONS SECTION 02832-STAINLESS STEEL FENCE.
- 2 PROTECT IN-PLACE OR RELOCATE AND MAINTAIN IN OPERATION DURING CONSTRUCTION. IF RELOCATED DURING CONSTRUCTION, REPLACE IN-KIND AND CONFIRM COMPLETE FUNCTIONALITY. ADD (N) 2" HOSE BIB CONNECTOR. CONTRACTOR TO ENSURE COMPLETE FUNCTIONALITY IS RESTORED AFTER CONSTRUCTION.
- 3 ALL LANDSCAPING, SHRUBS, TREES, VEGETATION AND GRASS/LAWN DAMAGED AS A RESULT OF CONSTRUCTION TO BE REPAIRED AND/OR REPLACED IN-KIND AFTER COMPLETION OF CONSTRUCTION. WITHIN PUMP STATION FENCE LINE, SCRAPE AND DISPOSE OF TOP 6" OF SOIL. LAY FABRIC AND RESTORE ORIGINAL SURFACE ELEVATION WITH 6" OF CRUSHED MISCELLANEOUS BASE PER SSPWC "GREENBOOK 2012" SECTION 200-2.4.
- 4 INSTALL NEW 4' PRECAST DROP MANHOLE WITH 3' LID AND CUSTOM BASE TO SERVE AS A ROCK TRAP. SEE DETAIL 1 ON SHEET C-3. AFTER INSTALLATION, REMOVE EXISTING MANHOLE AND APPROXIMATELY 10 LF OF EXISTING VCP. SEE DEMOLITION DETAIL 2 ON SHEET C-3. TRENCH BACKFILL SHALL BE PER CITY OF SAN DIEGO STD DWG SDS-110.
- 5 (E) ACCESS DRIVEWAY TO BE REPLACED W/ NEW PAVERS. PROVIDE 6"x12" TRADITIONAL CONCRETE PAVERS BY ANGELUS BLOCKS OR EQUAL. COLOR SHALL BE TERRACOTTA WITH 45 DEGREE HERRINGBONE PATTERN. PROVIDE 1" MIN SAND BASE FOR LEVELING AND FILL GAP WITH SAND. SUBMIT SAMPLE FOR APPROVAL BY CITY. APPLY WEATHER COATING ON TOP OF PAVERS SURFACE. SEE DETAIL 1 ON THIS SHEET FOR SITE PREPARATION.
- 6 SAND BLAST AND PAINT (E) SPRINKLER SYSTEM CONTROL PANEL. CITY TO APPROVE PAINT COLOR.



DETAIL 1
SCALE: 3/8" = 1'-0"



SITE PLAN
SCALE: 3/16" = 1'-0"

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SCALE
HORIZONTAL
VERTICAL

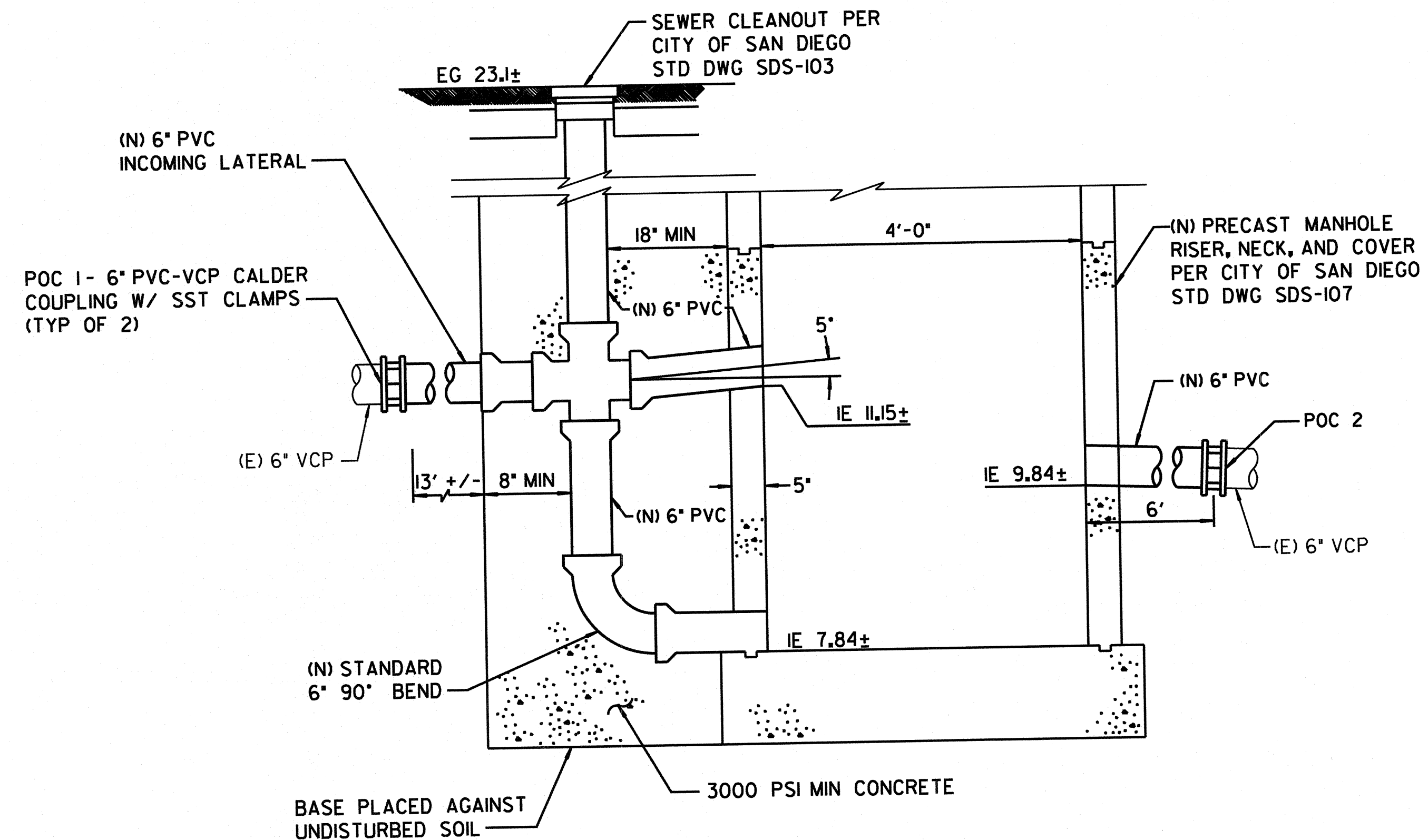


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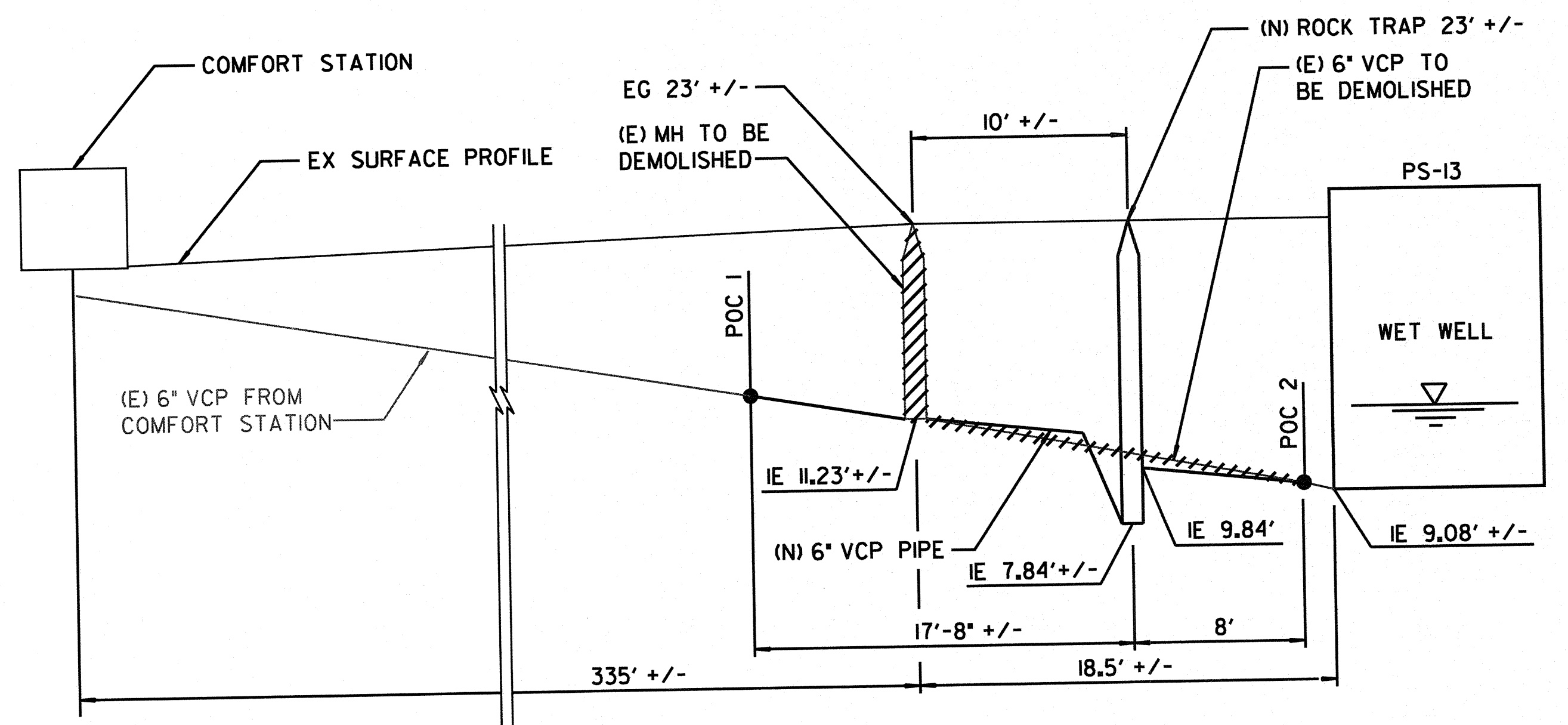
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TEMP BMP CS/SWP: LOW	SPEC. NO. 5717	C-2
SEWER PUMP STATION 13 IMPROVEMENTS		
SITE PLAN & DETAILS		
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 06 OF 22 SHEETS		WBS B-00476
APPROVED FOR CITY ENGINEER: <i>Hossein</i>	DATE: 2.21.13	SUBMITTED BY: <i>DAVID MANELA</i> ASSOCIATE ENGINEER
DESCRIPTION: ORIGINAL	BY: LRI	APPROVED: <i>SILVIA READON</i> PROJECT ENGINEER
		230-1689 LAMBERT COORDINATE
		1870-6250 CCS83 COORDINATE
CONTRACTOR: _____	DATE STARTED: _____	37021-06-D
INSPECTOR: _____	DATE COMPLETED: _____	

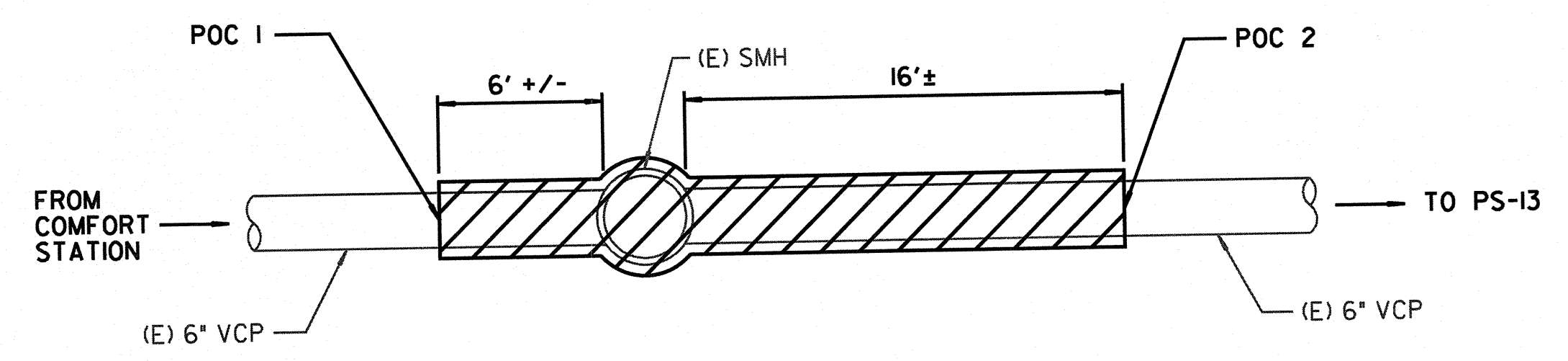
SEWER PUMP STATION 13 IMPROVEMENTS



ROCK TRAP MANHOLE BASE
DETAIL 1
SCALE: 3/4" = 1'-0" C-2



6" VCP SEWER PROFILE 3
NO SCALE C-2



DEMOLITION DETAIL 2
SCALE: 3/16" = 1'-0" C-2

NOTE: POC LOCATIONS ARE APPROXIMATE, CONNECTIONS MAY BE NEAREST JOINT FITTING.

TEMP BMP CS/SWP1	LOW	SPEC. NO.	5717	C-3
SEWER PUMP STATION 13 IMPROVEMENTS				
EXISTING COMFORT STATION MANHOLE PROFILE AND DEMOLITION DETAILS				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 07 OF 22 SHEETS				WBS B-00476
APPROVED	<i>Hogan</i>	DATE	2-21-13	SUBMITTED BY DAVID MANELA ASSOCIATE ENGINEER
FOR CITY ENGINEER				SILVIA REMON PROJECT ENGINEER
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
CONTRACTOR		DATE STARTED		230-1689
INSPECTOR		DATE COMPLETED		LAMBERT COORDINATE
				1870-6250
				CCS83 COORDINATE
				37021-07-D

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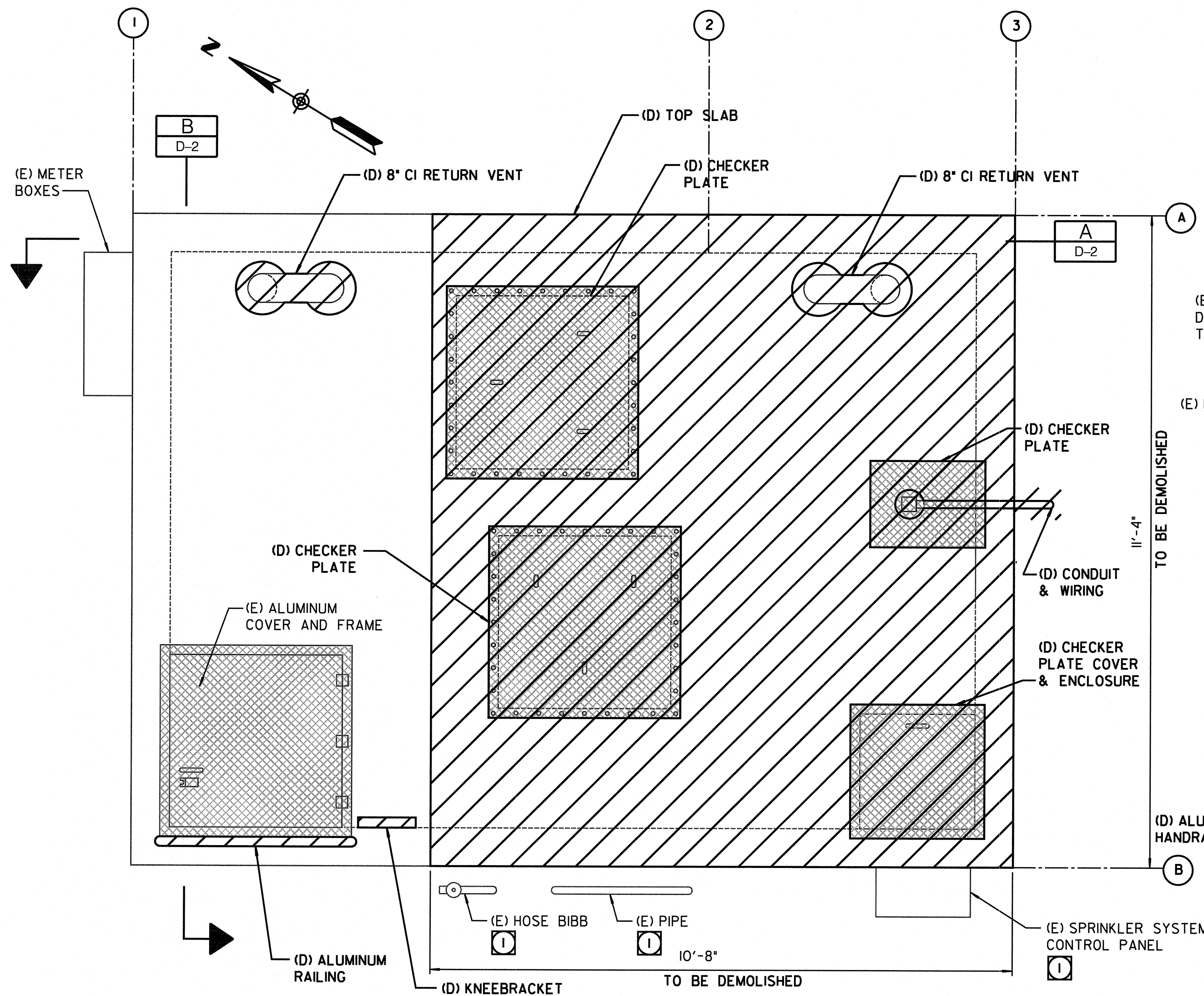
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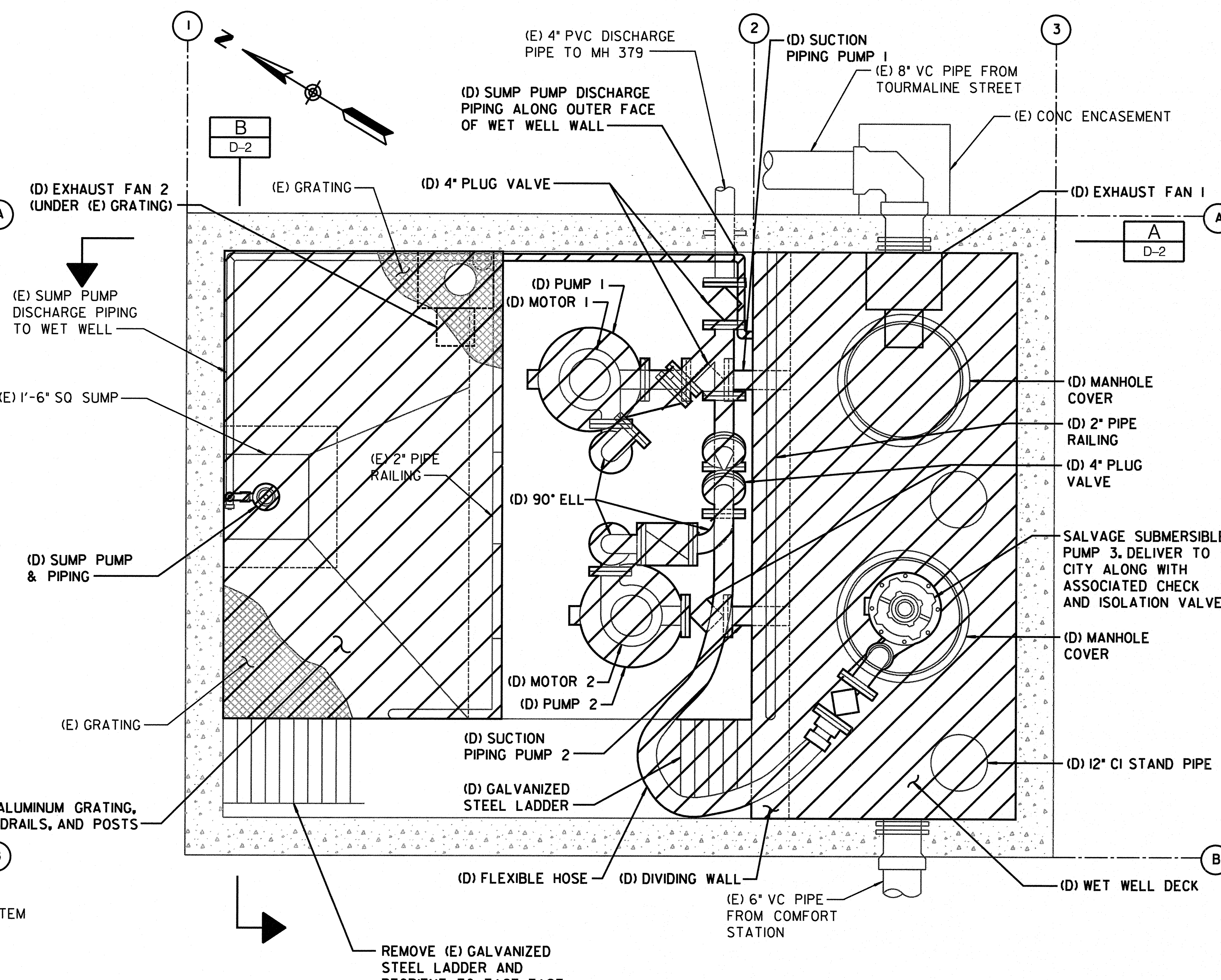
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TOP SLAB PLAN
 PLAN 1
 SCALE: 3/4"=1'-0"



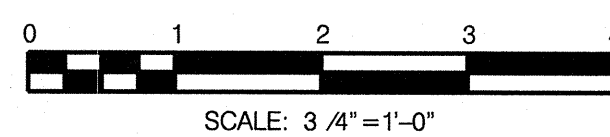
FLOOR PLAN
 PLAN 2
 SCALE: 3/4"=1'-0"

NOTES:

- 1. PROTECT IN PLACE OR TEMPORARILY RELOCATE DURING CONSTRUCTION, HOSE BIBB, PIPING AND SPRINKLER SYSTEM CONTROL PANEL TO BE REPLACED IN KIND AFTER CONSTRUCTION BY CONTRACTOR. CONTRACTOR TO ENSURE COMPLETE FUNCTIONALITY IS RESTORED AFTER CONSTRUCTION. HOSE BIBB, PIPING AND SPRINKLER SYSTEM TO REMAIN OPERATIONAL DURING CONSTRUCTION.

WORK TYPE DESIGNATIONS

- OR (D) - DEMOLITION
- OR (E) - EXISTING

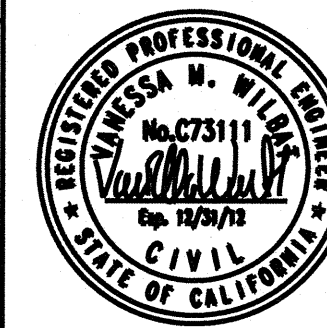


TEMP BMP CS/SWP: LOW	SPEC. NO. 5717	D-1
SEWER PUMP STATION 13 IMPROVEMENTS		
DEMOLITION TOP SLAB AND FLOOR PLAN		
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 08 OF 22 SHEETS		WBS B-00476
APPROVED: <i>Hageci Agar</i>	DATE: 2.21.13	SUBMITTED BY: <i>DAVID MANELA</i> ASSOCIATE ENGINEER
DESCRIPTION: ORIGINAL	BY: LRI	PROJECT ENGINEER: <i>SIL VIA RENDON</i>
		230-1689 LAMBERT COORDINATE
		1870-6250 CC83 COORDINATE
CONTRACTOR: _____	DATE STARTED: _____	37021-08-D
INSPECTOR: _____	DATE COMPLETED: _____	

CONSULTANT

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San Diego, California

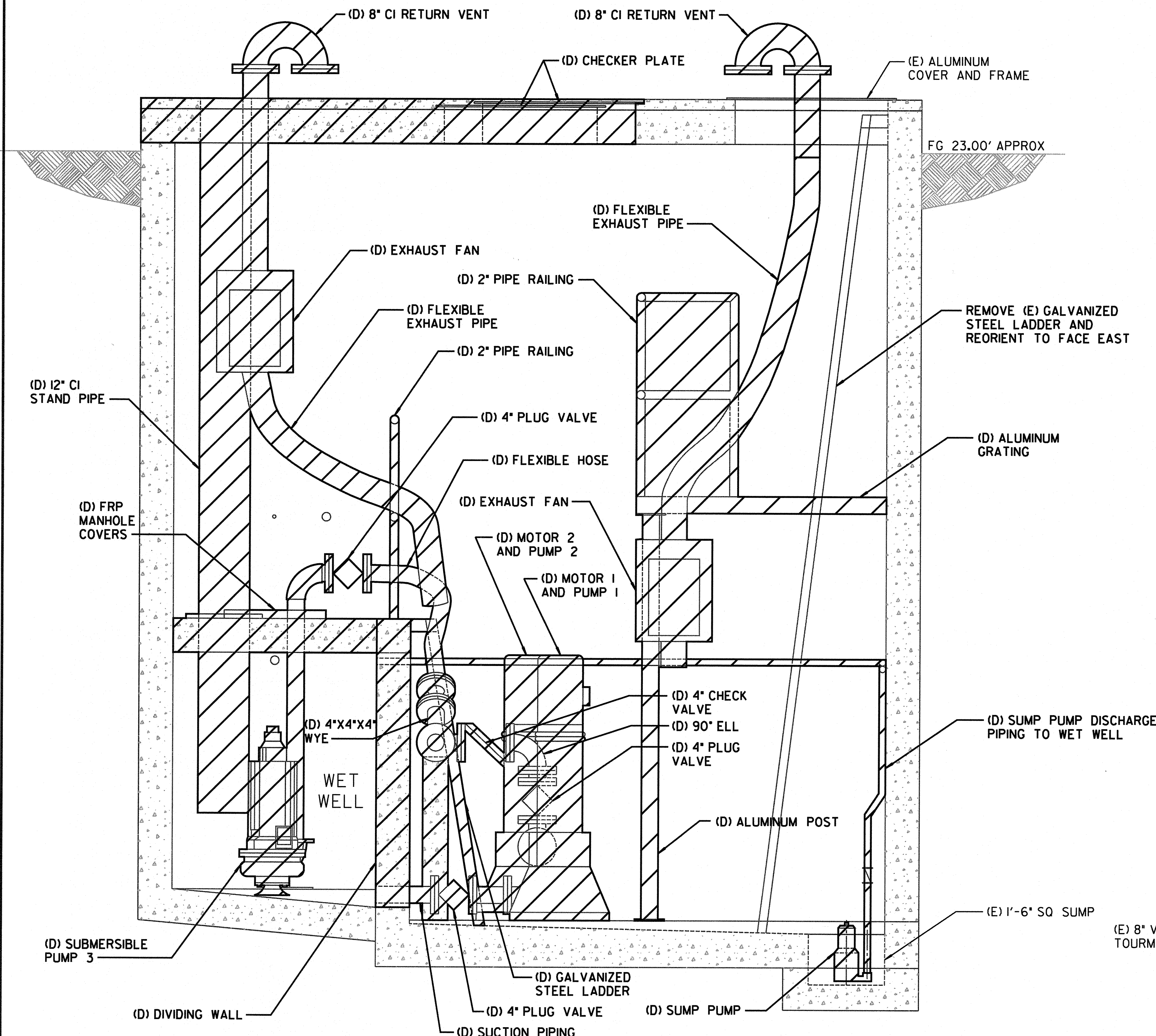
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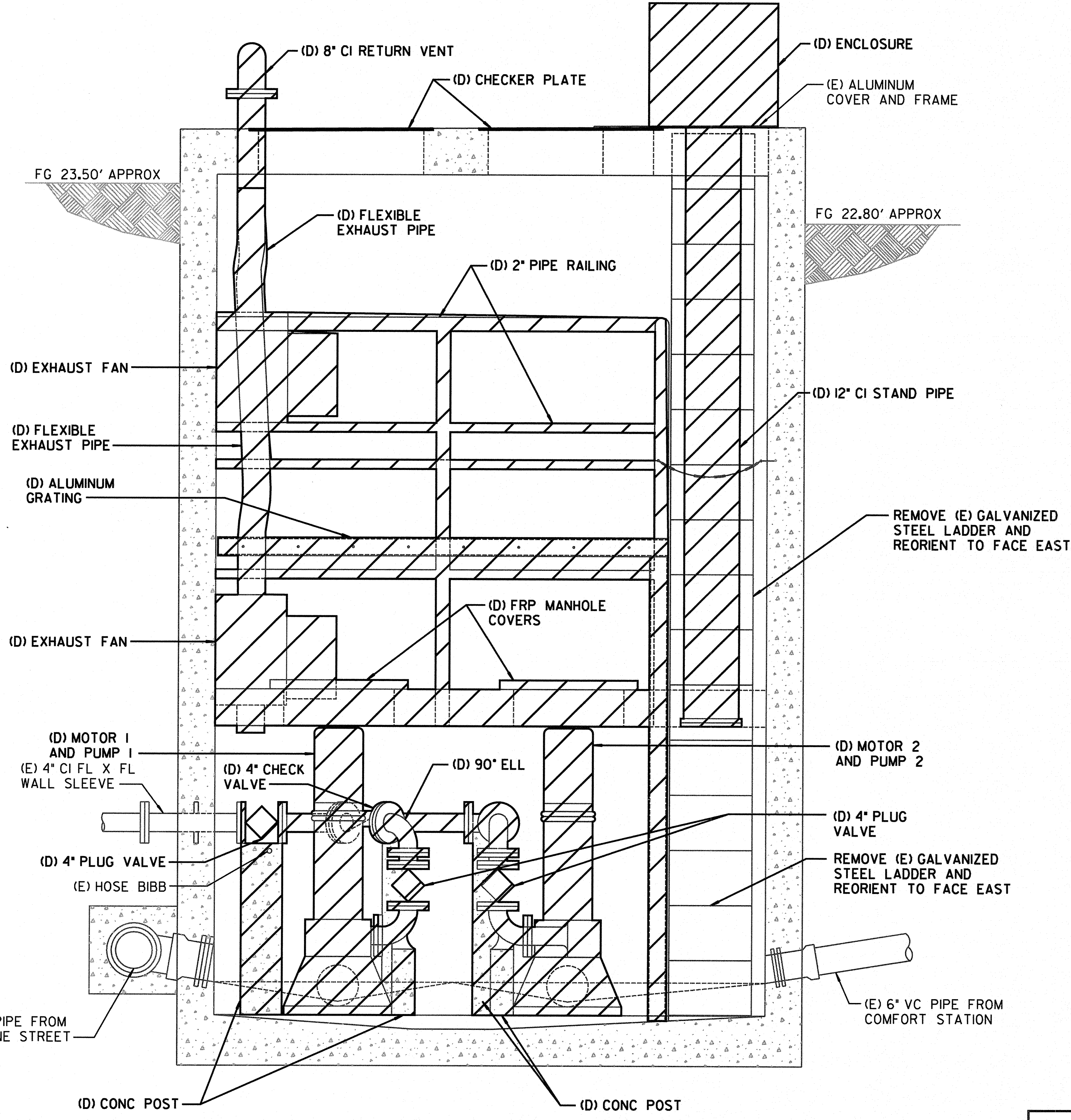
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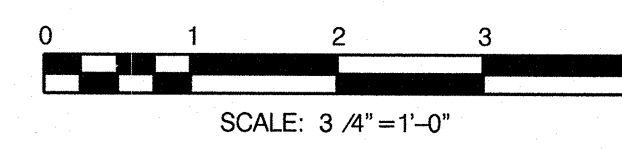
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SECTION A
SCALE: 3/4" = 1'-0"
D-1




SECTION B
SCALE: 3/4" = 1'-0"
D-1



TEMP BMP CS/SWP:	LOW	SPEC. NO.	5717	D-2
SEWER PUMP STATION 13 IMPROVEMENTS				
DEMOLITION SECTIONS				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 09 OF 22 SHEETS			WBS	B-00476
APPROVED:	<i>Hosei Agui</i>	DATE:	2-21-13	SUBMITTED BY:
FOR CITY ENGINEER				DAVID MANELA ASSOCIATE ENGINEER
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
				SILVIA REMON PROJECT ENGINEER
				230-1689 LAMBERT COORDINATE
				1870-6250 CCS83 COORDINATE
CONTRACTOR	DATE STARTED		37021-09-D	
INSPECTOR	DATE COMPLETED			

CONSULTANT

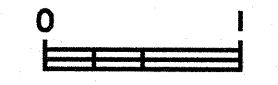


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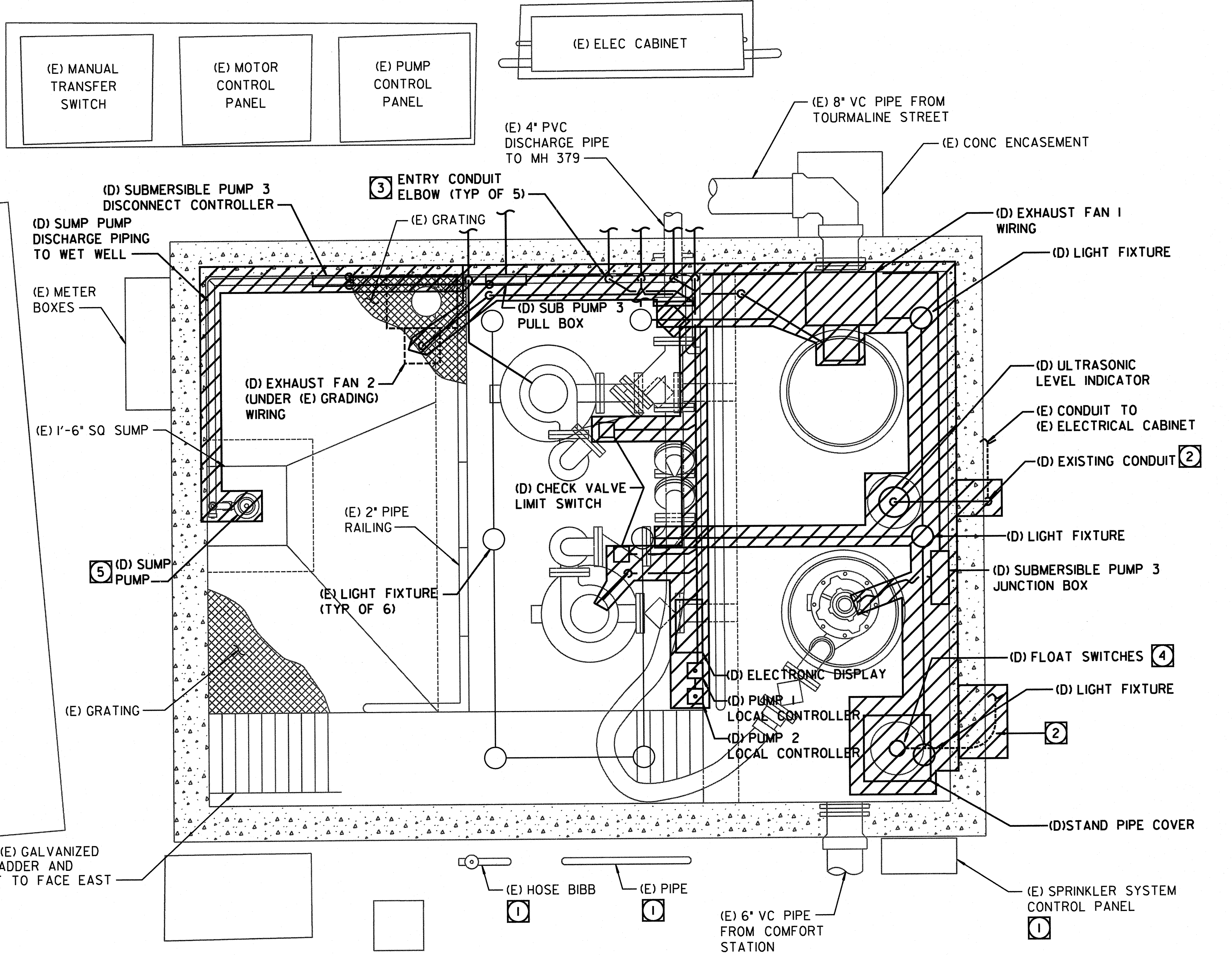
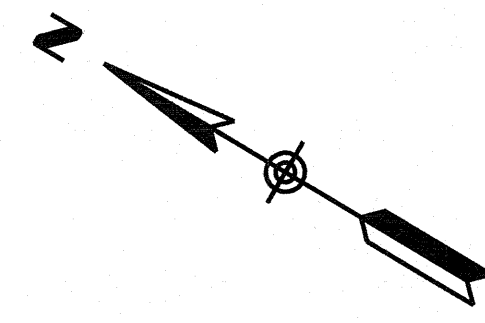
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WARNING



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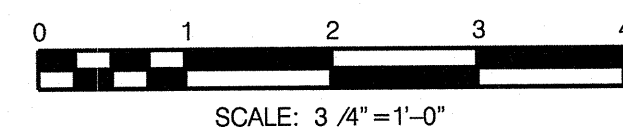


NOTES:

- 1 PROTECT IN PLACE OR TEMPORARILY RELOCATE DURING CONSTRUCTION, HOSE BIBB, PIPING AND SPRINKLER SYSTEM CONTROL PANEL TO BE REPLACED IN KIND AFTER CONSTRUCTION BY CONTRACTOR. CONTRACTOR TO ENSURE COMPLETE FUNCTIONALITY IS RESTORED AFTER CONSTRUCTION. HOSE BIBB, PIPING AND SPRINKLER SYSTEM TO REMAIN OPERATIONAL DURING CONSTRUCTION.
- 2 DEMOLISH EXISTING CONDUIT AND CONDUCTORS. PROTECT UNDERGROUND CONDUIT IN PLACE FOR REUSE. REFER TO SHEET E-2.
- 3 DEMOLISH CONDUIT TO EXISTING ENTRY ELBOW. COIL EXISTING WIRE FOR ELECTRONIC DISPLAY, E-STOP, AND START/STOP PUSH BUTTONS, NEAR EXISTING ENTRY ELBOW(S). REFER TO SHEET E-2.
- 4 PROTECT IN PLACE OR TEMPORARILY RELOCATE DURING CONSTRUCTION (E) FLOAT SWITCH TO BE REPLACED IN KIND AFTER CONSTRUCTION BY CONTRACTOR. CONTRACTOR TO ENSURE COMPLETE FUNCTIONALITY IS RESTORED AFTER CONSTRUCTION.
- 5 REMOVE EXISTING SUMP PUMP. PROTECT IN PLACE EXISTING CONDUCTORS AND CONDUITS FOR CONNECTION TO NEW SUMP PUMP.

ELECTRICAL DEMO PLAN

PLAN 1
SCALE: 3/4"=1'-0"



SEWER PUMP STATION 13 IMPROVEMENTS

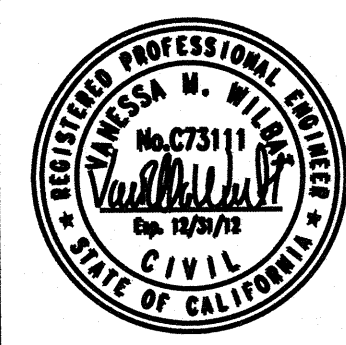
D-3

TEMP BMP CS/SWP:	LOW	SPEC. NO.	5717
SEWER PUMP STATION 13 IMPROVEMENTS			
DEMOLITION ELECTRICAL PLAN			
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 10 OF 22 SHEETS			WBS B-00476
APPROVED:	<i>Hoggin</i>	DATE	2.21.13
FOR CITY ENGINEER			
DESIGNER	BY	APPROVED	DATE
ORIGINAL	LRI		
SUBMITTED BY: DAVID MANELA ASSOCIATE ENGINEER			PROJECT ENGINEER: SILVIA RENDON
230-1689 LAMBERT COORDINATE			1870-6250 CC883 COORDINATE
CONTRACTOR	DATE STARTED	37021-10-D	
INSPECTOR	DATE COMPLETED		

CONSULTANT

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San Diego, California

SCALE
HORIZONTAL
VERTICAL



WARNING

0 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

STRUCTURAL NOTES

GENERAL

- G1 THE NOTES AND TYPICAL DETAILS ARE APPLICABLE TO THE ENTIRE PROJECT EXCEPT WHERE SPECIFIED OR INDICATED OTHERWISE.
- G2 ALL WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF THE CALIFORNIA BUILDING CODE, 2010 EDITION.
- G3 THE CONTRACTOR SHALL VERIFY, PRIOR TO CONSTRUCTION, ALL DIMENSIONS CONTROLLED BY OR RELATED TO EQUIPMENT AND INSTRUMENTS SHOWN ON OTHER DRAWINGS.
- G4 THE STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON COMPLETED STRUCTURES. DURING CONSTRUCTION, THE STRUCTURES SHALL BE PROTECTED BY PROPER BRACING, REINFORCING AND BALANCING WHEREVER ADDITIONAL CONSTRUCTION LOADS MAY OCCUR.
- G5 ALL WORK IN THIS PROJECT SHALL COMPLY WITH THE SPECIFIED SECTIONS OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION, AND SHALL BE EXECUTED IN ACCORDANCE WITH FEDERAL, STATE, COUNTY, AND CITY CODES AND REGULATIONS.
- G6 ALL ASPHALT CONCRETE, CONCRETE PAVEMENT, AND OTHER EXISTING SURFACES DAMAGED BY CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO THE ORIGINAL CONDITION OR BETTER AT THE CONTRACTOR'S EXPENSE.
- G7 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PERMITS AND INSPECTIONS REQUIRED BY THE DEPARTMENT OF BUILDING AND SAFETY OF THE CITY OF SAN DIEGO AND ALL OTHERS DESCRIBED IN THE SPECIFICATIONS.
- G8 UNLESS SPECIFIED OR SHOWN MORE RESTRICTIVE IN THE LATEST EDITIONS OF THE CALIFORNIA BUILDING CODE (CBC), A.C.I. CODE, AISC MANUAL, AND AWS CODE, CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS.
- G9 THE ENGINEER DOES NOT WARRANT THE ACCURACY OF THE DIMENSIONS AND VERIFY ELEVATIONS OF EXISTING STRUCTURES SHOWN ON THE DRAWINGS. FIELD MEASUREMENT OF DIMENSIONS AND ELEVATIONS OF EXISTING AFFECTED ITEMS PRIOR TO THE START OF CONSTRUCTION.
- G10 SAFETY NOTES:
 - A) IT IS THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH THE PERTINENT SECTIONS OF THE 'CONSTRUCTION SAFETY ORDERS' ISSUED BY THE STATE OF CALIFORNIA, LATEST EDITION, AND ALL OSHA REQUIREMENTS AS THEY APPLY TO THIS PROJECT.
 - B) THE ENGINEER, AND THE OWNER DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONTRACTOR'S FAILURE TO COMPLY WITH THESE REQUIREMENTS.
 - C) THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE DESIGN AND CONSTRUCTION OF ALL FORMS AND SHORING REQUIRED.
- G11 CONTRACTOR SHALL NOTIFY THE RESIDENT ENGINEER WHERE A CONFLICT OCCURS ON ANY OF THE CONTRACT DRAWINGS OR DOCUMENTS. CONTRACTOR IS NOT TO ORDER MATERIAL OR CONSTRUCT ANY PORTION OF THE BUILDING THAT IS IN CONFLICT UNTIL THE CONFLICT IS RESOLVED WITH THE AFFECTED PARTIES.
- G12 ALL REQUIRED APPROVALS MUST BE OBTAINED FROM THE FIRE AND HAZARD PREVENTION SERVICES BEFORE THE BUILDING IS OCCUPIED.
- G13 EXIT DOORS TO BE OPERABLE FROM THE INSIDE WITHOUT THE USE OF A KEY OR ANY SPECIAL KNOWLEDGE OR EFFORT.
- G14 NO STRUCTURAL WORK IS TO BE PERFORMED UNDER THIS PERMIT.
- G15 EPOXY DOWELS SHALL BE HILTI RE 500 SYSTEM PER ICC-ESR-2322, REDHEAD EPCON G5 SYSTEM PER ICC-ESR-1137, OR APPROVED EQUAL.

FOUNDATION / EARTHWORK

- F1 FOOTINGS SHALL BEAR ON SOIL COMPACTED TO 95% RELATIVE DENSITY PER ASTM D1557.
- F2 ALL FOOTINGS SHALL BE FORMED. FOUNDATIONS MAY BE PLACED IN EXCAVATIONS, PROVIDED WRITTEN PERMISSION IS OBTAINED FROM THE ENGINEER OF RECORD AND FOOTINGS ARE INCREASED THREE INCHES IN WIDTH.
- F3 NOTIFY THE ENGINEER 72 HOURS IN ADVANCE OF PLACING CONCRETE.
- F4 CONTRACTOR SHALL BE ENTIRELY RESPONSIBLE FOR DESIGN AND PROVISION OF ALL TEMPORARY SHORING.

STRUCTURAL STEEL

- S1 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 SPECIED.
- S2. 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. D11.
- S3 MATERIALS:
 - ROLLED SHAPES
 - WIDE FLANGES
 - CHANNELS, ANGLES & OTHER PLATES
 - BEAM COVER/SIDE PLATES
 - COLUMN CONTINUITY PLATES
 - COLUMN BASE PLATES
 - OTHER UON
 - STEEL PIPES
 - STEEL TUBING
 - HIGH STRENGTH BOLTS
 - MACHINE BOLTS
 - ANCHOR BOLTS
 - TREADED AND HANGER ROD
 - WELDED SHEAR CONNECTORS
 - GALVANIZING
 - RUST-INHIBITING PRIMER
- S4 HOT-DIPPED GALVANIZE PER ASTM A123, A153, A385 AFTER FABRICATION OF ALL STRUCTURAL STEEL AND CONNECTORS EXPOSED TO WEATHER. REPAIR PER ASTM A780.
- S5 CONNECTED MEMBERS SHALL BEAR ONLY UPON UNTHREADED PORTIONS OF BOLTS.
- S6 BURNING OF HOLES IS NOT ALLOWED.
- S7 INSPECTION OF WELDING SHALL CONFORM TO C.B.C. REQUIREMENTS (CHAPTER 17).
- S8 THE STRUCTURAL STEEL FABRICATOR SHALL SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.
- S9 BOLT HOLES SHALL BE 1/16" LARGER IN DIAMETER THAN NOMINAL SIZE OF BOLT USED, UNLESS NOTED OTHERWISE.
- S10 ALL STRUCTURAL STEEL SURFACES TO RECEIVE SPRAY-APPLIED FIREPROOFING OR TO BE ENCASED IN CONCRETE OR MASONRY SHALL BE LEFT UNPAINTED.
- S11 STRUCTURAL STEEL SHALL BE DELIVERED TO THE JOB SITE FREE OF EXCESSIVE RUST, MILL SCALE, GREASE, ETC.
- S12 OPENING SHALL NOT BE PLACED IN STEEL MEMBERS UNLESS SPECIFICALLY DETAILED
- S13 UNLESS OTHERWISE SHOWN OR SPECIFIED, STAINLESS STEEL SHALL BE TYPE 316.

WELDING

- W1 ALL WELDING SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF THE AMERICAN WELDING SOCIETY CODE D11 (LATEST EDITION), ALL WELDING SYMBOLS ARE SHOWN IN ACCORDANCE TO STEEL CONSTRUCTION MANUAL TABLE 8.2.
- W2 ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS.
- W3 ALL WELDS SHALL HAVE A WELD CONTROLLED SEQUENCE AND TECHNIQUE IN ORDER TO MINIMIZE SHRINKAGE, STRESSES AND DISTORTION.
- W4 ALL ELECTRODES FILLER MATERIAL SHALL BE A MINIMUM OF E70XX.
- W5 WELDING OF REINFORCING BARS TO BE IN ACCORDANCE WITH A.W.S. D14. REINFORCING STEEL TO BE WELDED SHALL HAVE A CARBON EQUIVALENT (CE) OF 0.75. SPECIAL INSPECTION IS REQUIRED.

WELDING (CONT'D)

- W6 WELDING OF SHEET METAL SHALL BE IN ACCORDANCE WITH A.W.S. D1.3.
- W7 SPECIAL INSPECTION IS REQUIRED FOR ALL FIELD WELDING.
- W8 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.
- W9 ALL SHOP AND FIELD WELDING OF MOMENT CONNECTIONS OR MOMENT RESISTING FRAMES, AND ALL COLUMN SPLICE WELDS, SHALL BE TESTED AS PER CBC.
- W10 PROVIDE ON PLANS A COMPREHENSIVE SCHEDULE FOR INSPECTIONS TO BE PERFORMED ON A PERIODIC BASIS. THE SPECIAL INSPECTOR MUST INSPECT THE MATERIALS AND VERIFY WELDING PROCEDURES AND QUALIFICATIONS OF WELDERS PRIOR TO THE START OF WORK; INSPECT WORK IN PROGRESS DURING PERIODS STATED AND VISUALLY INSPECT ALL WELDS PRIOR TO COMPLETION OR PRIOR TO SHIPMENT OF WELDED COMPONENTS TO THE JOBSITE.
- W11 WELDS DONE IN A FABRICATOR'S SHOP APPROVED BY INSPECTION SERVICES NEED NOT TO HAVE CONTINUOUS OR PERIODIC SPECIAL INSPECTION. AT COMPLETION OF FABRICATION, THE APPROVED FABRICATOR SHALL SUBMIT THE 'CERTIFICATE OF COMPLIANCE' FORM TO INSPECTION SERVICES.

CONCRETE

- C1 ALL CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF A.C.I. 318 - LATEST EDITION 'SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS' AND ACI 350 - LATEST EDITION 'CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES', EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS CONTAINED HEREIN OR SHOWN ON THE DRAWINGS.
- C2 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.
- C3 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.
- C4 CEMENT SHALL CONFORM TO A.S.T.M. C-150, TYPE II, LOW ALKALI. AGGREGATES FOR NORMAL WEIGHT SHALL CONFORM TO A.S.T.M. C-33.
- C5 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.
- C6 CONCRETE MIXES SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY. THE MIX DESIGNS SHALL CONFORM TO C.B.C. SEC. 1905 UNLESS OTHERWISE NOTED.
- C7 NON-STRUCTURAL STEEL EMBEDDED IN CONCRETE SHALL BE GALVANIZED OR PAINTED. ALL DAMAGED GALVANIZED AREAS SHALL BE REPAIRED PRIOR TO EMBEDMENT.
- C8 PROVIDE 2- #5 DIAGONAL BARS AT CORNERS OF WALL, FLOOR, AND ROOF OPENINGS AND INSIDE CORNERS OF FLOORS.
- C9 PROVIDE WATERSTOPS IN ALL BELOW GRADE FOUNDATION WALL CONSTRUCTION JOINTS.
- C10 READY MIXED CONCRETE SHALL CONFORM TO (A.S.T.M. C-94).
- C11 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.
- C12 ALL EXPOSED CONCRETE SHALL HAVE A SMOOTH FORM FINISH USING B-B PLYFORM, CLASS I, EXT-A.P.A. PLYWOOD.
- C13 ALL SLABS SHALL HAVE A TROWELED FINISH EXCEPT AS NOTED ON THE DRAWINGS.
- C14 ALL REINFORCING STEEL, ANCHOR BOLTS, DOWELS AND INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
- C15 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.
- C16 NO BRICK OR POROUS MATERIAL SHALL BE USED TO SUPPORT FOUNDATION STEEL OFF THE GROUND.
- C17 PROVIDE 3/4 INCH CHAMFER ON ALL EXPOSED CONCRETE CORNERS, U.O.N.

CONCRETE (CONT'D)

- C18 SLEEVE PLUMBING OPENINGS IN SLABS WITH NON-CORROSIVE SLEEVE BEFORE PLACING CONCRETE AND BEND REINFORCING AROUND SLEEVES.
- C19 ALL REINFORCING BARS SHALL BE PROVIDED WITH THE FOLLOWING CONCRETE MINIMUM COVER:
 - C20 FOOTINGS CAST AGAINST EARTH 3"
 - FORMED CONCRETE EXPOSED TO EACH, WEATHER OR LIQUID 2"
 - BEAMS AND GIRDERS 1 1/2"
 - WALLS 1 1/2"
 - COLUMN TIES 1 1/2"
 - SLABS (#11 AND SMALLER) 3/4"
- C21 CONCRETE CURING: TYPICALLY REQUIRED A MINIMUM OF 10 DAYS.

ALUMINUM

- A1 ALL ALUMINUM PLATES AND ALUMINUM STRUCTURAL MEMBERS SHALL BE ALLOY 6061-T6, UNLESS NOTED OTHERWISE. SEE SPECIFICATIONS FOR CORROSION PROTECTION.
 - A. ALL CONNECTION BOLTS SHALL BE 3/4" DIAMETER TYPE 316 STAINLESS STEEL, UON.
 - B. COAT ALL SURFACES OF ALUMINUM WHICH COME IN CONTACT WITH CONCRETE WITH ZINC CHROMATE.
 - C. WELDING SHALL CONFORM TO THE LATEST EDITION OF OF AWS D11. WELDING SHALL BE PERFORMED BY WELDERS CERTIFIED BY AWS FOR ALUMINUM.

REINFORCEMENT

- R1 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.
- R2 REINFORCING BARS SHALL CONFORM TO A.S.T.M. A-615, DEFORMED GRADE 60.
- R3 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.
- R4 ALL REINFORCING BAR BENDS SHALL BE MADE COLD, UNLESS OTHERWISE PERMITTED BY THE BUILDING OFFICIAL.
- R5 WELDED WIRE FABRIC SHALL CONFORM TO A.S.T.M. A-185, AND SHALL BE LAPPED 1SPACE AND 12" MINIMUM.
- R6 DOWELS BETWEEN FOOTINGS AND WALLS OR COLUMNS SHALL BE LAPPED WITH THE SAME GRADE, SIZE, SPACING AND NUMBER AS THE VERTICAL REINFORCEMENT.
- R7 REINFORCING SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS.
- R8 ALL VERTICAL REINFORCING SHALL BE CONTINUOUS BETWEEN TWO LEVELS, UNLESS OTHERWISE NOTED.
- R9 SLAB ON GRADE REINFORCING SHALL BE POSITIONED AT MID-DEPTH, UNLESS OTHERWISE NOTED.
- R10 PROVIDE #3 SPACER TIES AT 2'-6" ON CENTER IN ALL BEAMS AND FOOTINGS TO SECURE REINFORCING BARS IN PLACE, UNLESS OTHERWISE NOTED.
- R11 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
- R12 UNLESS SPECIFIED OTHERWISE, THE LENGTH OF LAP FOR SPLICES SHALL BE PER T-S10 S4.

SEWER PUMP STATION 13 IMPROVEMENTS

TEMP BMP CS/SWP	LOW	SPEC. NO.	5717	S-1
SEWER PUMP STATION 13 IMPROVEMENTS				
STRUCTURAL NOTES				
SHEET 1 OF 2				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 11 OF 22 SHEETS			WBS B-00476	
APPROVED: <i>Hogic</i> FOR CITY ENGINEER		DATE 2.21.13		SUBMITTED BY: <i>DAVID MANELA</i> ASSOCIATE ENGINEER
DESCRIPTION		BY	APPROVED	DATE
ORIGINAL		LRI		
PROJECT ENGINEER <i>SILVIA REMONDY</i>				
230-1689 LAMBERT COORDINATE				
1870-6250 CC883 COORDINATE				
CONTRACTOR		DATE STARTED		INSPECTOR
		DATE COMPLETED		37021- II -D

CONSULTANT			WARNING  IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.
 San Diego, California			
SCALE	HORIZONTAL		
	VERTICAL		

BASIS OF DESIGN

(2010 CALIFORNIA BUILDING CODE)

DESIGN LOADS:

DEAD LOADS: CONCRETE 150 pcf
 WATER 63 pcf
 STEEL 490 pcf

LIVE LOADS: ROOF 20 psf
 FLOOR 300 psf

SEISMIC CRITERIA: DESIGN PROCEDURE: EQUIVALENT LATERAL FORCE PROCEDURE
 OCCUPANCY CATEGORY = III
 SEISMIC DESIGN CATEGORY = D
 SITE CLASS = D

F_o = 1.00 S_{DS} = 1.040
 F_v = 1.50 S_{DI} = 0.607
 S_s = 1.560 I_p = 1.50
 S_i = 0.607 I = 1.25

WIND CRITERIA: WIND SPEED 90mph
 EXPOSURE C I_w = 1.15

SPECIAL INSPECTION NOTES – APPLIES TO ALL TABLES

- THE SPECIAL INSPECTORS MUST BE CERTIFIED BY THE CITY OF SAN DIEGO DEVELOPMENT SERVICES, IN THE CATEGORY OF WORK REQUIRED TO HAVE SPECIAL INSPECTION.
- THE CONSTRUCTION MATERIALS TESTING LABORATORY MUST BE APPROVED BY THE CITY OF SAN DIEGO DEVELOPMENT SERVICES, FOR TESTING OF MATERIALS, SYSTEMS, COMPONENTS AND EQUIPMENTS.
- 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.
- FABRICATOR SHALL SUBMIT AN APPLICATION TO PERFORM OFF-SITE FABRICATION TO THE INSPECTION SERVICES DIVISION FOR APPROVAL PRIOR TO COMMENCEMENT OF FABRICATION.
- FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE FOR OFF-SITE FABRICATION TO THE INSPECTION SERVICES DIVISION PRIOR TO ERECTION OF FABRICATED ITEMS AND ASSEMBLIES.
- A PROPERTY OWNER'S FINAL REPORT FORM FOR WORK REQUIRED TO HAVE SPECIAL INSPECTIONS, TESTING AND STRUCTURAL OBSERVATIONS 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.
- THE SPECIAL INSPECTIONS IDENTIFIED ON PLANS ARE, IN ADDITION TO, AND NOT A SUBSTITUTE FOR, THESE INSPECTIONS REQUIRED TO BE PERFORMED BY A CITY'S BUILDING INSPECTOR.
- WHERE MATERIALS OR ASSEMBLIES ARE REQUIRED BY THE BUILDING CODE TO BE LABELED, SUCH MATERIALS AND ASSEMBLIES SHALL BE LABELED BY AN AGENCY APPROVED BY THE CITY OF SAN DIEGO IN ACCORDANCE WITH SECTION 1703. PRODUCTS AND MATERIALS TO BE LABELED SHALL BE TESTED, INSPECTED AND LABELED IN ACCORDANCE WITH THE PROCEDURES SET FORTH IN SECTIONS 1703.5.1 THROUGH 1703.5.3. IDENTIFY ON PLANS, NAME AND ADDRESS OF THE TESTING/INSPECTION AGENCY.
- 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.
- ALL HIGH STRENGTH BOLTS SHALL BE INSTALLED AND INSPECTED IN ACCORDANCE WITH THE CALIBRATED WRENCH METHOD.
- "NOTICE TO THE APPLICANT/OWNER/OWNER'S AGENT/ARCHITECT OR ENGINEER OF RECORD: BY USING THIS PERMITTED CONSTRUCTION DRAWINGS FOR CONSTRUCTION/INSTALLATION OF THE WORK SPECIFIED HEREIN, YOU AGREE TO COMPLY WITH THE REQUIREMENTS OF CITY OF SAN DIEGO FOR SPECIAL INSPECTIONS, STRUCTURAL OBSERVATIONS, CONSTRUCTION MATERIAL TESTING AND OFF-SITE FABRICATION OF BUILDING COMPONENTS, CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS AND, AS REQUIRED BY THE CALIFORNIA CONSTRUCTION CODES".
- "NOTICE TO THE CONTRACTOR/BUILDER/INSTALLER/SUB-CONTRACTOR/OWNER-BUILDER : BY USING THIS PERMITTED CONSTRUCTION/INSTALLATION OF THE WORK SPECIFIED HEREIN, YOU ACKNOWLEDGE AND ARE AWARE OF, THE REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS. YOU AGREE TO COMPLY WITH THE REQUIREMENTS OF CITY OF SAN DIEGO FOR SPECIAL INSPECTIONS, STRUCTURAL OBSERVATIONS, CONSTRUCTION MATERIAL TESTING AND OFF-SITE FABRICATION OF BUILDING COMPONENTS, CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS AND, AS REQUIRED BY THE CALIFORNIA CONSTRUCTION CODES".

STATEMENT OF SPECIAL INSPECTIONS

- SPECIAL INSPECTIONS, STRUCTURAL TESTS AND STRUCTURAL OBSERVATIONS WILL BE PERFORMED IN ACCORDANCE WITH APPROVED PLANS, SPECIFICATIONS, THIS STATEMENT AND CALIFORNIA BUILDING CODE 2010 SECTION 1704, 1705, 1707, 1708 AND 1709.
- CONTRACTOR SHALL PROVIDE SPECIAL INSPECTION FOR CONCRETE CONSTRUCTION PER SCHEDULE OF SPECIAL INSPECTIONS IN ACCORDANCE WITH CBC 2010, TABLE 1704.4.
- CONTRACTOR SHALL PROVIDE SPECIAL INSPECTION FOR SOILS PER SCHEDULE OF SPECIAL INSPECTIONS.

STRUCTURAL OBSERVATION NOTES

- STRUCTURAL OBSERVATION SHALL BE PROVIDED BY THE ENGINEER OF RECORD RESPONSIBLE FOR THE STRUCTURAL DESIGN, OR ANOTHER ENGINEER DESIGNATED BY THE ENGINEER OF RECORD RESPONSIBLE FOR THE STRUCTURAL DESIGN, AS OUTLINED IN THE STRUCTURAL OBSERVATION PROGRAM.
- STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE INSPECTIONS REQUIRED BY SECTIONS 108, 1701 OR OTHER SECTIONS OF THE CODE.
- ALL OBSERVED DEFICIENCIES SHALL BE REPORTED IN WRITING TO THE OWNER'S REPRESENTATIVE, SPECIAL INSPECTOR, CONTRACTOR AND INSPECTION SERVICES. THE STRUCTURAL OBSERVER SHALL SUBMIT A WRITTEN STATEMENT TO INSPECTION SERVICES THAT THE SITE VISITS HAVE BEEN MADE AND THE CONSTRUCTION REQUIRING STRUCTURAL OBSERVATION CONFORMS TO THE APPROVED PLANS.

SCHEDULE OF SPECIAL INSPECTION


REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION		
VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING TENDONS, AND PLACEMENT.	-	-
2. INSPECTION OF REINFORCING STEEL WELDING IN ACCORDANCE WITH REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION TABLE, ITEM 5B.	-	-
3. INSPECT CAST-IN-PLACE ANCHOR BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE WHERE ALLOWABLE LOADS HAVE BEEN INCREASED FROM TABLE 19II.2.	X	-
4. VERIFYING USE OF REQUIRED DESIGN MIX.	-	X
5. 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	-
6. INSPECTION OF CONCRETE AND PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	-	X
7. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	-	X
8. ERECTION OF PRECAST CONCRETE MEMBERS.	-	-
9. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	X
10. ADHESIVE ANCHORS AND EXPANSION ANCHORS FOR MECHANICAL AND ELECTRICAL EQUIPMENTS.	X	-

SCHEDULE 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.	-	X
B. MANUFACTURERS CERTIFICATE OF COMPLIANCE REQUIRED.	-	X
2. INSPECTION OF HIGH-STRENGTH BOLTING: ON-SITE		
A. BEARING-TYPE CONNECTIONS	-	X
B. SLIP-CRITICAL CONNECTIONS	-	-
C. SNUG TIGHT CONNECTIONS	-	X
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL:		
A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	-	X
B. MANUFACTURERS CERTIFIED MILL TEST REPORTS.	-	X
4. MATERIAL VERIFICATION OF WELD FILLER MATERIALS:		
A. IDENTIFICATION MARKINGS TO CONFORM TO AWS SPECIFICATIONS IN THE APPROVED CONSTRUCTION DOCUMENTS.	-	X
B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	-	X
5. INSPECTION OF WELDING: ON-SITE		
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.	-	-
B. REINFORCING STEEL:		
1) VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A706.	-	-
2) REINFORCING STEEL-RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES, AND BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS AND SHEAR REINFORCEMENT.	-	-
3) SHEAR REINFORCEMENT.	-	-
4) OTHER REINFORCING STEEL.	-	-
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS:		
A. DETAILS SUCH AS BRACING AND STIFFENING.	-	X
B. MEMBER LOCATIONS.		
C. APPLICATION OF JOINT DETAILS AT EACH CONNECTION.		

SEWER PUMP STATION 13 IMPROVEMENTS

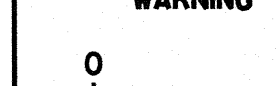
CONSULTANT



San Diego, California

SCALE: HORIZONTAL, VERTICAL

WARNING



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TEMP BMP CS/SMP: LOW SPEC. NO. 5717

S-2

SEWER PUMP STATION 13 IMPROVEMENTS

STRUCTURAL NOTES SHEET 2 OF 2

CITY OF SAN DIEGO, CALIFORNIA
 ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
 SHEET 12 OF 22 SHEETS

WBS B-00476

APPROVED: *Herc. Arca* 2.21.13
 FOR CITY ENGINEER DATE

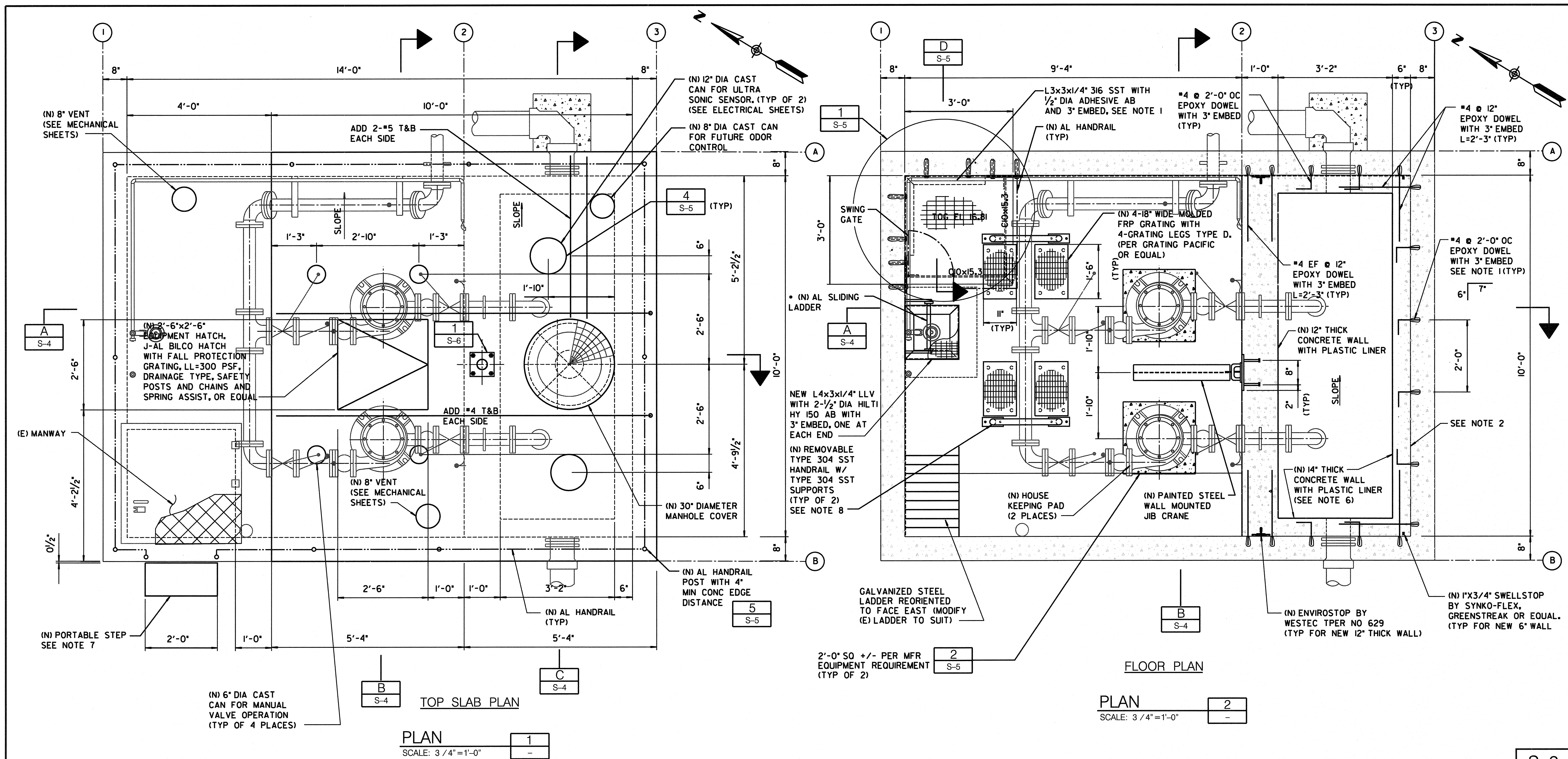
DESIGNED BY: *DAVID MANILA*
 ASSOCIATE ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			

PROJECT ENGINEER: *SILVIA REARDON*

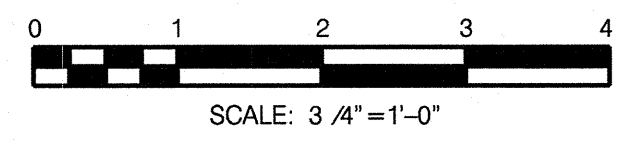
230-1689 LAMBERT COORDINATE
 1870-6250 CCS83 COORDINATE

CONTRACTOR: DATE STARTED: 3702I-12-D
 INSPECTOR: DATE COMPLETED:



NOTES:

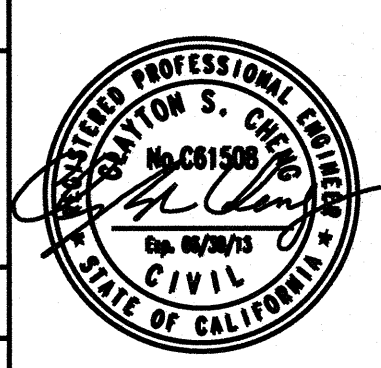
1. BEFORE DRILLING EPOXY DOWELS OR ANCHORS, CONTRACTOR SHALL LOCATE THE EXISTING HORIZ AND VERT REBARS BY USING ULTRASONIC SENSOR DETECTOR.
2. EXISTING WETWELL LINER SHALL BE REMOVED. ALL CONCRETE SURFACE TO BE ATTACHED WITH NEW WALL SHALL BE SANDBLASTED AND APPLY EPOXY BONDING AGENT BEFORE PLACING CONCRETE.
3. ALL ANCHOR BOLTS, NUTS AND WASHERS SHALL BE 316 SST.
4. PROVIDE PAINT ON TOP OF EXTERIOR CONCRETE SLAB PER SYSTEM NO 110F SPEC SECTION 09800. COLOR SHALL BE TAN. EXTEND PAINT TO THE WALL 1'-0" BELOW FINISHED GRADE.
5. PROVIDE EPOXY FLOOR COATING ON DRY WELL FLOOR WITH ANIT-SKID SURFACE PER RUST-OLEUM EPOXY SHIELD PROFESSIONAL GRADE OR EQUAL, COLOR SHALL BE TAN.
6. CONTRACTOR SHALL CUT PLASTIC LINER AT INFLUENT PIPE PENETRATIONS PER MFR'S RECOMMENDATIONS.
7. PROVIDE 2'-0" WIDE MINIMUM, ALUMINUM PORTABLE STEP, 300 LB MINIMUM CAPACITY BY WERNER OR EQUAL.
8. PROVIDE 4-RAIL HANDRAIL WITH 4'-6" HEIGHT.



CONSULTANT

LEE & RO, Inc.
San Diego, California

SCALE
HORIZONTAL
VERTICAL

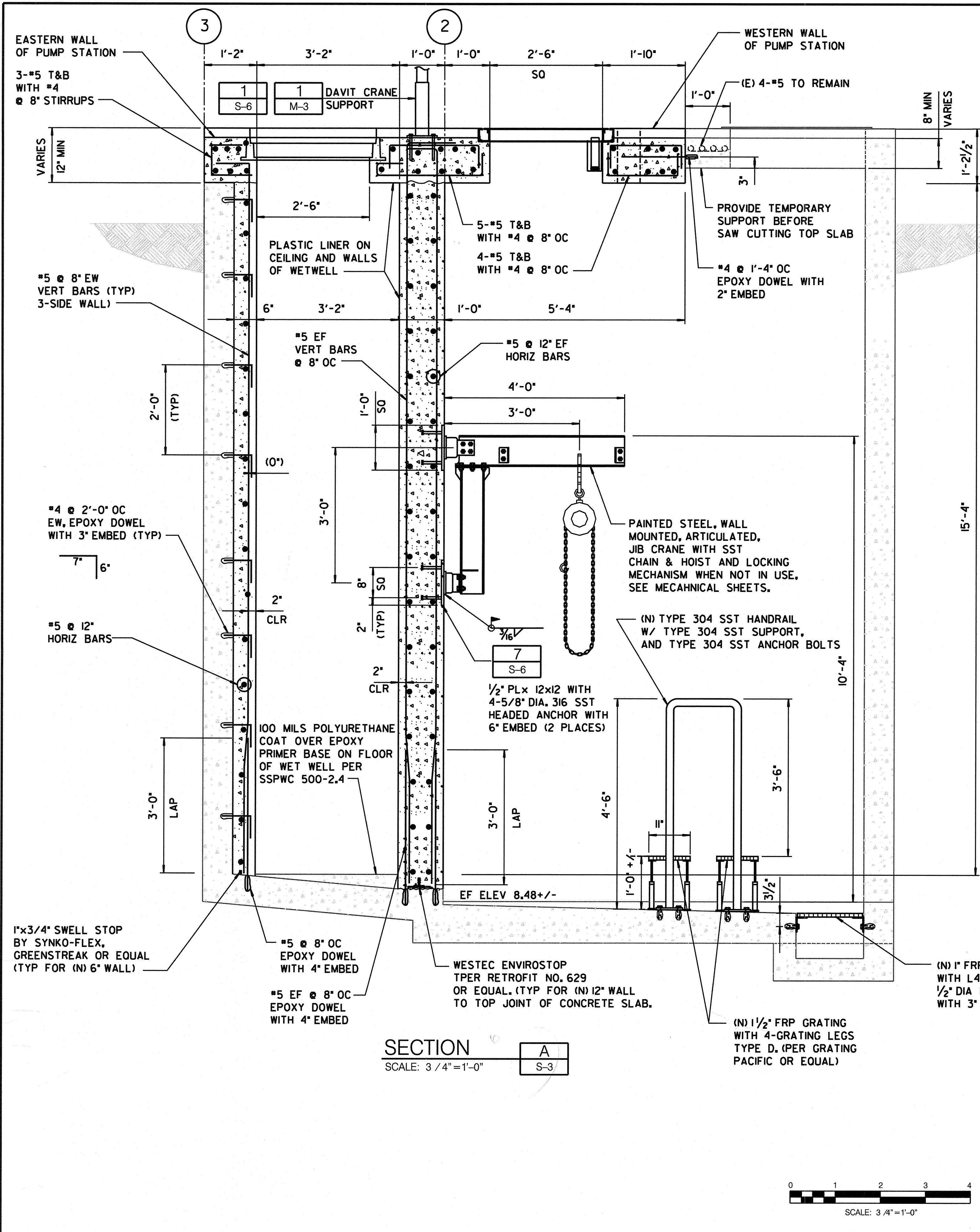


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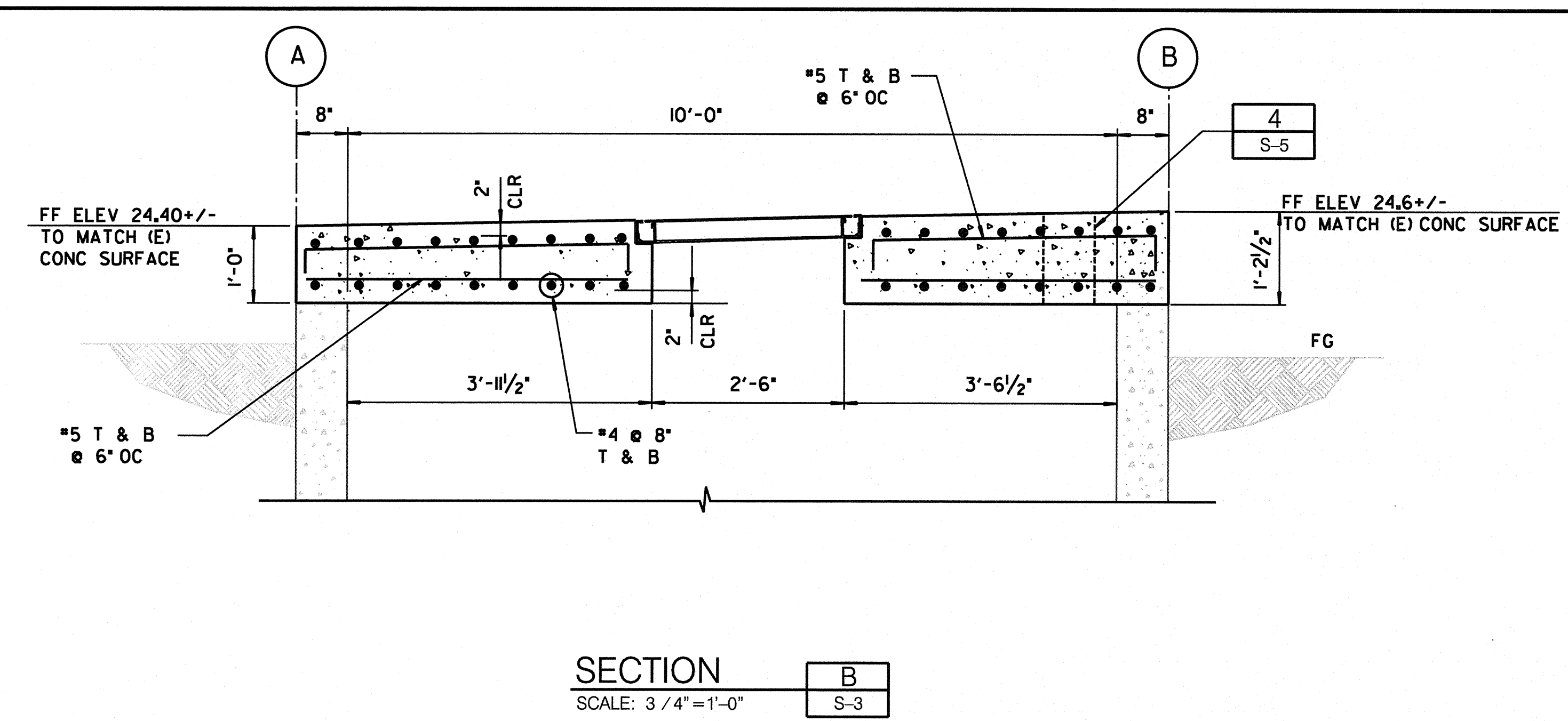
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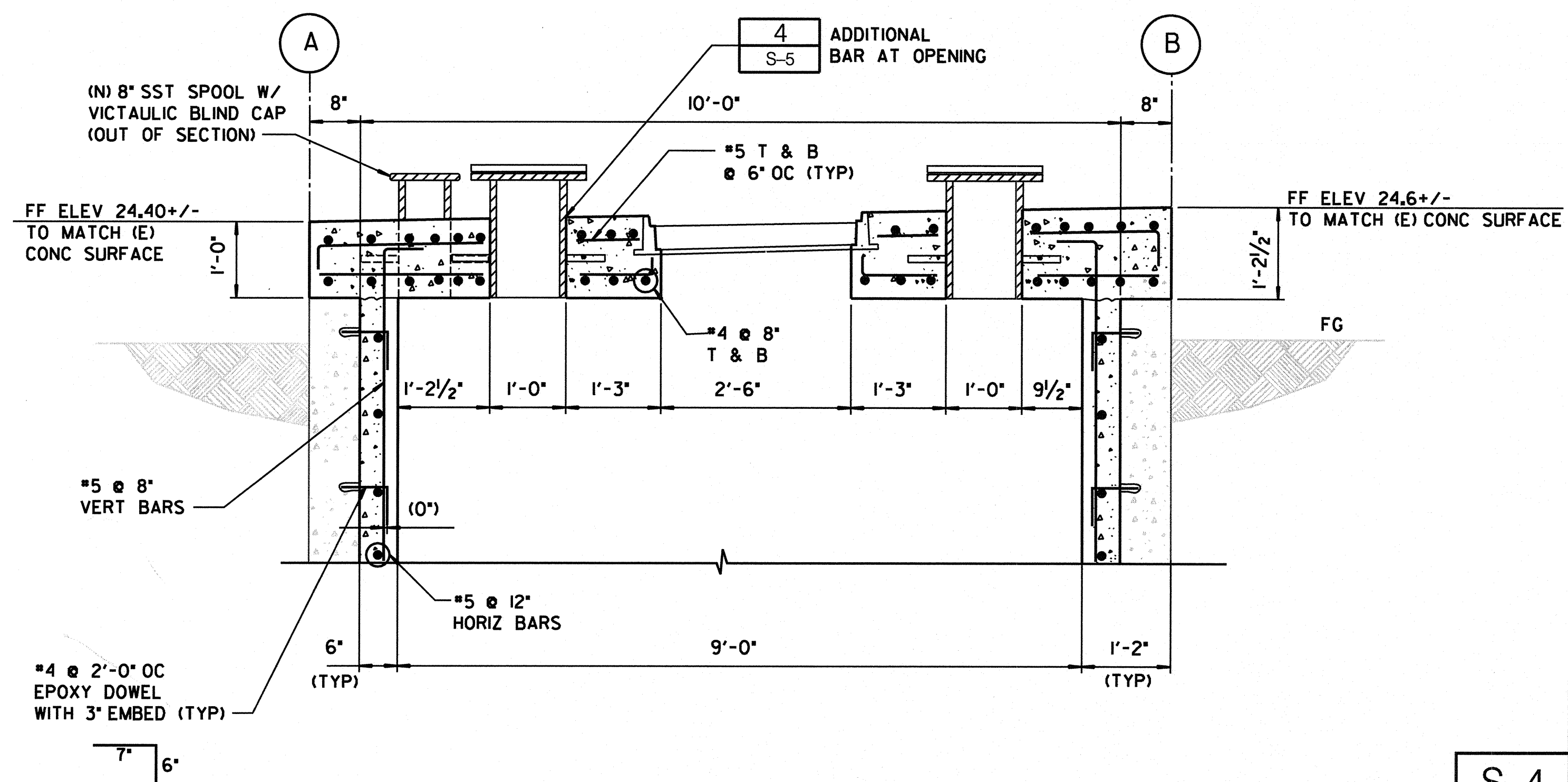
TEMP BMP CS/SWP#	LOW	SPEC. NO.	5717	S-3
SEWER PUMP STATION 13 IMPROVEMENTS				
STRUCTURAL IMPROVEMENTS TOP SLAB & WET WELL PLAN				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 13 OF 22 SHEETS			WBS	B-00476
APPROVED FOR CITY ENGINEER	DATE	2.21.13	SUBMITTED BY	DAVID MANELA (ASSOCIATE ENGINEER)
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
PROJECT ENGINEER				SIL VIA RENDON
LAMBERT COORDINATE				230-1689
CCS83 COORDINATE				1870-6250
CONTRACTOR	DATE STARTED	37021-13-D		
INSPECTOR	DATE COMPLETED			



SECTION A
SCALE: 3/4"=1'-0"
S-3



SECTION B
SCALE: 3/4"=1'-0"
S-3

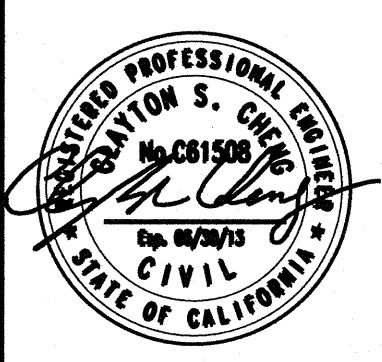


SECTION C
SCALE: 3/4"=1'-0"
S-3

TEMP BMP CS/SWP:	LOW	SPEC. NO.	5717	S-4	
SEWER PUMP STATION 13 IMPROVEMENTS					
STRUCTURAL IMPROVEMENTS TOP SLAB & WET WELL SECTIONS					
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 14 OF 22 SHEETS				WBS	B-00476
APPROVED:	<i>Haci Aguir</i>	DATE:	2-21-13	SUBMITTED BY:	<i>DAVID MANELA</i>
FOR CITY ENGINEER				ASSOCIATE ENGINEER	
DESCRIPTION	BY	APPROVED	DATE	FILED	
ORIGINAL	LRI				SILVIA RENDON
					PROJECT ENGINEER
					230-1689
					LAMBERT COORDINATE
					1870-6250
					CS883 COORDINATE
CONTRACTOR		DATE STARTED			
INSPECTOR		DATE COMPLETED			37021-14-D

CONSULTANT

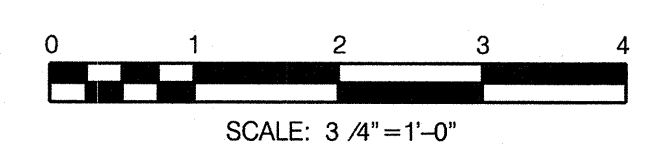
San Diego, California

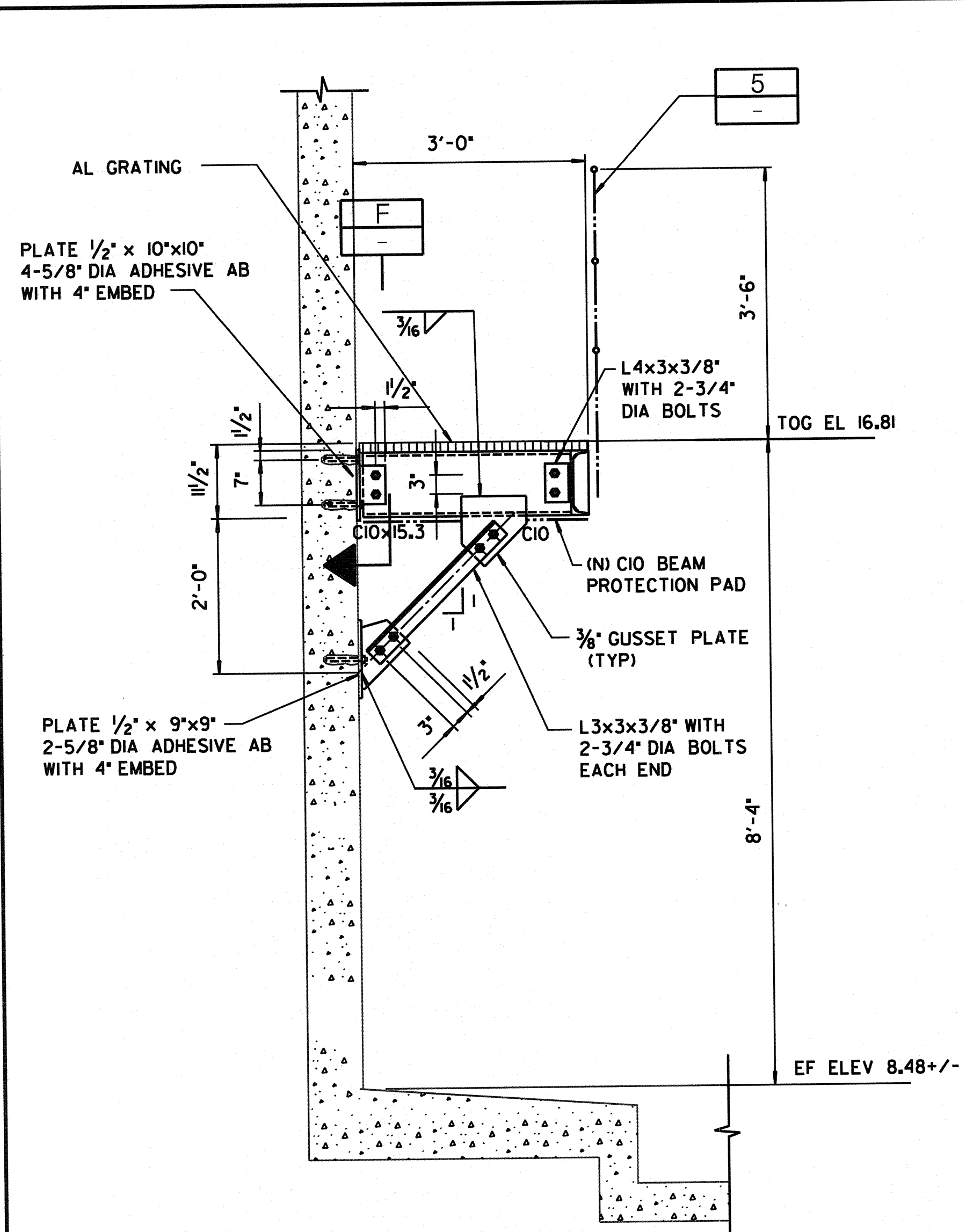


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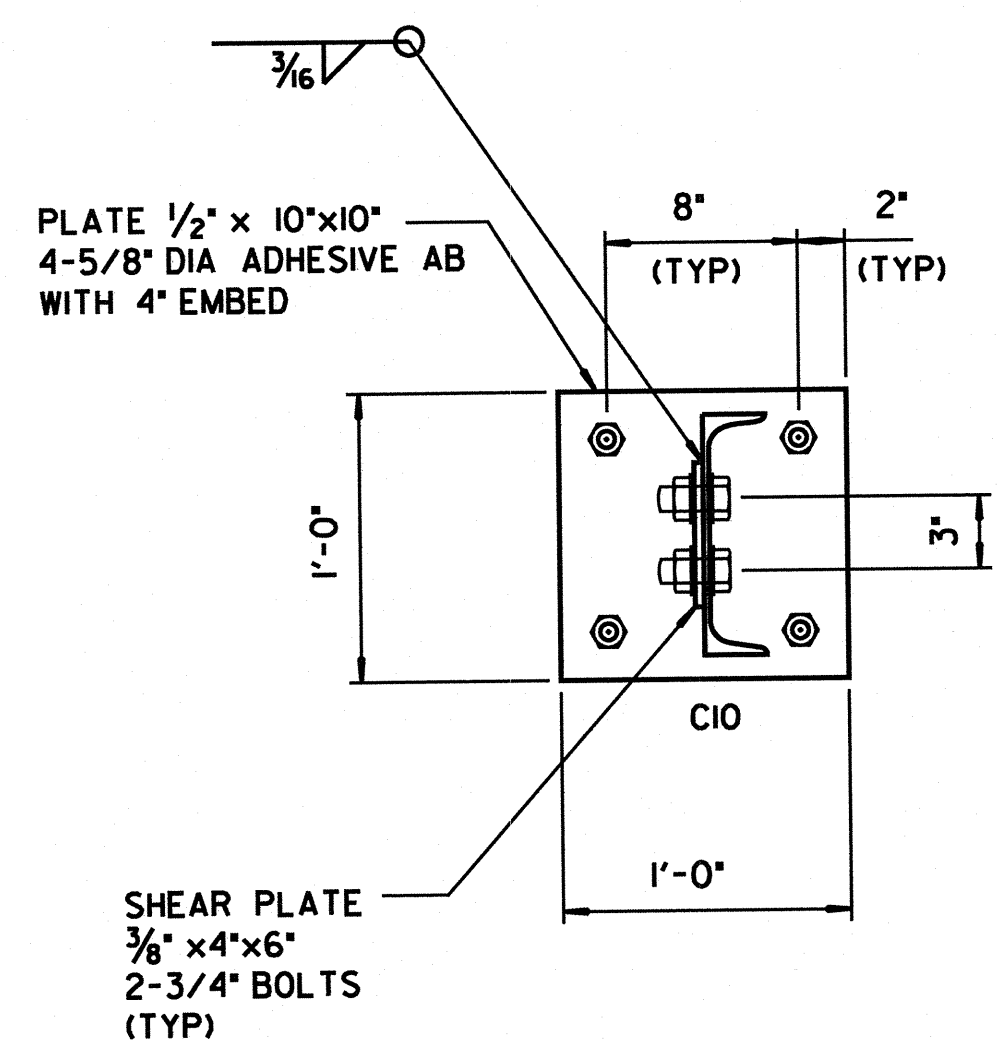
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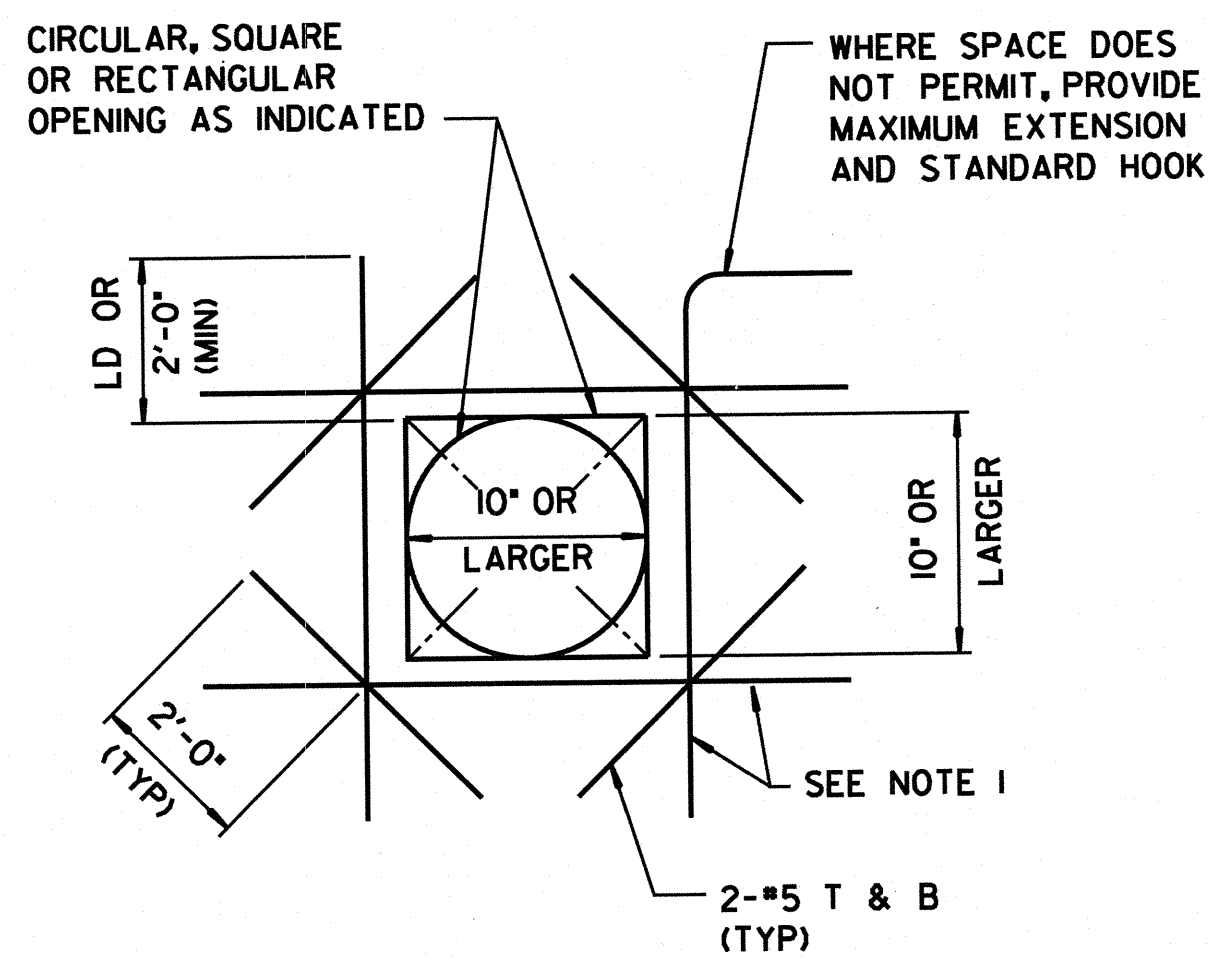




SECTION D
SCALE: 3/4"=1'-0"
S-3

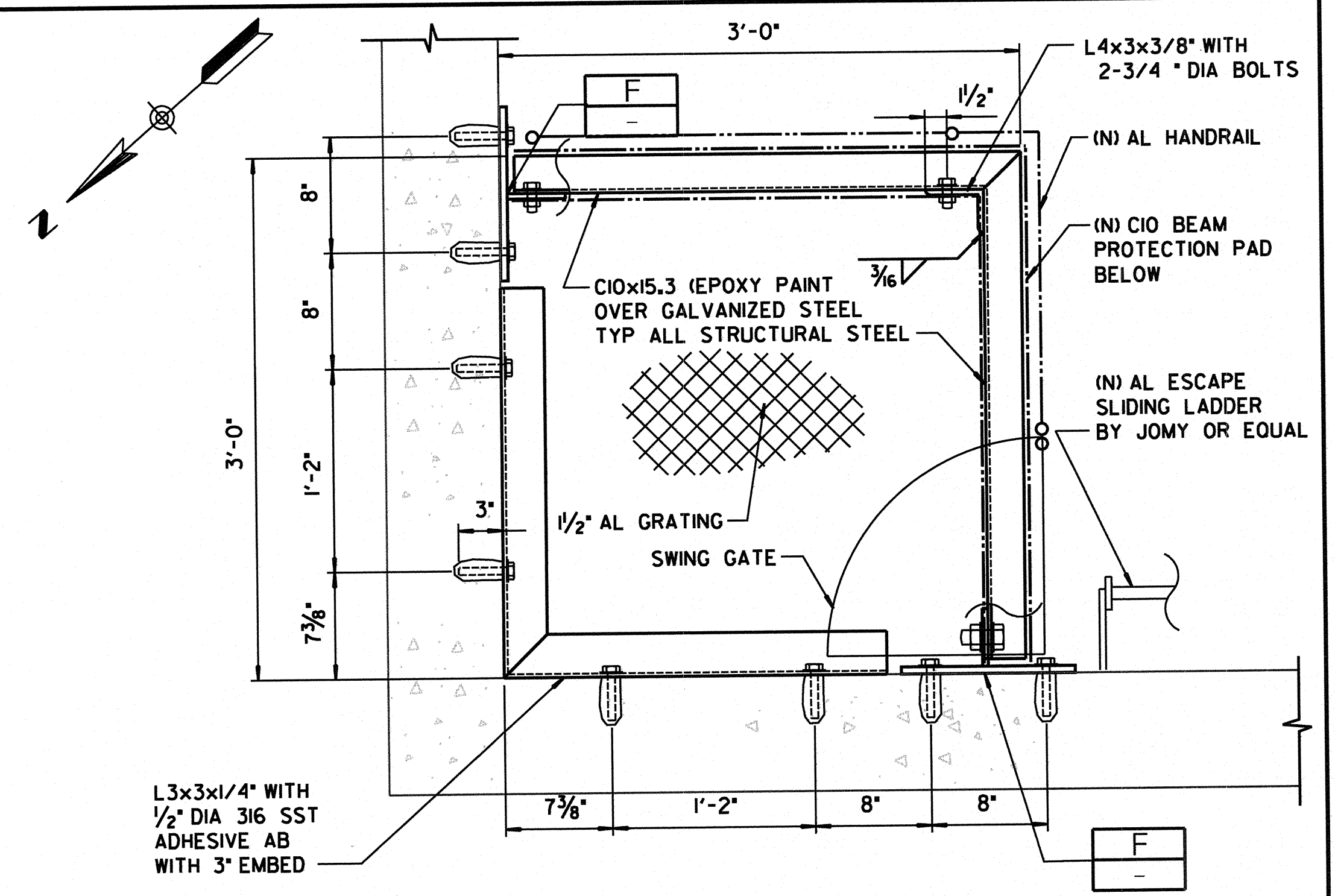


SECTION F
SCALE: 1 1/2"=1'-0"
-

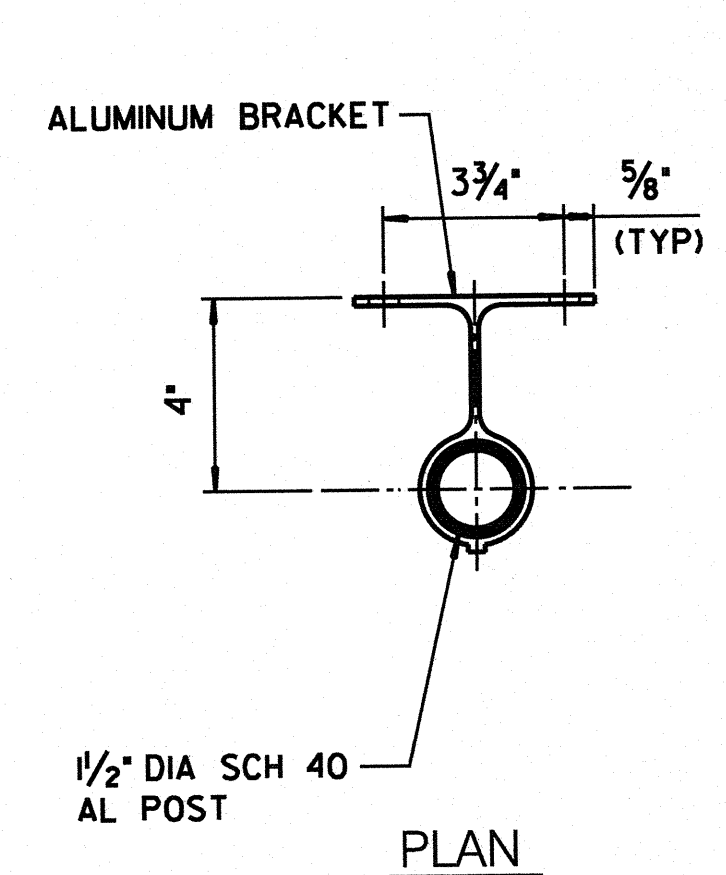


- NOTES:**
1. PROVIDE A MINIMUM 1/2 OF THE AREA OR NUMBER OF THE INTERRUPTED BARS TO EACH SIDE OF THE OPENING PARALLEL TO THE INTERRUPTED BARS (TYP AT EACH FACE) OR A MINIMUM OF 2-#5 BARS
 2. ADDITIONAL REINF MAY BE OMITTED WHERE OPENING IS FRAMED BY MEMBERS.
 3. NO ADDITIONAL REINFORCING IS REQUIRED FOR OPENINGS LESS THAN 10".

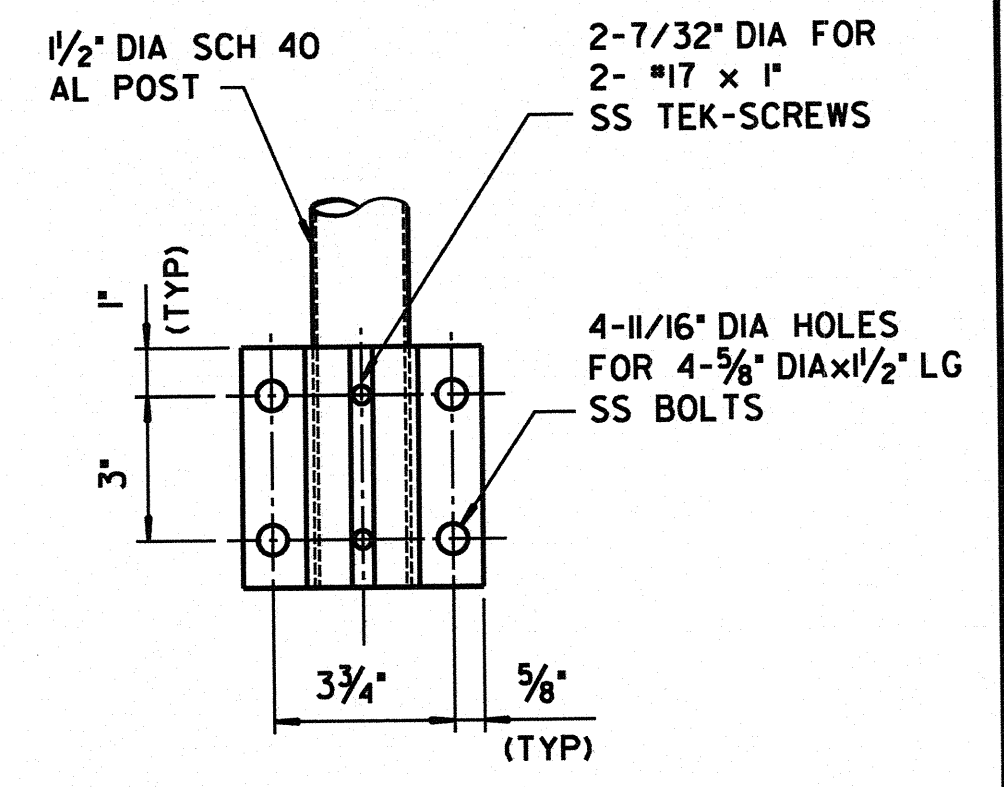
DETAIL 4
SCALE: NTS
-



DETAIL 1
SCALE: 1 1/2"=1'-0"
S-3



PLAN

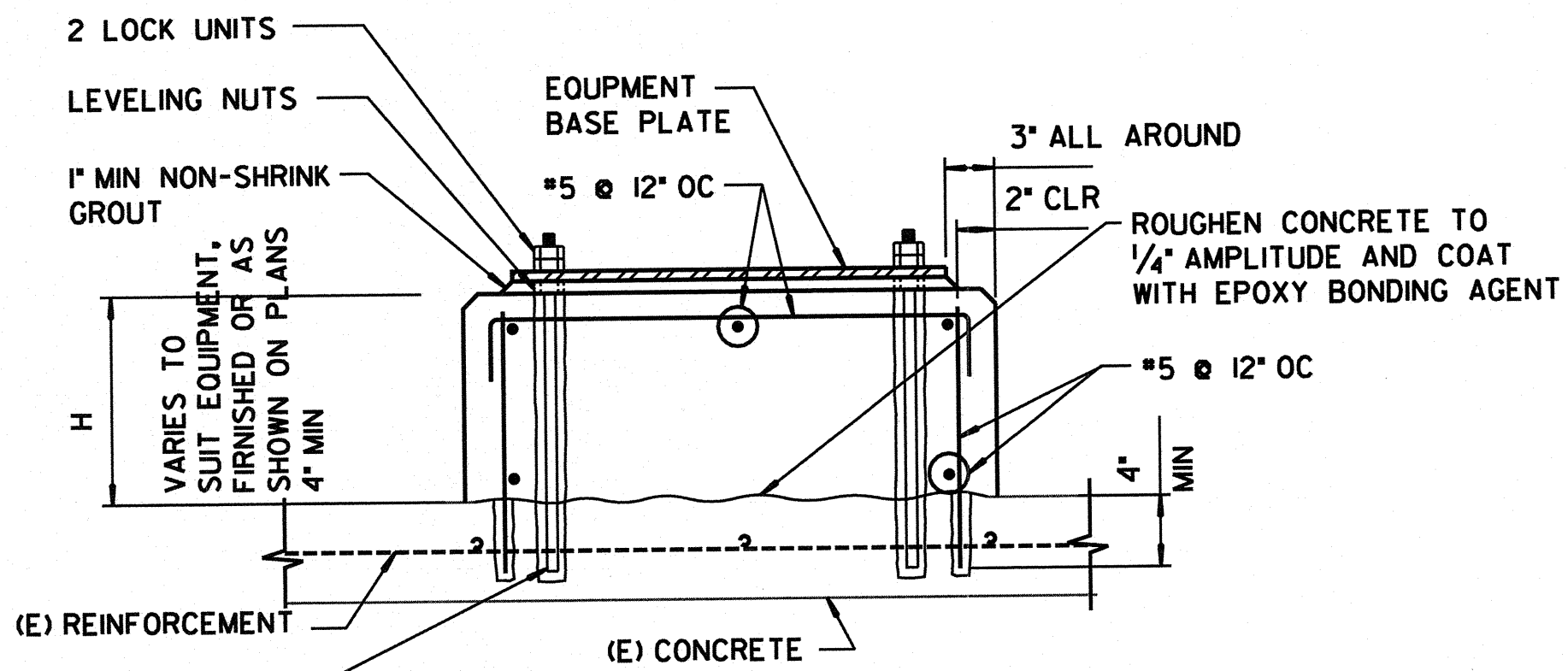


ELEVATION

SIDE MOUNT BRACKET

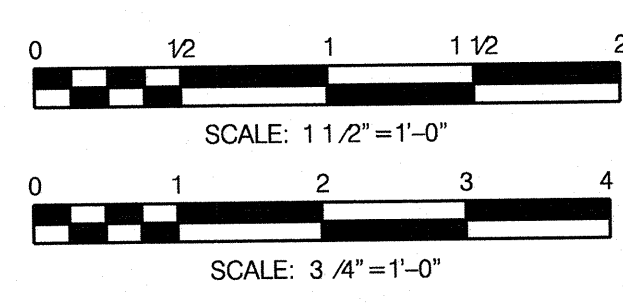
DETAIL 5
SCALE: NTS
S-3

NOTE:
CONTRACTOR SHALL INSTALL PROTECTIVE PAD UNDER CIO BEAM AND EXTEND ALL AROUND ANGLE L3x3.



NOTE: MAXIMUM EQUIPMENT PAD CAPACITY IS 2000 LBS. EQUIPMENT AND MACHINERY PAD

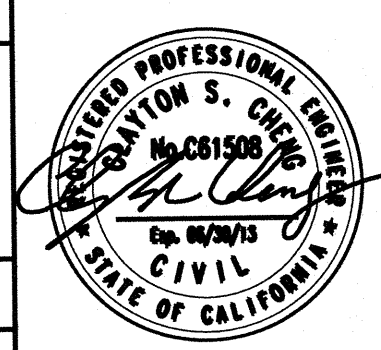
DETAIL 2
SCALE: NTS
-



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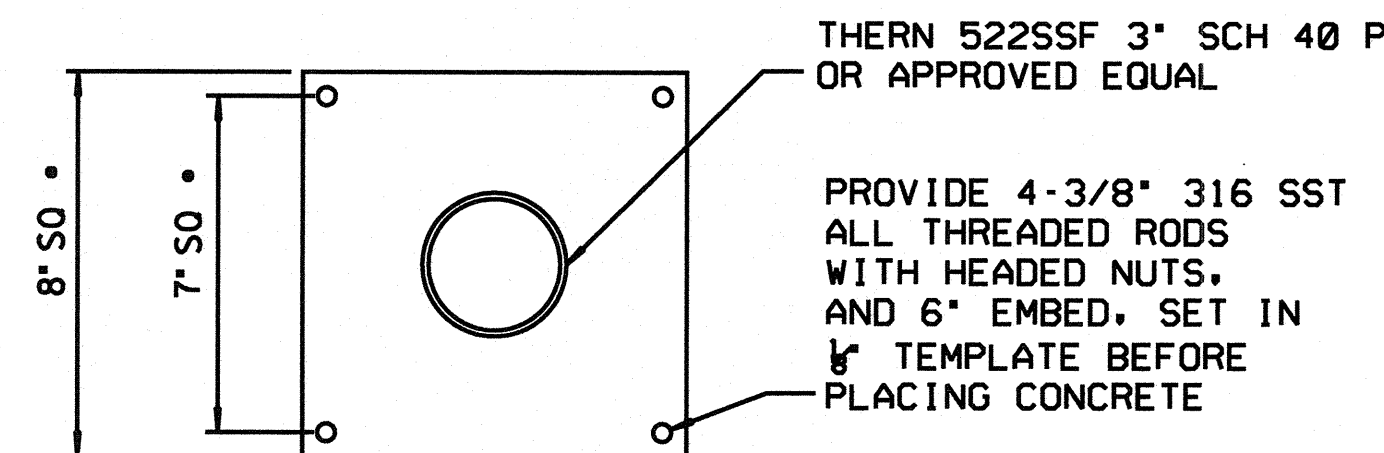
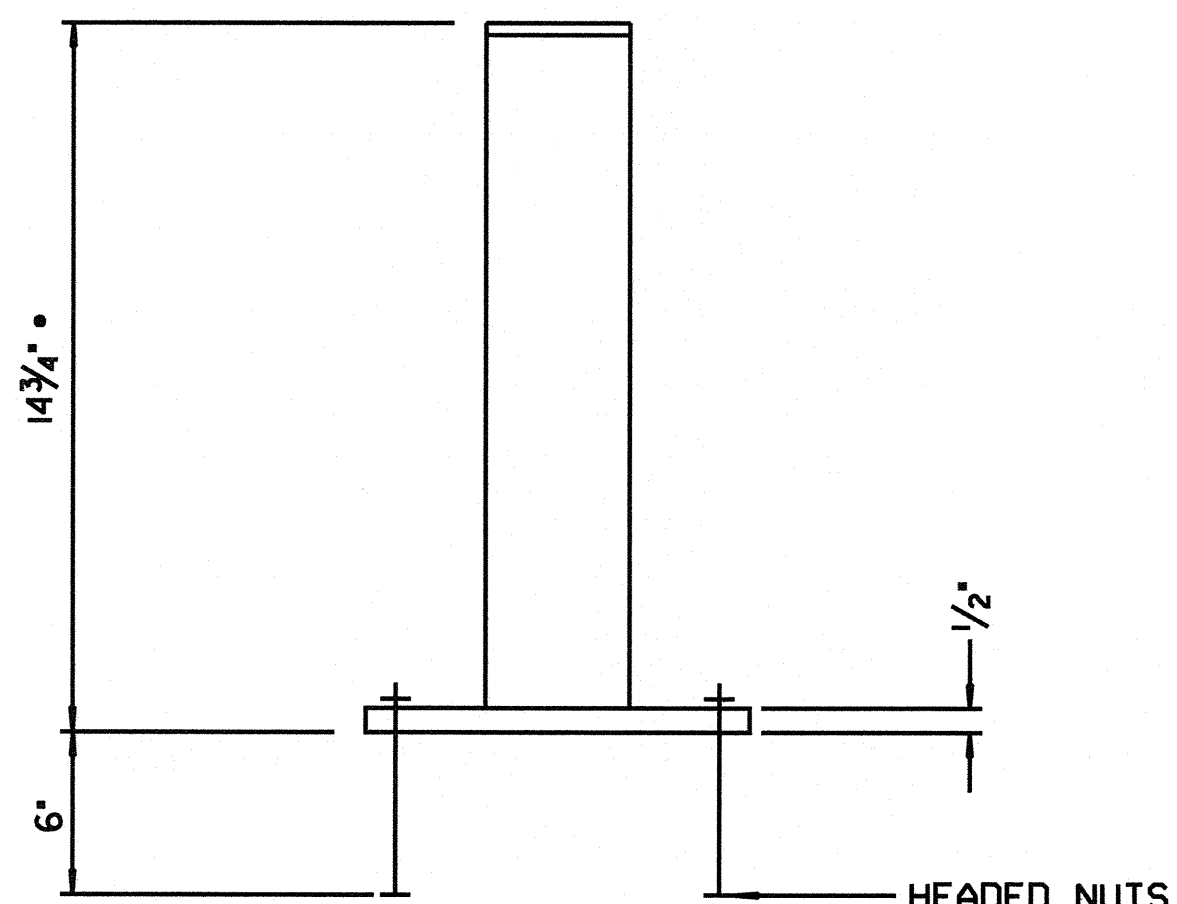
SCALE: HORIZONTAL
VERTICAL



WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

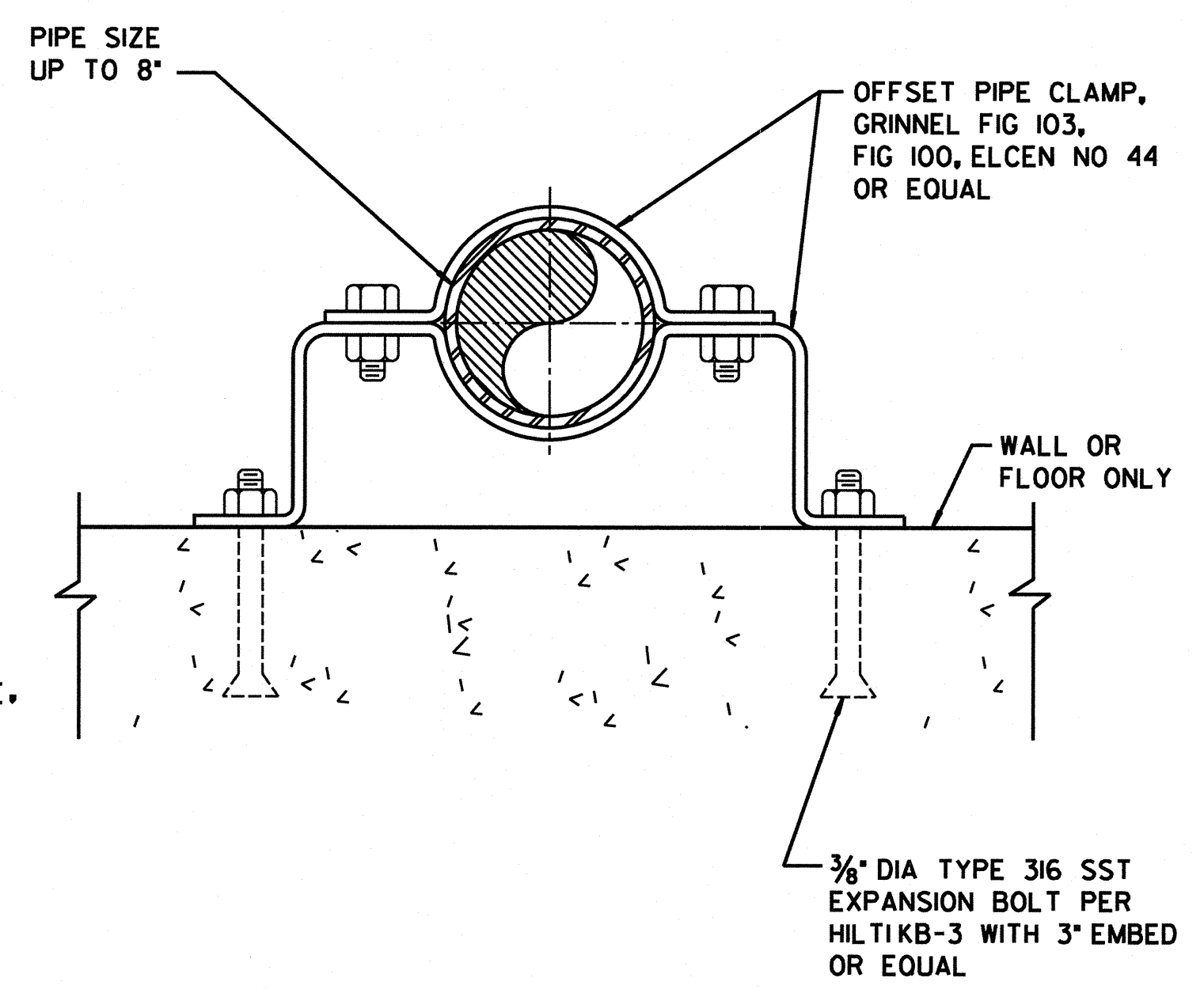
TEMP BMP CS/SHP:	LOW	SPEC. NO.	5717	S-5
SEWER PUMP STATION 13 IMPROVEMENTS				
STRUCTURAL IMPROVEMENTS ALUMINUM PLATFORM AND MISCELLANEOUS DETAILS				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 15 OF 22 SHEETS			WBS	B-00476
APPROVED FOR CITY ENGINEER	DATE	2.21.13	SUBMITTED BY	DAVID MARELA
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
CONTRACTOR				37021-15-D
INSPECTOR				



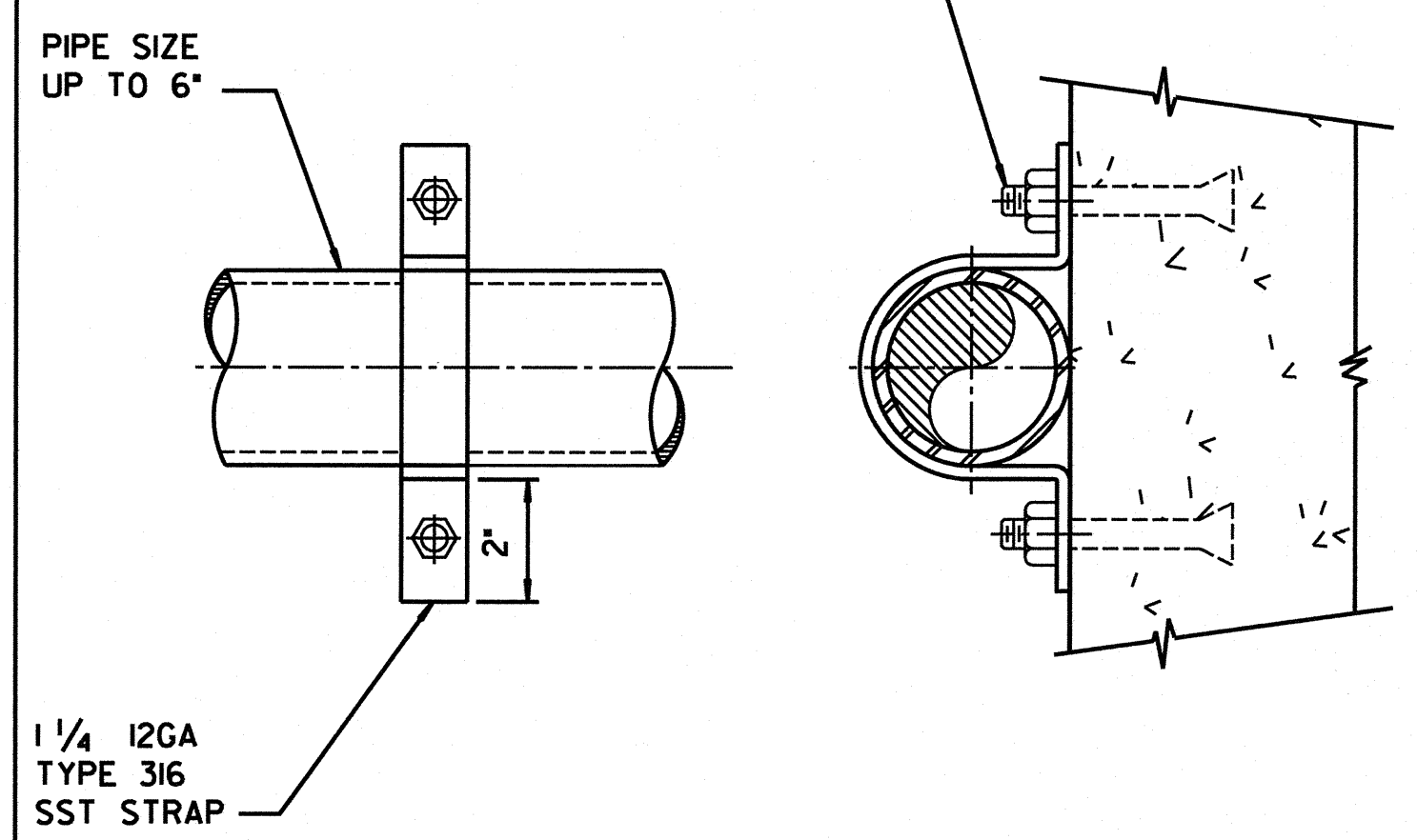
EQUIPMENT DIMENSION SHALL BE VERIFIED BY CONTRACTOR BEFORE INSTALLATION

DAVIT CRANE SUPPORT

DETAIL 1
SCALE: NTS
S-3



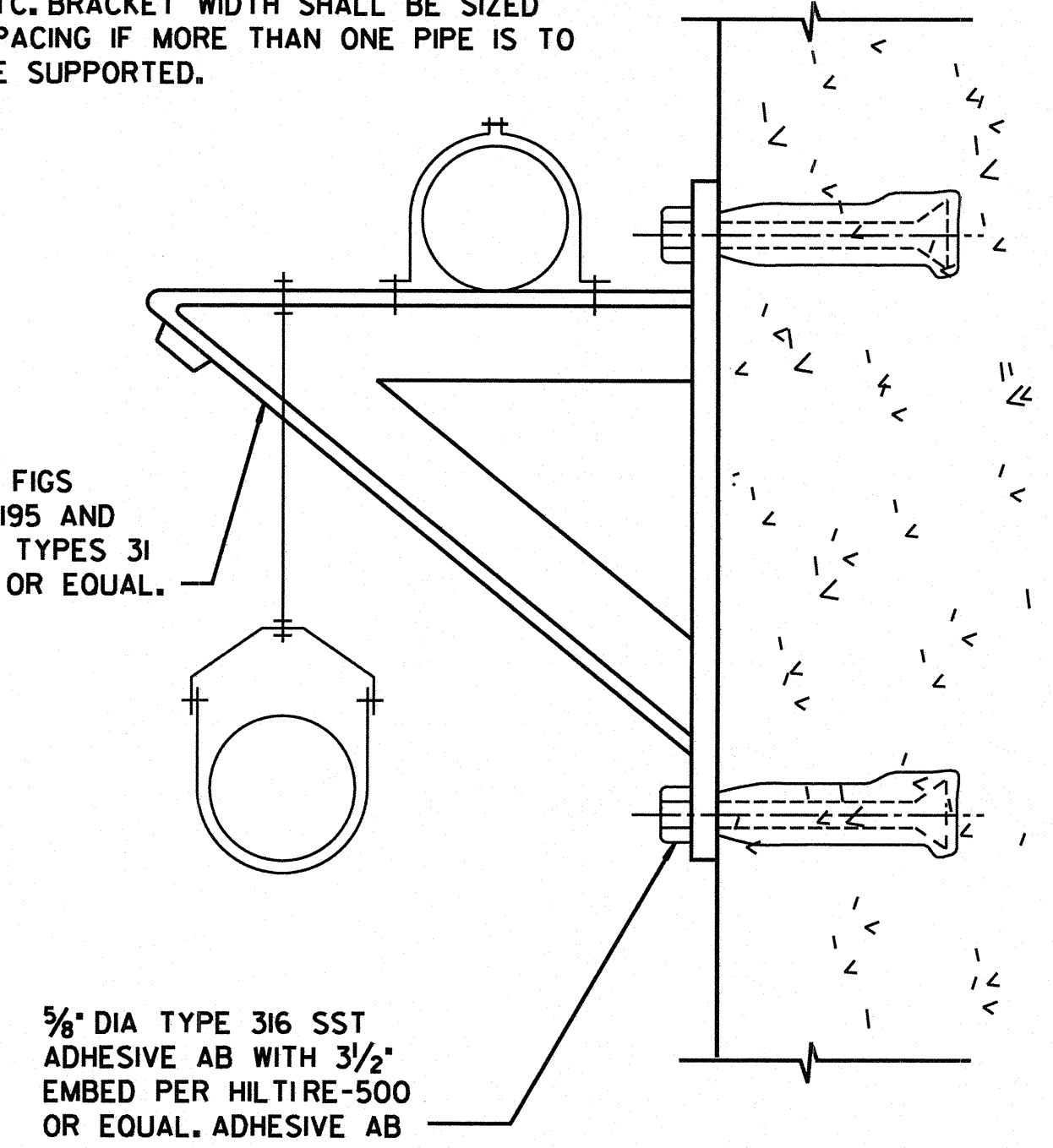
DETAIL 2
SCALE: 1 1/2" = 1'-0"
M-2



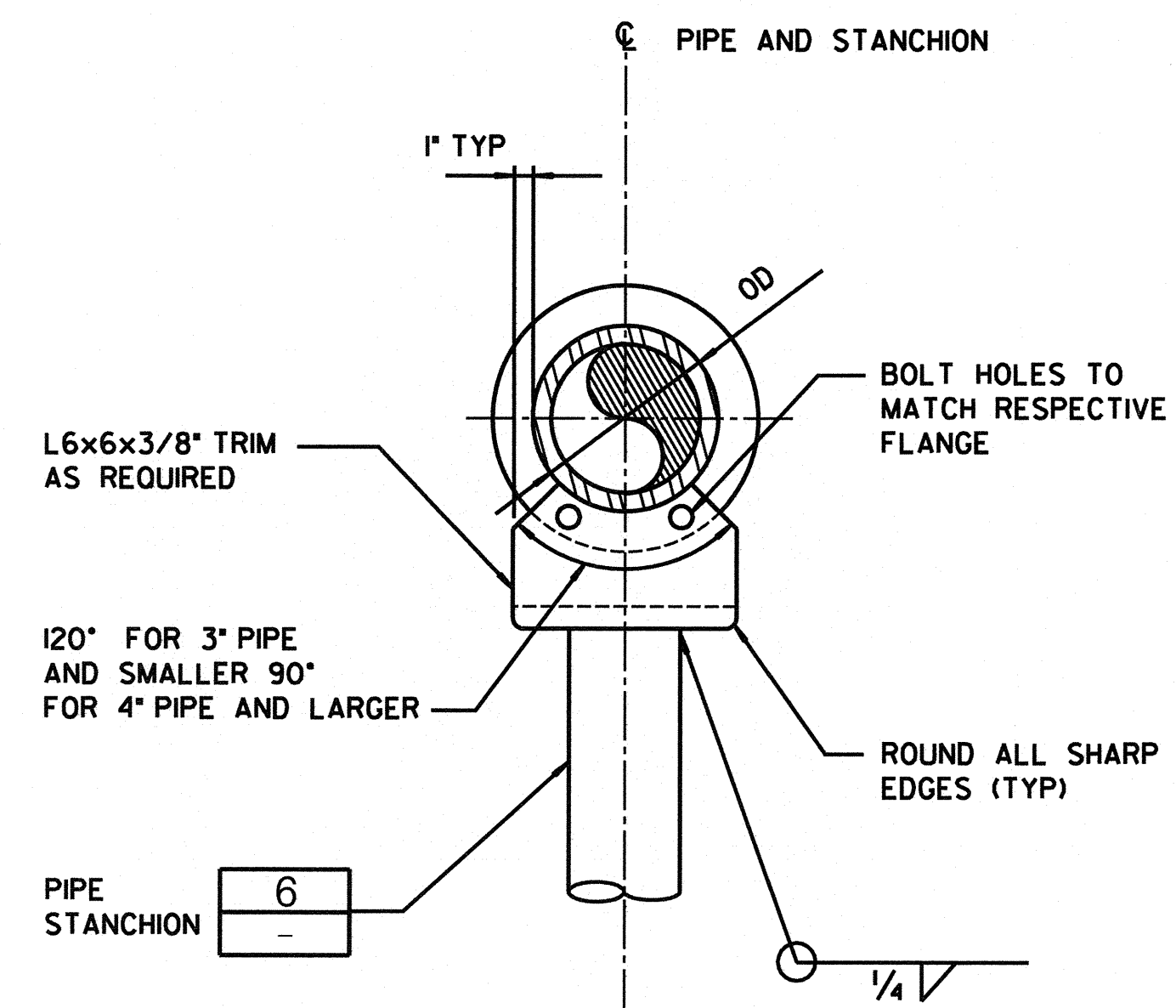
DETAIL 3
SCALE: NTS
M-2

NOTE: BRACKET MAY BE USED WITH OTHER ACCEPTABLE HANGERS, CLAMOS, GUIDES, ETC. BRACKET WIDTH SHALL BE SIZED SPACING IF MORE THAN ONE PIPE IS TO BE SUPPORTED.

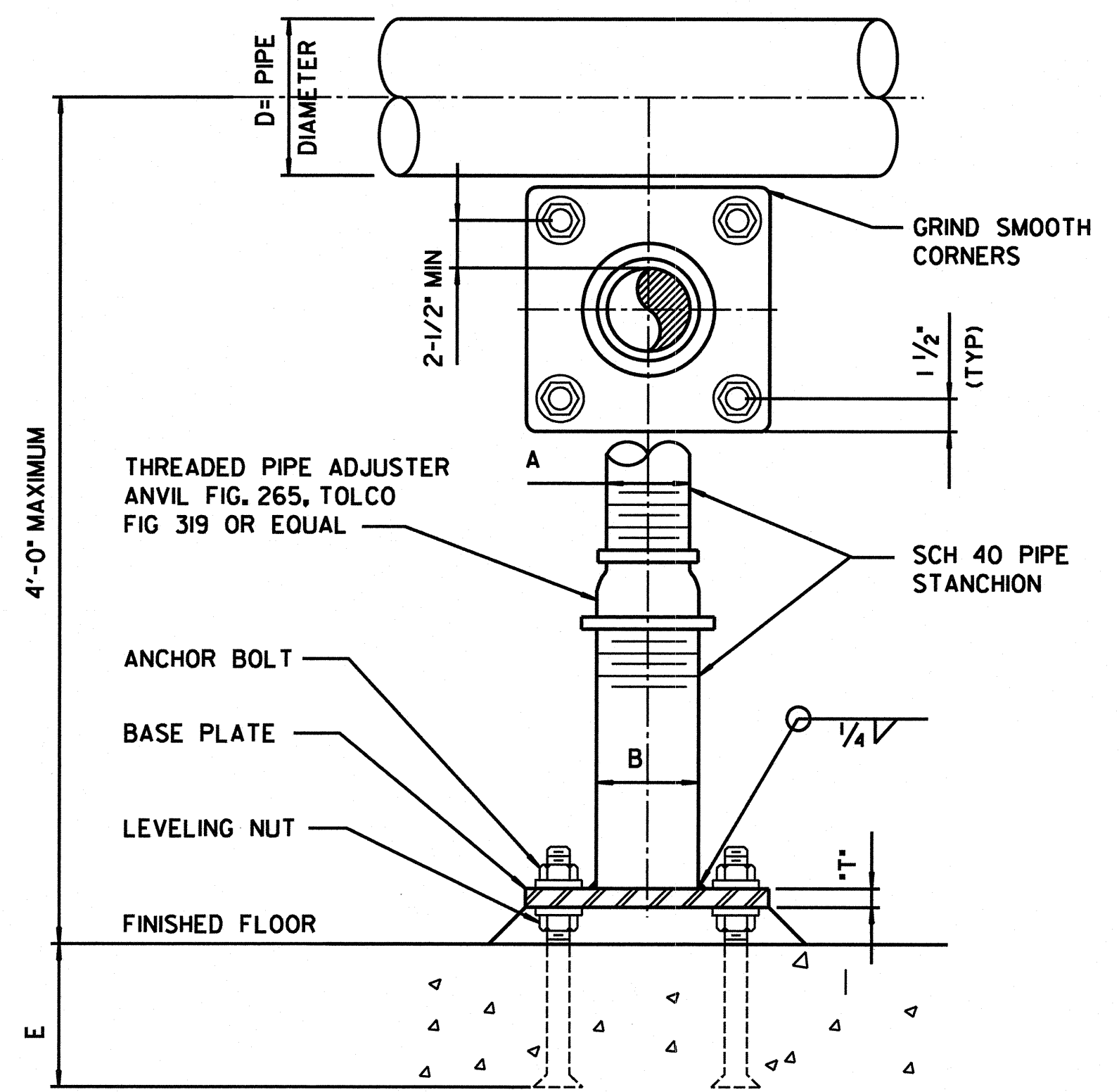
GRINNEL FIGS 193, 194, 195 AND 199 MSS TYPES 31 AND 33 OR EQUAL.



DETAIL 4
SCALE: NTS
M-1



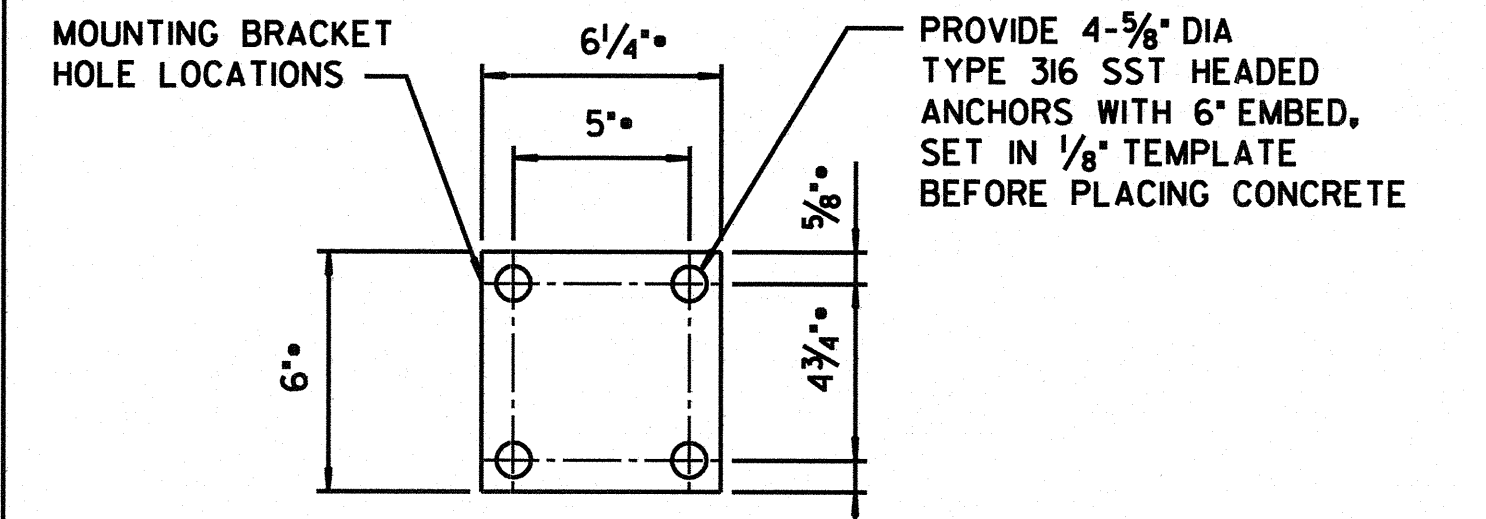
DETAIL 5
SCALE: NTS
M-2



DETAIL 6
SCALE: NTS
M-2

D= PIPE DIAMETER (INCHES)	4
A= UPPER STANCHION DIAMETER (INCHES)	2 1/2
L= LOWER STANCHION DIAMETER (INCHES)	3
ANCHOR BOLT DIAMETER (INCHES)	5/8
E= ANCHOR BOLT EMBEDMENT E (INCHES)	4
T= MINIMUM BASE PLATE THICKNESS (INCHES)	3/8

- NOTE: PROVIDE SEISMIC BRACING AS FOLLOWS:
- A. TRANSVERSE BRACING SHALL BE PROVIDED AT 20'-0" MAXIMUM SPACING.
 - B. LONGITUDINAL BRACES SHALL BE PROVIDED AT 40'-0" MAXIMUM SPACING (MINIMUM ONE PER EACH END)
 - C. ANCHOR BOLTS (HILTI HY-150 ADHESIVE ANCHORS) SHALL BE INSTALLED PER ICBO ER 5193.
 - D. UNLESS OTHERWISE INDICATED, ALL SUPPORT COMPONENTS SHALL BE GALVANIZED.



MOUNTING BRACKET HOLE LOCATIONS

EQUIPMENT DIMENSION SHALL BE VERIFIED BY CONTRACTOR BEFORE INSTALLATION.

DETAIL 7
SCALE: NTS
S-4

S-6

TEMP BMP CS/SWP: LOW SPEC. NO. 5717

SEWER PUMP STATION 13 IMPROVEMENTS

STRUCTURAL IMPROVEMENTS MISCELLANEOUS PIPE SUPPORTS

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 16 OF 22 SHEETS

WBS B-00476

APPROVED: *Hossein Arvan* 2.21.13
FOR CITY ENGINEER DATE

DESIGNED BY: *DAVID MANELA*
ASSOCIATE ENGINEER

DESCRIPTION ORIGINAL BY APPROVED DATE FILMED

PROJECT ENGINEER: *SILVIA REMON*

230-1689

1870-6250

CCS83 COORDINATE

CONTRACTOR INSPECTOR DATE STARTED DATE COMPLETED

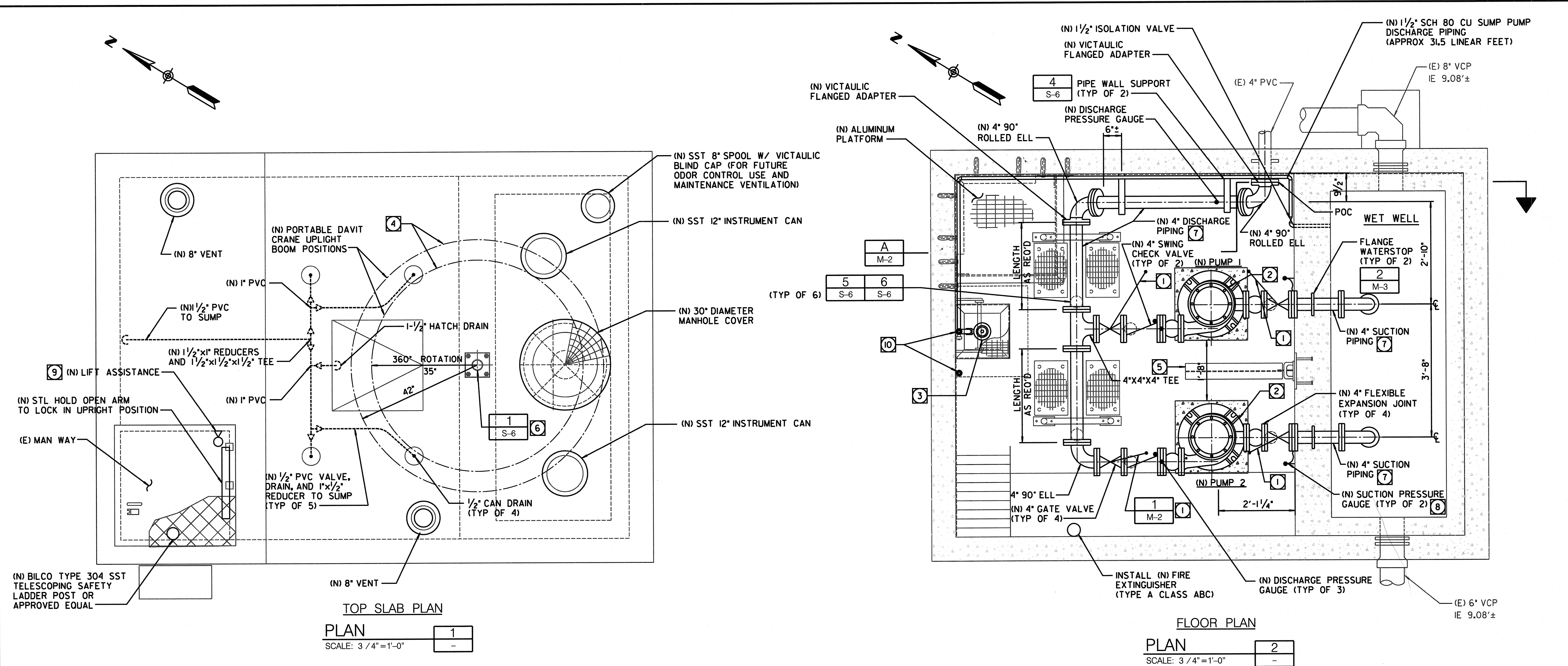
37021-16 -D

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WARNING
0 1
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SCALE HORIZONTAL VERTICAL

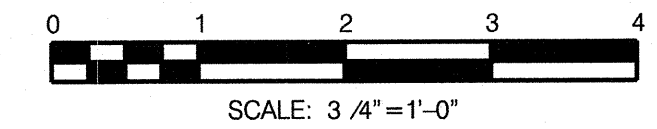


TOP SLAB PLAN
PLAN 1
SCALE: 3/4" = 1'-0"

FLOOR PLAN
PLAN 2
SCALE: 3/4" = 1'-0"

NOTES:

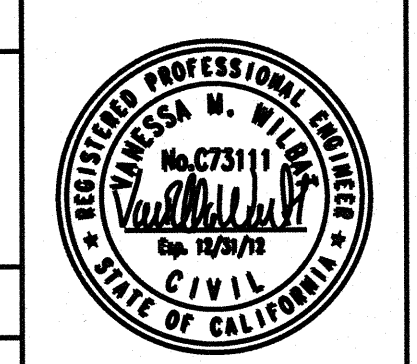
- 1 SEE VALVE EXTENSION ROD DETAIL 1 ON SHEET M-2. (TYP OF 4 PLACES)
- 2 SEE SHEET M-3 FOR PUMP OPERATIONAL INFORMATION.
- 3 REPLACE (E) SUMP PUMP WITH (N) SUBMERSIBLE SEWAGE SUMP PUMP, ZOELLER MODEL M98 OR EQUAL:
 - 1/2HP
 - VERTICAL SWITCH TYPE
 - CAST IRON HOUSING
 - 1/2" SOLIDS HANDLING
 - POLYPROPYLENE IMPELLERS
 - CARBON SHAFT SEAL
 - 1 1/2" NPT DISCHARGE
 - LIFTING HEAD 20 FT; CAPACITY 25 GPM
- 4 DAVIT CRANE SHALL BE ABLE TO PICK UP AND DROP LOAD ANYWHERE IN CRANE COVERAGE AREA. DAVIT CRANE'S PROFILE AND TRAVEL SHALL NOT INTERFERE WITH ANY OTHER PUMP STATION EQUIPMENT.
- 5 (N) PAINTED STEEL JIB CRANE. SEE STRUCTURAL SHEETS FOR DETAILS.
- 6 THERN PORTABLE STAINLESS STEEL DAVIT CRANE, HAND WINCH OPERATED, SERIES 5122, MODEL M3SS, WITH PEDESTAL BASE, OR EQUAL.
- 7 SUCTION AND DISCHARGE PIPING SHALL BE DI CLASS 350. DI FITTINGS SHALL BE RATED FOR 250 PSI, CLASS 125 FLANGE DETAILS.
- 8 INSTALL PRESSURE GAUGE ON SUCTION SIDE AT OR BELOW ELEV 11.5', PER SECTION 7.3.1.5 OF THE CITY OF SAN DIEGO SEWER DESIGN GUIDELINES, LATEST EDITION.
- 9 CONTRACTOR SHALL DETERMINE THE NECESSARY NUMBER AND SIZE OF COMPRESSION SPRING OPERATORS ENCLOSED IN TELESCOPING TUBES AND RETROFIT (E) MANWAY COVER; SPRING AND SPRING TUBES SHALL BE TYPE 316 SST.
- 10 RELOCATE TWO EXISTING FLOATS ADJACENT TO NEW SLIDING LADDER; USE SST HARDWARE.



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SCALE
HORIZONTAL
VERTICAL

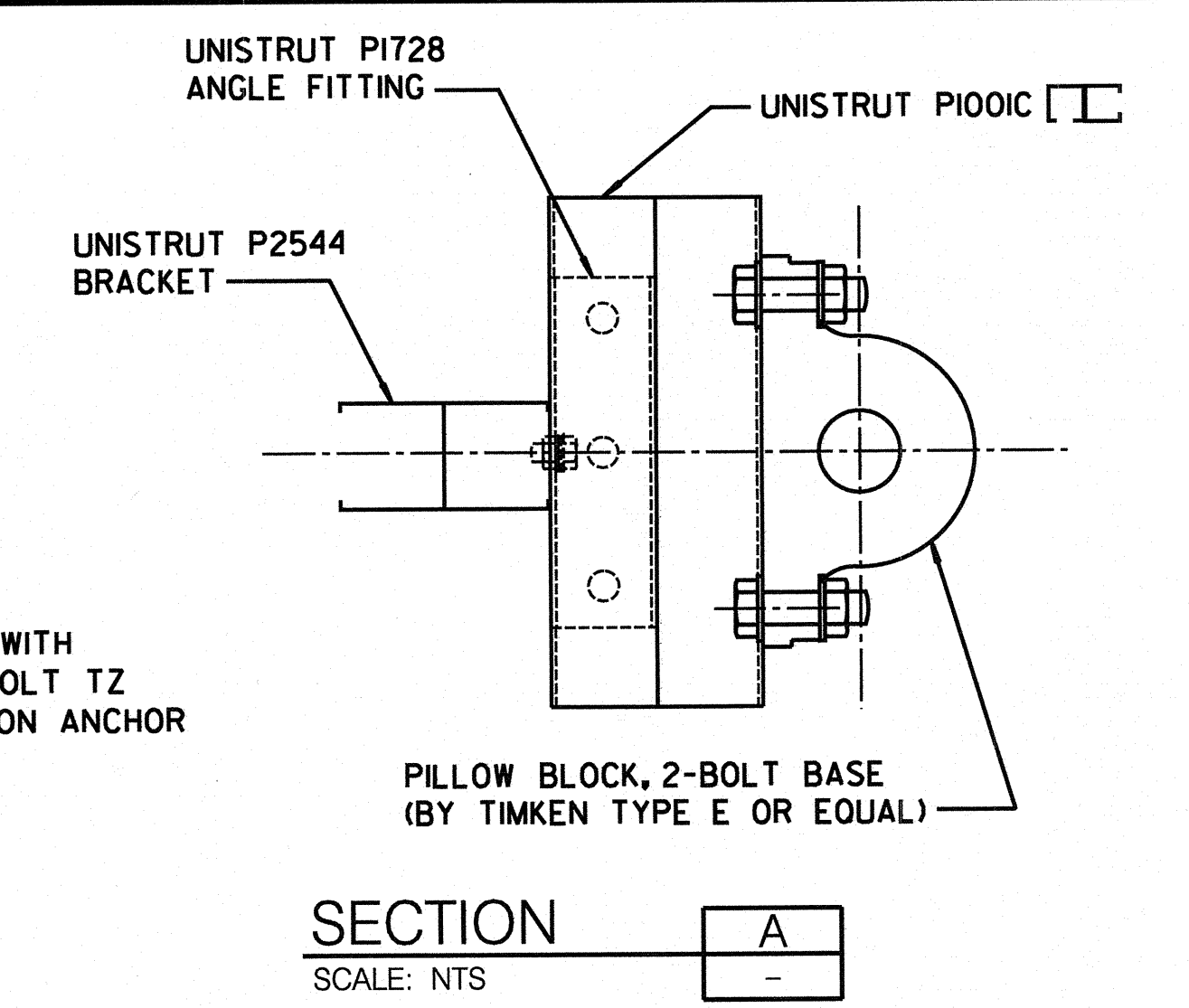
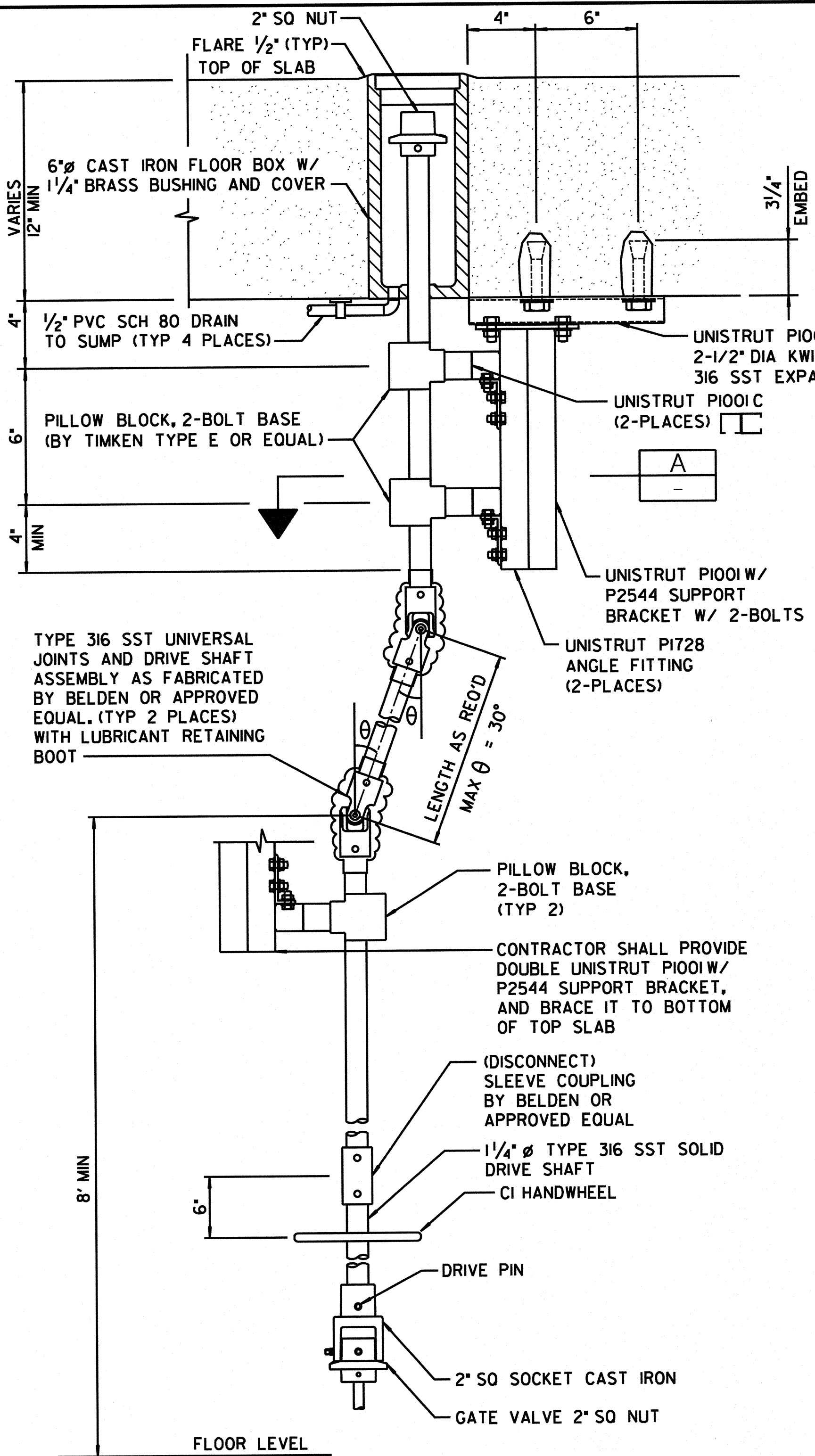
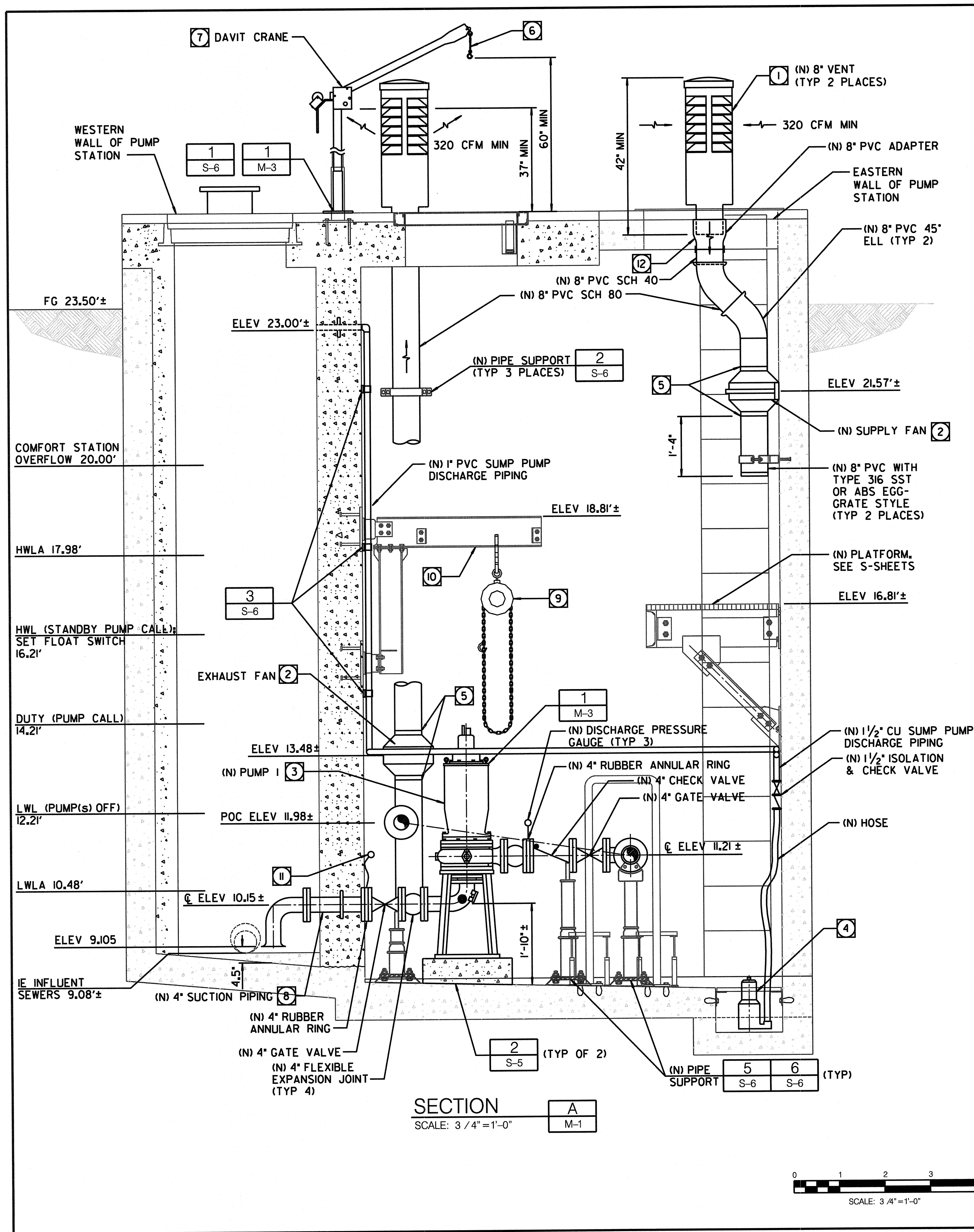


WARNING

0 1

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TEMP BMP CS/SWP	LOW	SPEC. NO.	5717	M-1
SEWER PUMP STATION 13 IMPROVEMENTS				
MECHANICAL IMPROVEMENTS TOP SLAB, WET WELL & DRY WELL PLAN & CRANE COVERAGE PLAN				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 17 OF 22 SHEETS			WBS	B-00476
APPROVED FOR CITY ENGINEER	DATE	2.21.13	SUBMITTED BY	DAVID MANELA ASSOCIATE ENGINEER
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
CONTRACTOR			DATE STARTED	230-1689
INSPECTOR			DATE COMPLETED	1870-6250
				CCSB3 COORDINATE
				37021-17-D



- NOTES:
- 8" X 42" POLYETHYLENE STANDPIPE VENT W/ SANDSTONE FINISH AS FABRICATED BY ARMORCAST PRODUCTS, CO., PART NO. P6002708-DSD, OR EQUAL. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
 - (N) 8" IN-LINE, 320 CFM, CIDII, CENTRIGUGAL FAN O.J., H₂O, 14 SONES MAX. ABS PLASTIC HOUSING W/ TYPE 316 SST MOUNTING BRACKET.
 - SEE SHEET M-3 FOR PUMP OPERATIONAL INFORMATION.
 - SEE SHEET M-1 FOR SUMP PUMP SPECIFICATIONS.
 - FLEXIBLE NEOPRENE OR RIGID PVC FITTINGS, FIT TO SUIT. ALL METAL HARDWARE SHALL BE TYPE 316 SST. SUPPORT FAN PER MANUFACTURER'S RECOMMENDATIONS.
 - DAVIT CRANE'S PROFILE AND TRAVEL SHALL NOT INTERFERE WITH ANY OTHER PUMP STATION EQUIPMENT.
 - TERN PORTABLE STAINLESS STEEL DAVIT CRANE, HAND WINCH OPERATED, SERIES 5122, MODEL M3SS, WITH PEDESTAL BASE, OR EQUAL, UP TO 500 LBS. CAPACITY.
 - FOR DIPIPE CLASS SEE SHEET M-1, NOTE 7.
 - 500 LBS CAPACITY LUG MOUNTED 3/8" TYPE 304 SST CALIBRATED LOAD CHAIN GEAR BOX AND CAST IRON WELDED HOIST FRAME, 8' HAND CHAIN DROP. ALL OTHER HARDWARE SHALL BE TYPE 316 SST.
 - 3' SPAN PAINTED STEEL, WALL MOUNTED JIB CRANE MAX ROTATION 180°
 - INSTALL PRESSURE GAUGE ON SUCTION SIDE AT OR BELOW ELEV 11.5', PER SECTION 7.3.1.5 OF THE CITY OF SAN DIEGO SEWER DESIGN GUIDELINES, LATEST EDITION.
 - 8" Ø ADAPTER SCH 40 PVC. JOINTS SHALL BE SEALED AGAINST WATER INFILTRATION PER MANUFACTURER'S RECOMMENDATIONS.

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San Diego, California

SCALE HORIZONTAL VERTICAL

WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

0 1

APPROVED FOR CITY ENGINEER: *Hoten Agur* 2.21.13

DATE: 2.21.13

DATE FILMED: []

DESCRIPTION: ORIGINAL

BY: LRI

APPROVED: []

DATE: []

FILMED: []

CONTRACTOR: [] DATE STARTED: []

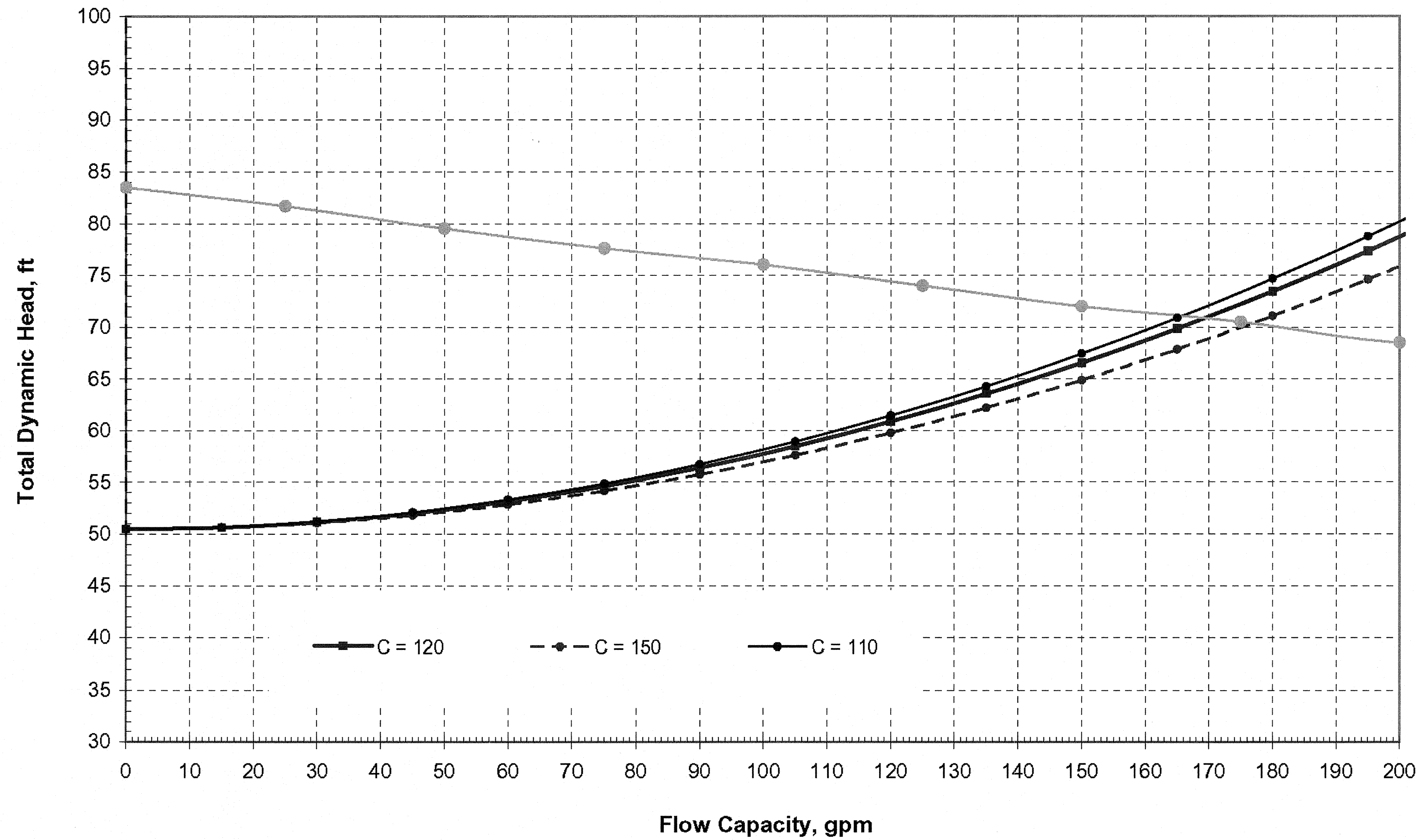
INSPECTOR: [] DATE COMPLETED: []

TEMP BMP CS/SWP	LOW	SPEC. NO.	5717	M-2
SEWER PUMP STATION 13 IMPROVEMENTS				
MECHANICAL IMPROVEMENTS TOP SLAB & WET WELL SECTIONS & CRANE COVERAGE DETAILS				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 18 OF 22 SHEETS			WBS B-00476	
APPROVED FOR CITY ENGINEER: <i>Hoten Agur</i> 2.21.13			SUBMITTED BY: <i>DAVID MANELA</i> ASSOCIATE ENGINEER	
DESCRIPTION: ORIGINAL			PROJECT ENGINEER: <i>SILVIA RENBORN</i>	
BY: LRI			230-1689 LAMBERT COORDINATE	
APPROVED: []			1870-6250 CS883 COORDINATE	
DATE: []			37021- 18 -D	
DATE FILMED: []				
CONTRACTOR: [] DATE STARTED: []				
INSPECTOR: [] DATE COMPLETED: []				

SEWER PUMP STATION 13 IMPROVEMENTS

Pump Station 13- City of San Diego- System Head Curves

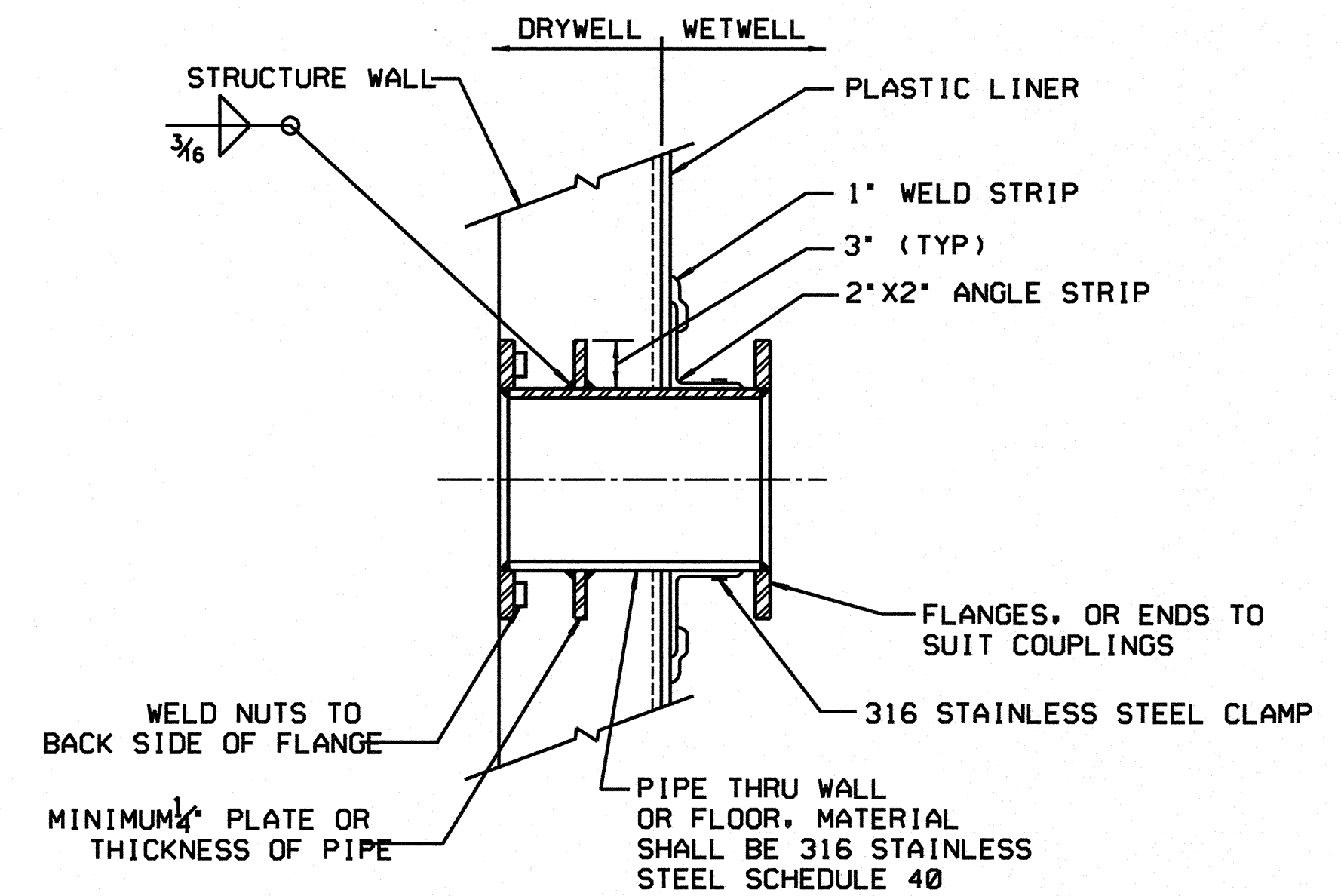
Force Main Length = 260 ft; Pipe Diameter = 4 in



PUMP OPERATION CRITERIA	1
	M-2

FLOW (GPM)	TDH (FT)	MAX RPM	SOLIDS PASSAGE	MIN SUCTION DI	MIN DISCHARGE DI	MIN-MAX MOTOR SIZE (HP)
160	71	1750	3"	3"	3"	10-15

NOTE:
SEE TECHNICAL SPECIFICATIONS SECTION 11175 - PUMP, GENERAL AND 11220 - VERTICAL DRY-PIT NON-CLOG PUMP FOR PUMP SELECTION CRITERIA.



FLANGE WATERSTOP

DETAIL 2
SCALE: NTS M-1

NOTE:
1. PLASTIC LINER AND STAINLESS STEEL CLAMP APPLY ONLY FOR PENETRATIONS INTO THE WETWELL.

M-3

TEMP BMP CS/SWP	LOW	SPEC. NO.	5717
SEWER PUMP STATION 13 IMPROVEMENTS			
MECHANICAL DETAILS & PUMP OPERATIONAL INFORMATION			
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 19 OF 22 SHEETS			WBS B-00476
APPROVED	DATE	SUBMITTED BY	
<i>Hesc Alar</i>	2-21-13	DAVID MANELA	
FOR CITY ENGINEER		ASSOCIATE ENGINEER	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LRI		
CONTRACTOR	DATE STARTED	PROJECT ENGINEER	
INSPECTOR	DATE COMPLETED	SILVIA REardon	
		230-1689	
		LAMBERT COORDINATE	
		1870-6250	
		CCS83 COORDINATE	
		37021-19-D	

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SCALE: HORIZONTAL
VERTICAL



WARNING

0 1

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SEWER PUMP STATION 13 IMPROVEMENTS

ELECTRICAL DIAGRAM LEGEND

	DRAWOUT TYPE CIRCUIT BREAKER 3-POLE UNLESS OTHERWISE NOTED		NORMALLY OPEN VACUUM OR PRESSURE SWITCH, CLOSE ON RISING PRESSURE		TWO-POSITION SELECTOR SWITCH, H=HAND, M=MANUAL, R=REMOTE, L=LOCAL, A=AUTOMATIC, O=OFF OR OPEN, C=CLOSE, X'S AND O'S INDICATE SEQUENCE OF OPERATION
	MOLDED CASE CIRCUIT BREAKER 3-POLE UNLESS OTHERWISE NOTED		NORMALLY CLOSED VACUUM OR PRESSURE SWITCH, OPEN ON RISING PRESSURE		THREE-POSITION SELECTOR SWITCH (SAME AS ABOVE)
	60A DISCONNECT SWITCH, 60A 3-POLE UNLESS OTHERWISE NOTED		NORMALLY OPEN TEMPERATURE ACTUATED SWITCH, CLOSE ON RISING TEMPERATURE		SINGLE POLE TOGGLE SWITCH
	60AF FUSE, 60A		NORMALLY CLOSED TEMPERATURE ACTUATED SWITCH, OPEN ON RISING TEMPERATURE		GROUND CONNECTION
	GROUND CONNECTION		NORMALLY CLOSED LIMIT SWITCH		NORMALLY CLOSED, AUXILIARY OVERLOAD RELAY CONTACT
	CURRENT TRANSFORMER		NORMALLY OPEN FLOW SWITCH CLOSE ON FLOW INCREASE		NORMALLY OPEN, AUXILIARY OVERLOAD RELAY CONTACT
	POWER TRANSFORMER, DELTA CONNECTED PRIMARY AND SOLIDLY GROUNDED STAR CONNECT SECONDARY		NORMALLY CLOSED FLOW SWITCH OPEN ON FLOW INCREASE		MANUAL MOTOR STARTER WITH THERMAL OVERLOAD RELAY
	MAGNETIC MOTOR STARTER FVNR, 3 POLE, UON NUMBER DENOTES NEMA SIZE		NORMALLY OPEN PUSH BUTTON, MOMENTARY CLOSE		FUSE
	INDUCTION MOTOR, 3 PHASE NUMBER DENOTES HP		NORMALLY CLOSED PUSHBUTTON, MOMENTARY OPEN		ELAPSED TIME METER
	INDICATING LIGHT, PUSH TO TEST TYPE LENS COLOR CODE: A=AMBER, R=RED, W=WHITE, G=GREEN		NORMALLY CLOSED PUSH BUTTON SINGLE CIRCUIT, LOCK-OUT-STOP (LOCATED AT MOTOR UNLESS OTHERWISE NOTED)		RESISTOR (FIXED)
	INDICATES CONTROL RELAY OR MOTOR STARTER COIL T OR TD = TIME DELAY RELAY R OR CR = CONTROL RELAY MS = MAGNETIC MOTOR STARTER C = MAGNETIC CONTACTOR		NORMALLY OPEN TIMED CONTACT - CONTACT ACTION, IN DIRECTION OF ARROW, RETARDED ON ENERGIZATION		POTENTIOMETER TYPE RESISTOR (CONTINUOUSLY ADJUSTABLE)
			NORMALLY CLOSED TIMED CONTACT - CONTACT ACTION, IN DIRECTION OF ARROW, RETARDED ON ENERGIZATION		PUSH-TO-TEST INDICATING LIGHT R=RED, A=AMBER, Y=YELLOW, W=WHITE, G=GREEN
			NORMALLY OPEN TIMED CONTACT - UPON INITIAL ENERGIZATION, CONTACT CHANGES STATE, CONTACT ACTION, IN DIRECTION OF ARROW, RETARDED ON DE-ENERGIZATION		TERMINALS IN ELECTRICAL CONTROL EQUIPMENT
			NORMALLY CLOSED TIMED CONTACT - UPON INITIAL ENERGIZATION, CONTACT CHANGES STATE, CONTACT ACTION, IN DIRECTION OF ARROW, RETARDED ON DE-ENERGIZATION		SOFTWARE LINK

ABBREVIATIONS

A	AMPERE (AMPS), ANALOG	(N)	NEW
AC	ALTERNATING CURRENT/ AIR CONDITIONING	N	NEUTRAL
AF	AMPS-FRAME	NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
AIC	AVAILABLE INTERRUPTING CURRENT	NC	NORMALLY CLOSED
AM	AMP METER	NF	NON-FUSED
AS	AMP SWITCH	NL	NIGHT LIGHT
AT	AMPS-TRIP	NO	NORMALLY OPEN
ATS	AUTOMATIC TRANSFER SWITCH	N/P	NAMEPLATE
AUTO	AUTOMATIC		
AWG	AMERICAN WIRE GAUGE	OC	OPEN/CLOSE (STATUS)
BKR	BREAKER	P	POLE
BPS	BOOSTER PUMP STATION	PB	PULL BOX
BSC	BARE STRANDED COPPER	PC	PHOTO CELL
C	CONDUIT	PH	PHASE
CB	CIRCUIT BREAKER	PNL	PANEL
CID	CURRENT INDICATING TRANSMITTER	PM	POWER MONITOR
CKT	CIRCUIT	RECEPT	RECEPTACLE
CO	CONDUIT ONLY	RTD	RESISTANCE TEMPERATURE DEVICE
CP	CONTROL PANEL	RVAT	REDUCED VOLTAGE AUTO XFMR STARTER
CPT	CURRENT POTENTIAL TRANSFORMER		
CR	CONTROL RELAY	S	STAINLESS STEEL
CT	CURRENT TRANSFORMER	SW	SWITCH
CU	COPPER	SWBD	SWITCHBOARD
CIDI	CLASS I DIVISION 1	SWGR	SWITCHGEAR
CIDII	CLASS I DIVISION 2		
DC	DISCONNECT	TB	TERMINAL BLOCK
DCS	DISTRIBUTIVE CONTROL SYSTEM	TD	TIME DELAY
ETM	ELAPSED TIME METER	TDI	TIME DELAY IMMIGRATION
(E),EXST	EXISTING	TEMP	TEMPERATURE
FBK	FEEDER BREAKER	TOU	TIME OF USE
FLA	FILL LOAD AMPS	TSP	TWISTED SHIELDED PAIR
FVNR	FULL VOLTAGE NON-REVERSING	TST	TWISTED SHIELDED TRIAD
G,GND	GROUND	TT	THERMOSTAT
GFI	GROUND FAULT INTERRUPTER	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
GIW	GROUND FAULT INTERRUPTER, WEATHER PROOF	UG	UNDERGROUND
HID	HIGH INTENSITY DISCHARGE (LAMP)	UON	UNLESS OTHERWISE NOTED
HMI	HUMAN MACHINE INTERFACE	UPS	UNINTERRUPTIBLE POWER SUPPLY
HPS	HIGH PRESSURE SODIUM (LAMP)	V	VOLT
HTR	HEATER	VA	VOLT AMPERES
HZ	HERTZ	VAC	VOLTS AC
I/O	INPUT/OUTPUT	VDC	VOLTS DC
J	JUNCTION BOX	VFD	VARIABLE FREQUENCY DRIVE
K	KIRK KEY INTERLOCK	VS	VOLTAGE SWITCH
KCM	THOUSAND CIRCULAR MILS (OR MCM)	W	WATTS, WIRE
KV	KILOVOLT	WP	WEATHERPROOF
KVA	KILOVOLT AMPERES	XFMR	TRANSFORMER
L	LINE		
LCP	LOCAL CONTROL PANEL		
LOS	LOCK-OUT STOP PUSH BUTTON		
LTG	LIGHTING		
MA	MILLIAMPERE		
MBK	MAIN BREAKER		
MCC	MOTOR CONTROL CENTER		
MCP	MOTOR CIRCUIT PROTECTION		
MH	MANHOLE		
MIC	MANUFACTURER'S INTERCONNECTING CABLE		
MOV	MOTOR OPERATED VALVE		
MS	MAGNETIC STARTER		
MTS	MANUAL TRANSFER SWITCH		

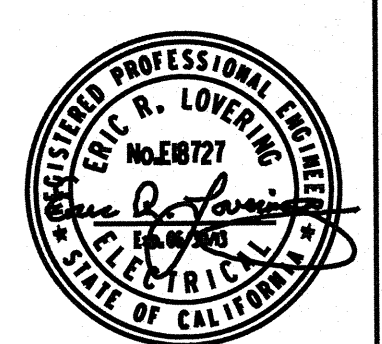
ELECTRICAL PLAN LEGEND

	POLE MOUNTED LIGHTING FIXTURE WITH CONCRETE PULLBOX AT BASE OF POLE		SINGLE POLE TOGGLE TYPE IPH MOTOR SWITCH		TELEPHONE OUTLET
	SURFACE OR PENDENT MOUNTED FIXTURE		GROUND TYPE DUPLEX RECEPTACLE		VARIABLE FREQUENCY DRIVE
	PENDENT OR CEILING MOUNTED FLUORESCENT FIXTURE		MOTOR		CONDUIT NUMBER (P=POWER, C=CONTROL, I=INSTRUMENTATION)
	1' X 4' LIGHT FIXTURE		LOCAL CONTROL STATION (LCS)		PANEL BOARD
	1' X 4' EMERGENCY LIGHT FIXTURE		EXPOSED ELECTRICAL CONDUIT		GROUND ROD AND WELL, 3/4" X 10'-0" LENGTH COPPERCLAD STEEL
	WALL MOUNTED OCCUPANCY SENSOR		CONDUIT IN SLAB OR UNDERGROUND		DISCONNECT SWITCH 3P
	EMERGENCY FIXTURE WITH BATTERY PACK		HOMERUN TO PANEL A CIRCUIT 1 & 3		FIELD MOUNTED INSTRUMENT
	WALL MOUNTED FIXTURE		GROUND WIRE, SIZE AS NOTED		SPEAKER/HORN
	STANCHION MOUNTED FIXTURE		HASH MARKS DENOTE QUANTITY OF CONDUCTORS, *12AWG UON		GENERATOR RECEPTACLE
	EXIT SIGN		ELECTRICAL CONDUIT RUN-UP		PHOTOCELL
	EXPLOSION PROOF CONDUIT SEAL		ELECTRICAL CONDUIT RUN-DOWN		
	SINGLE POLE TOGGLE TYPE LIGHTING SWITCH		WATER TIGHT FLEXIBLE CONDUIT		

CONSULTANT

LEE & RO, Inc.
San Diego, California

SCALE: HORIZONTAL, VERTICAL



WARNING

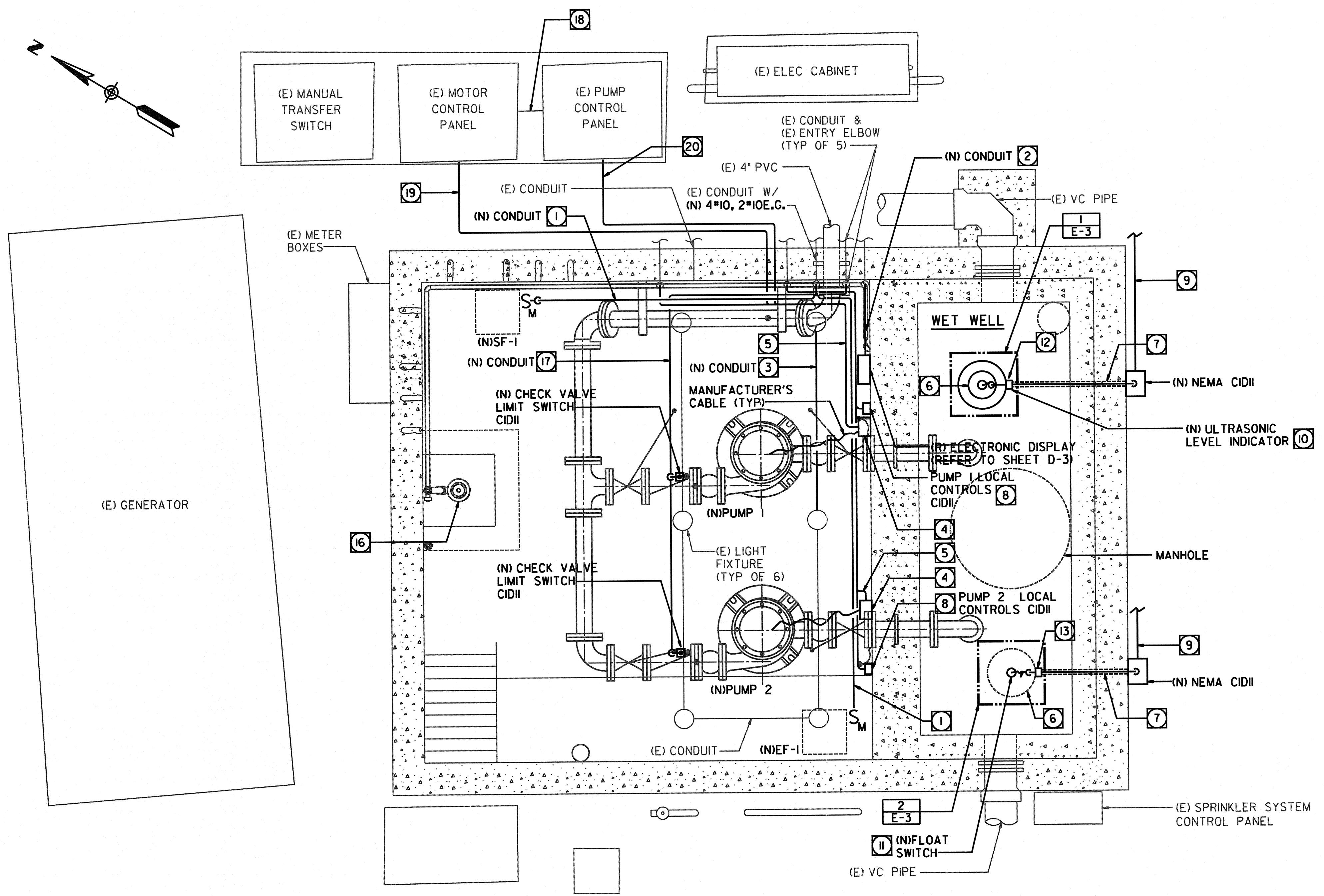
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

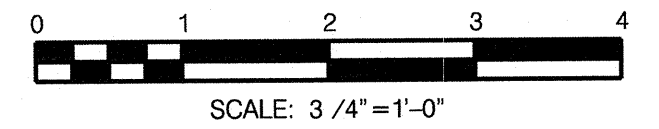
TEMP BMP CS/SWP:	LOW	SPEC. NO.	5717	E-1
SEWER PUMP STATION 13 IMPROVEMENTS				
ELECTRICAL LEGENDS, SYMBOLS & ABBREVIATIONS				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 20 OF 22 SHEETS			WBS B-00476	
APPROVED FOR CITY ENGINEER	DATE	SUBMITTED BY		
<i>Hoc-Acay</i>	2-21-13	DAVID MANELA ASSOCIATE ENGINEER		
DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LRI			
PROJECT ENGINEER SILVIA RENDON				
230-1689 LAMBERT COORDINATE				
1870-6250 CCS83 COORDINATE				
CONTRACTOR	DATE STARTED	37021- 20 -D		
INSPECTOR	DATE COMPLETED			

NOTES:

- 1 NEW 1" CONDUIT, FROM EXISTING ENTRY ELBOW WITH NEW 2"10, 1"10E.G TO (E) PUMP CONTROL PANEL. REUSE EXISTING CIRCUIT ASSOCIATED WITH DEMOLISHED FAN. REFER TO D-3, AND EXISTING TESCO DRAWING HZ6437104.
- 2 (2) NEW 1" CONDUITS, FROM EXISTING ENTRY ELBOWS. EXTEND EXISTING CONDUCTORS TO RELOCATED ELECTRONIC DISPLAY. REFER TO SHEET D-3.
- 3 NEW 3/4" CONDUIT, FROM EXISTING LIGHTING FIXTURE TO EXISTING LIGHTING FIXTURE. PROVIDE 4#12 TO EXISTING CONDUCTORS INSTALLED BETWEEN EXISTING FIXTURES.
- 4 NEW JUNCTION BOX WITH NEW TERMINAL BLOCK FOR POWER CABLE TO MANUFACTURER CABLE TRANSITION.
- 5 (2) NEW 1" CONDUIT FOR POWER AND CONTROL. POWER CIRCUIT: FROM EXISTING ENTRY ELBOW TO NEW ASSOCIATED PUMP MOTOR. REFER TO SINGLE LINE ON E-3 FOR FEEDER INFORMATION. REUSE EXISTING CIRCUIT ASSOCIATED WITH DEMOLISHED PUMP MOTOR. REFER TO D-3. CONTROL: 6#14 (STATOR & OIL MOISTURE, & WINDING TERMINAL SWITCHES).
- 6 NEW ACCESS CAN WITH COVER.
- 7 EMBEDDED 1" CONDUIT IN NEW CONCRETE ROOF.
- 8 EXTEND EXISTING CONTROL WIRING FOR NEW E-STOP, START, AND STOP PUSH BUTTON LOCAL CONTROLS. EXISTING CABLES LOCATED IN SAME CONDUIT AS PUMP 2 FEEDER. REFER TO D-3.
- 9 INTERCEPT EXISTING CONDUITS TO THE JUNCTION BOX, SEE SHEET D-3.
- 10 NEW ULTRASONIC TRANSDUCER IN WET WELL. NEW MANUFACTURER CABLE FROM NEW TRANSDUCER TO (E) TRANSMITTER IN (E) ELECTRICAL CABINET VIA EXISTING UNDERGROUND CONDUIT AND NEW RACEWAYS.
- 11 (1) NEW FLOAT SWITCH WITH NEW MANUFACTURER CABLE. CONNECT NEW MANUFACTURER CABLE TO NEW TERMINAL BOX. NEW 2#14 CONDUCTOR WIRES FROM TERMINAL BOX TO (E) CONTROL PANEL. CONNECT INDIVIDUAL FLOAT SWITCH TO ASSOCIATED FLOAT SWITCH (E) CONTACTOR/RELAY.
- 12 NEW SST CIDIINEMA JUNCTION BOX.
- 13 NEW SST CIDIINEMA TERMINAL BOX.
- 14 ALL ELECTRICAL COMPONENTS AND EQUIPMENT WITHIN THE DRY WELL SHALL BE CIDIIL.
- 15 CONTRACTOR SHALL REFER TO EXISTING TESCO VENDOR DRAWING SHEETS 26437 FOR THE EXISTING CONTROL, SIGNAL, POWER ROUTING AND TERMINAL POINTS.
- 16 REMOVED EXISTING SUMP PUMP AND PROTECT IN PLACE EXISTING CONDUCTORS. RECONNECT EXISTING CONDUCTORS TO NEW SUMP PUMP.
- 17 NEW 1" C-6#14 FROM EXISTING FROM ELBOW FROM (E) PUMP CONTROL PANEL TO ASSOCIATED CHECK VALVE LIMIT SWITCH.
- 18 USE EXISTING CONDUIT. PROVIDE 4#14 FOR A17 AND A18 ANNUNCIATOR, SEE DETAIL 4/E-13.
- 19 1" CONDUIT, 8#14, (STATOR MOISTURE AND WINDING TERMINAL SWITCHES).
- 20 1" CONDUIT, 4#14, (OIL TRANSFER MOISTURE).



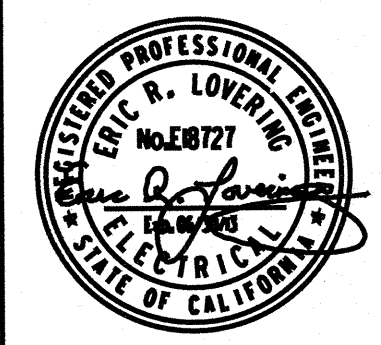
PLAN
SCALE: 3/4" = 1'-0"



CONSULTANT

LEE & RO, Inc.
San Diego, California

SCALE: HORIZONTAL
VERTICAL

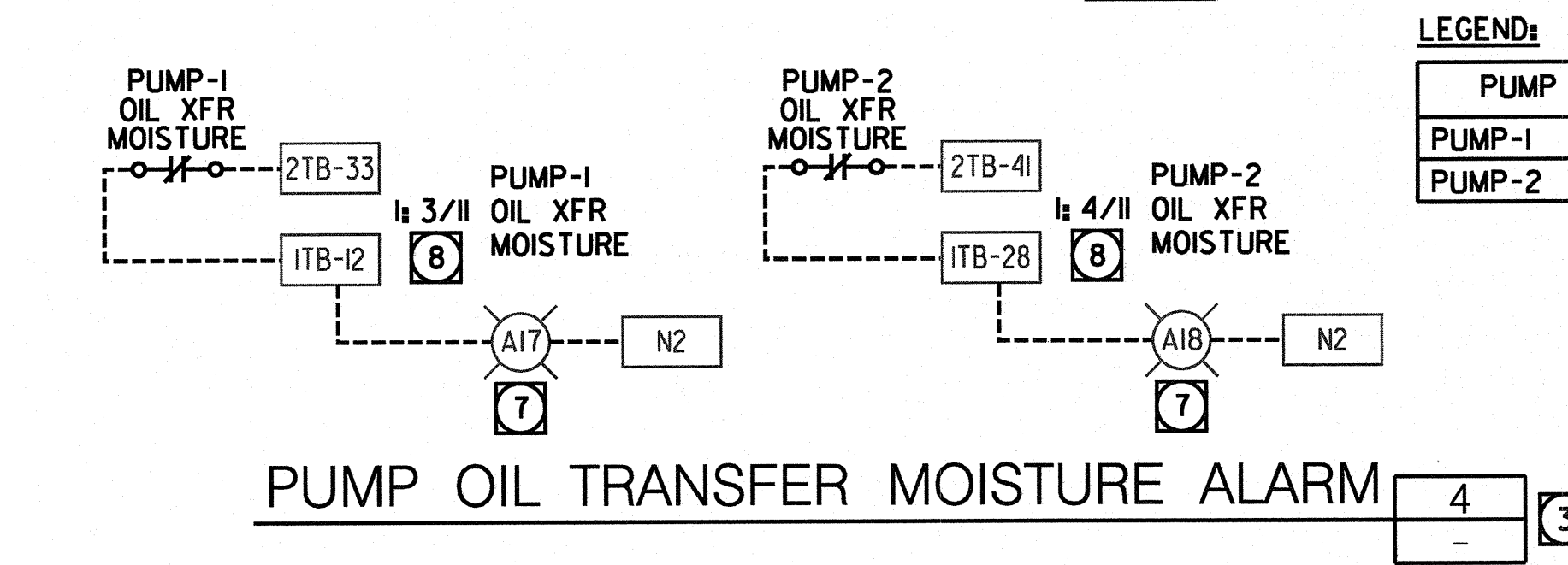
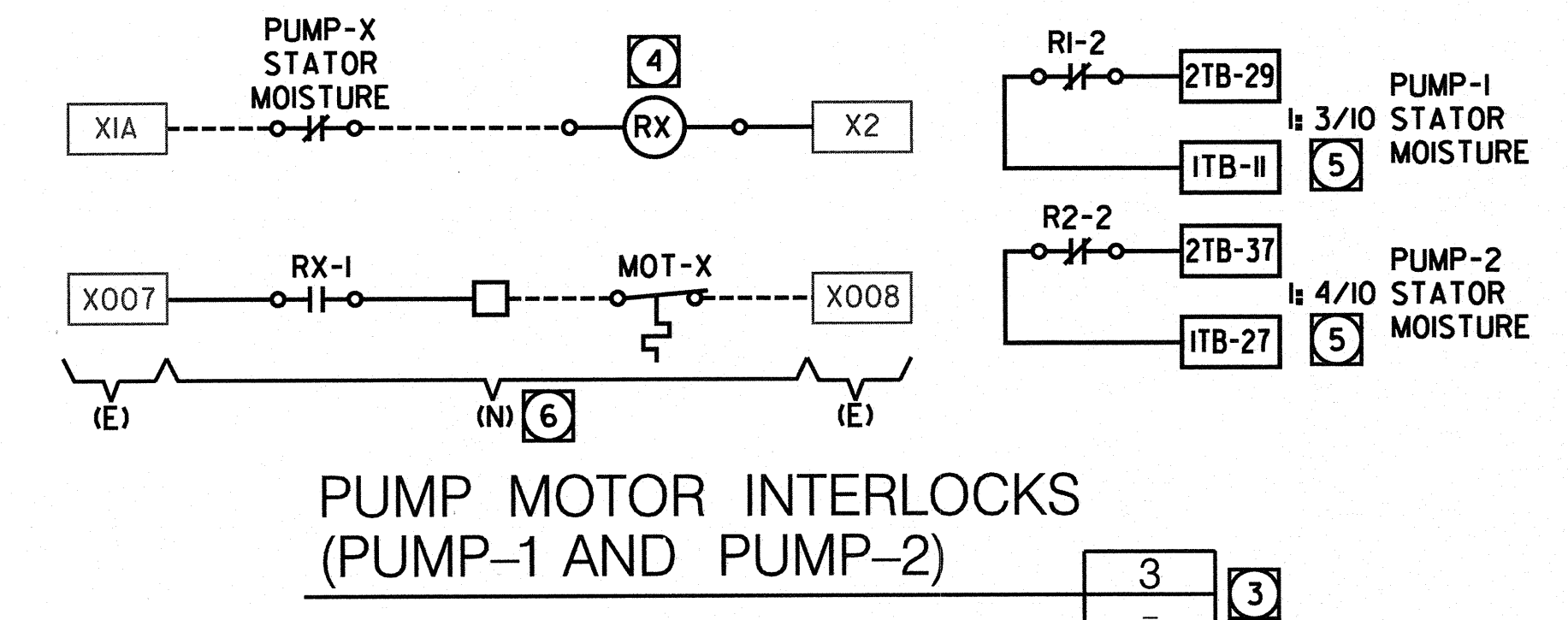
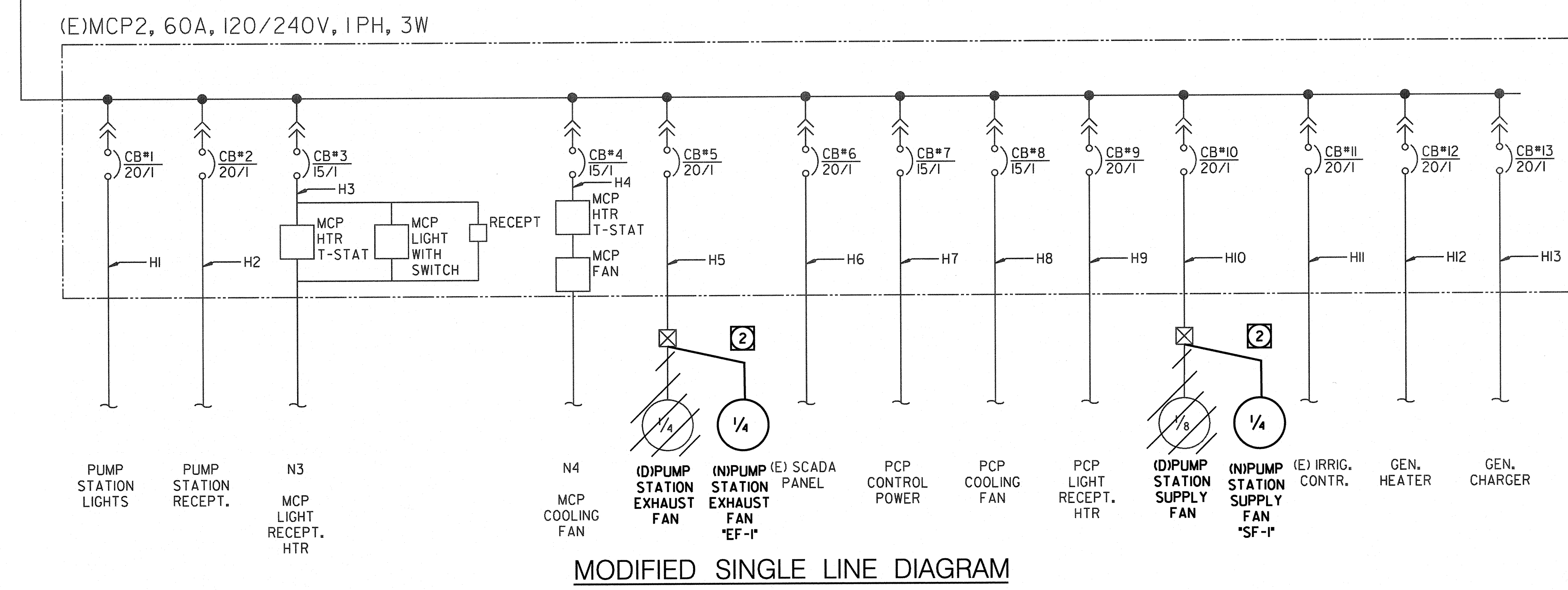
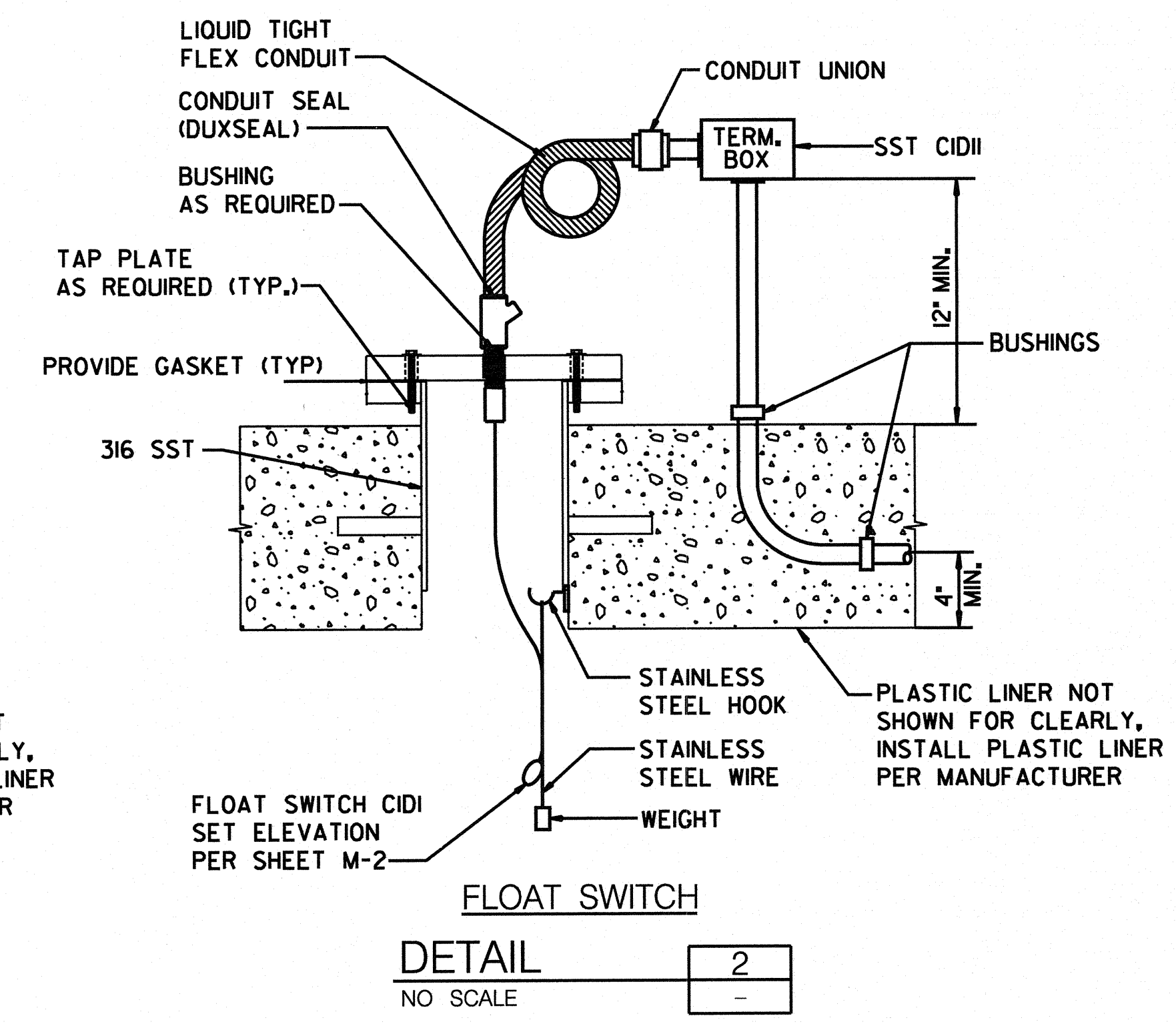
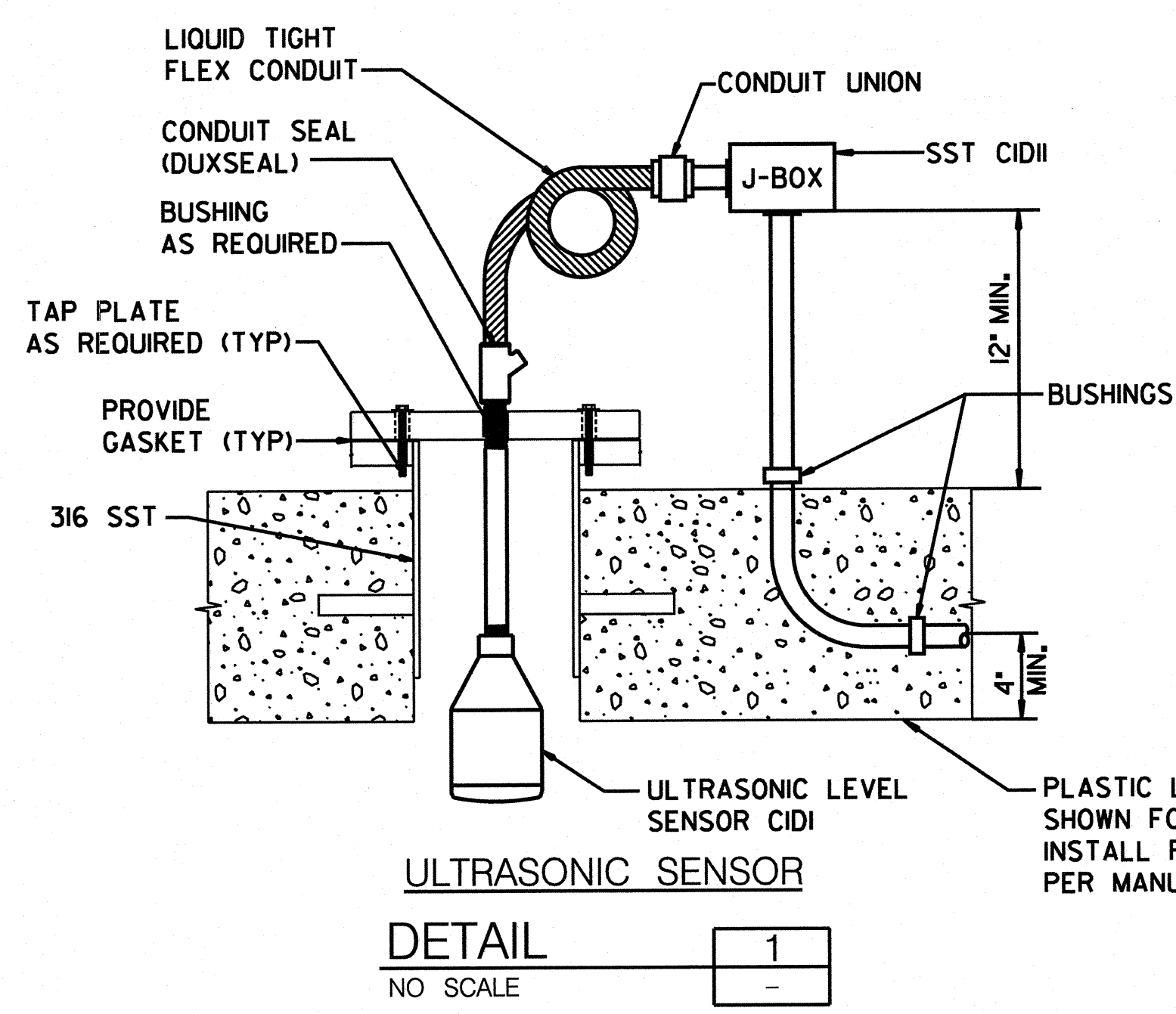
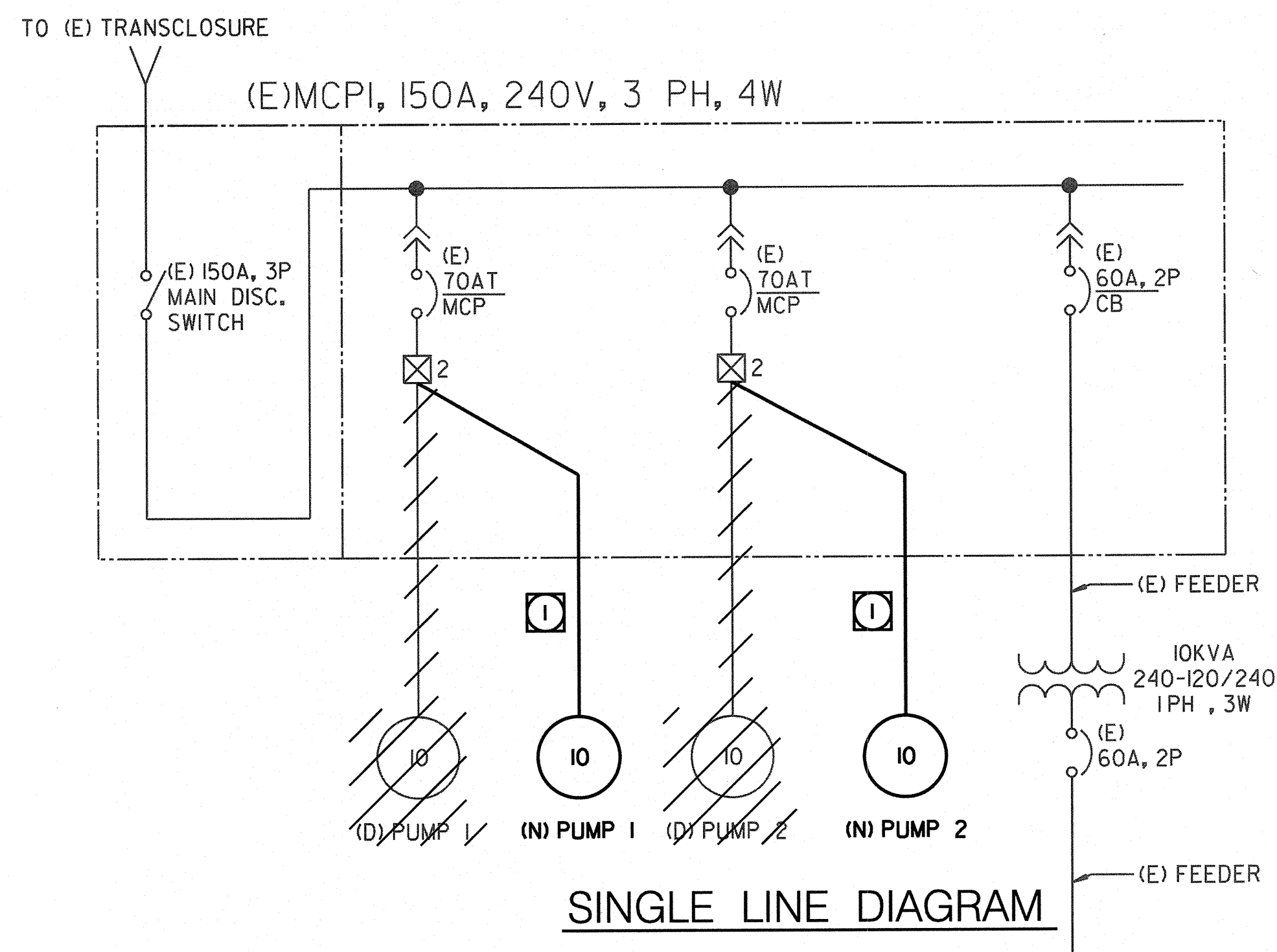


WARNING

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TEMP BMP CS/SWP:	LOW	SPEC. NO.	5717	E-2
SEWER PUMP STATION 13 IMPROVEMENTS				
ELECTRICAL IMPROVEMENTS WET WELL PLAN				
CITY OF SAN DIEGO, CALIFORNIA ENGINEERING AND CAPITAL PROJECTS DEPARTMENT SHEET 21 OF 22 SHEETS			WBS B-00476	
APPROVED FOR CITY ENGINEER	DATE	SUBMITTED BY		
<i>Hossein Arar</i>	2.21.13	DAVID MANELA		
DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	LRI			
PROJECT ENGINEER			SILVIA RENDON	
LAMBERT COORDINATE			230-1689	
CCS83 COORDINATE			1870-6250	
CONTRACTOR			DATE STARTED	
INSPECTOR			DATE COMPLETED	
			37021- 21-D	



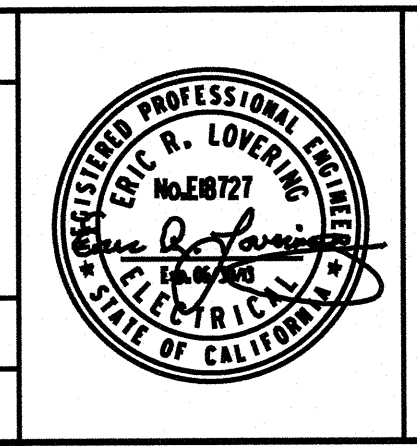
LEGEND:

PUMP	X
PUMP-1	1
PUMP-2	2

- NOTES:**
- ① (N) POWER: 3*8, 1*10 E.G. (REFER TO SHEET E-2 FOR ROUTING INFORMATION)
 - ② 2*10, 1*10 E.G. (REFER TO SHEET E-2 FOR ROUTING INFORMATION)
 - ③ SEE MUNICIPAL SCADA UPGRADES-PACKAGE 'A', 26437-D FOR EXISTING INFORMATION.
 - ④ USE (E) RELAYS, 'SPR' IN (E) PANEL.
 - ⑤ PROGRAM ALARM TO EXISTING ALLEN BRADLEY I747 PLC. ADD IN SERIES TO EXISTING PUMP FAILURE LOGIC.
 - ⑥ REMOVE (E) JUMPER BETWEEN TB'S X007 AND X008.
 - ⑦ ADD (N) NAMEPLATE LABEL TO (E) ANNUNCIATOR.
 - ⑧ TB'S ARE EXISTING. ADD ALARM INDICATION LOGIC TO EXISTING ALLEN-BRADLEY I747 PLC.

CONSULTANT

LEE & RO, Inc.
 San Diego, California
 SCALE: HORIZONTAL, VERTICAL



WARNING
 0 1
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TEMP BMP CS/SWP: LOW SPEC. NO. 5717 **E-3**

SEWER PUMP STATION 13 IMPROVEMENTS
 MODIFIED SINGLE LINE DIAGRAM AND DETAILS

CITY OF SAN DIEGO, CALIFORNIA
 ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
 SHEET 22 OF 22 SHEETS

APPROVED: *David Maneca* 2.21.13 DATE
 FOR CITY ENGINEER

DESCRIPTION BY APPROVED DATE FILMED
 ORIGINAL LRI

WBS: B-00476
 SUBMITTED BY: *DAVID MANECA*
 ASSOCIATE ENGINEER
 PROJECT ENGINEER: *SILVIA REMON*
 230-1689
 LAMBERT COORDINATE
 1870-6250
 CCS83 COORDINATE
 CONTRACTOR: DATE STARTED: 37021-22-D
 INSPECTOR: DATE COMPLETED: