

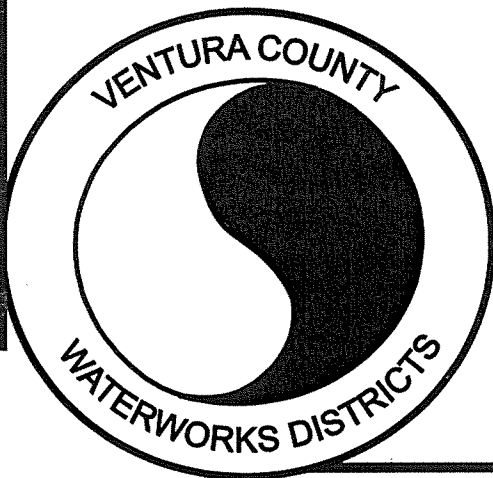
VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

PLANS & SPECIFICATIONS
FOR

ROSELAND BOOSTER PUMP STATION

SPECIFICATION NO. **WW09-06**
(FOR PROJECT IDENTIFICATION)

PROJECT NO. **31886**
(FOR COST ACCOUNTING)



PUBLIC WORKS AGENCY
WATER AND SANITATION DEPT.
VENTURA, CALIFORNIA

VENTURA COUNTY WATERWORKS DISTRICT NO. 1

NOTICE INVITING BIDS, PROPOSAL FORM & SPECIFICATIONS FOR

Project Name: **ROSELAND BOOSTER PUMP STATION**

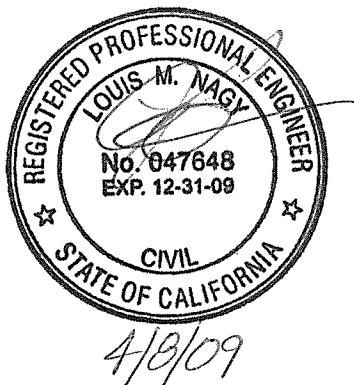
Location: Roseland Avenue, unincorporated area of Ventura County, California,
Thomas Guide page #476 E-2

Specification No: **WW 09-06**

Cost Accounting Project No. **31886**

Designed By: Water Resource Engineering Associates Checked By:

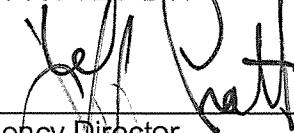
Project Manager: Eric Keller



RECOMMENDED BY:


Director
Water and Sanitation Department
4/15/09

APPROVED BY:


Agency Director
Public Works Agency

BIDS WILL BE RECEIVED UNTIL 2:00 P.M.

May 28, 2009

at County Surveyor's Public Counter
Third Floor, Hall of Administration
800 South Victoria Avenue
Ventura, California 93009-1670

Construction bidding documents, including plans, specifications, addenda and any supplementary documents are now available on the Ventura County Web Site.

Printed copies may also be purchased at the Ventura County Hall of Administration, 800 South Victoria Ave, Ventura, CA 93009-1670 (Surveyor's Public Counter on 3rd floor).

VENTURA COUNTY WATERWORKS DISTRICT NO.1

NOTICE INVITING FORMAL BIDS

Sealed bids will be received in the bid box at the County Surveyor's Public Counter, 3rd Floor, Administration Building, 800 South Victoria Avenue, Ventura, California 93009-1670, until **2:00 p.m.** on **May 28, 2009**, and afterwards publicly opened, for **ROSELAND BOOSTER PUMP STATION**, for Specification No **WW09-06**, which consists of **construction of a booster pump station consisting of four pumps, Piping and electrical work including a stand by generator.**

The estimated cost of construction is \$ **550,000.00**

The plans, specifications and proposal forms for this project are filed in the office of the Ventura County Surveyor and are, by reference, made a part of this Notice. Construction bidding documents, including plans, specifications, addenda and any supplementary documents are now available on the Ventura County Web Site at :

<http://countyofventura.org> then click **Construction Bids**.

where the documents may be viewed, downloaded and printed.

Printed copies of the document can be purchased at most commercial printing companies that have internet access.

Printed copies may also be purchased at the Ventura County Hall of Administration, 800 South Victoria Ave, Ventura, CA 93009-1670 (Surveyor's Public Counter on 3rd floor).

A **List of Plan Holders** is available on the **Website** shown above.

An abstract of bids received will be available at the same web site under **Recent Bid Results**.

For **Technical Questions** concerning bidding documents, **Fax 805-677-8762**, or **Voice 805-654-3805**.

Bids must be submitted on the proposal form furnished with said documents. Each bid must be accompanied by a bid guarantee in the amount of not less than 10% of the amount bid, **PAYABLE TO THE Ventura County Waterworks District No. 1** and guaranteeing that the bidder will enter into a contract in accordance with the terms of the bidding documents if award is made. The bid guarantee shall be in one of the following forms: a bid bond written by an admitted surety insurer on the form included with the Proposal form, a cashier's check drawn by a National bank, a check certified by a National bank or cash. An electronically transmitted copy (FAX) of the bid bond form included in the Proposal form may be used, but the form must have the original signatures of the principal and surety. A FAX of the completed bond will not be accepted.

Bidders must have a **Class A** California Contractors license, and will be required to furnish a Performance Bond and a Payment Bond, each in the amount of 100% of the contract price.

In accordance with Section 22300 of the Public Contract Code, securities may be substituted for funds withheld.

Bidders, contractors and other interested parties can also obtain printed copies of the wage rates pertaining to specific current projects at the Ventura County Surveyor's public counter.

The contractor must post copies of the prevailing wage schedule at each job site.

California general prevailing wage rates for construction can be obtained from the following Web site: <http://www.dir.ca.gov/DLSR/PWD/index.htm>.

NOTICE TO BIDDERS, SUBCONTRACTORS AND SUPPLIERS

SOURCES OF INFORMATION

DURING BIDDING PERIOD

PLAN HOLDERS LIST & OTHER INFORMATION IS AVAILABLE ON THE INTERNET AT:

<http://www.countyofventura.org>

In Online Services, click **Construction Bids**.

NUMBER OF ADDENDA ISSUED:

Phone: (805) 654-2068

TECHNICAL QUESTIONS on plans and specifications:

Please call early in the bidding period to discuss problems that may require an addendum.

FAX: (805) 677-8762

Phone: (805) 654-3805

and indicate bid question.

Please do not call other staff members or consultant.

Note that our consultants are directed to refer all calls to the numbers listed.

DIRECTIONS TO VENTURA COUNTY GOVERNMENT CENTER

From US101 (Ventura Freeway), take Victoria Ave off ramp, north (towards mountains) about one mile to Telephone Road, then right on Telephone Road one block and turn left at Lark St. into the Government center parking lot.

From Cal126 (Santa Paula Freeway), take Victoria Ave off ramp, south (away from mountains) about one mile to Telephone Road, then left on Telephone Road 1 block and turn left at Lark St. into the Government center parking lot.

Go to the Hall of Administration (building nearest the corner of Victoria & Telephone) and to the Surveyors counter on the third floor (at the top of the escalator) where plans can be purchased and bids placed in the **bid box**.

ONLY AFTER BID OPENING

BID RESULTS are available on the internet site shown above, usually within 24 hours after bids are opened and Include abstracts of unit prices, totals of all bids & subcontractor's list for low & 2nd bidder.

LOW BIDDER - ONLY AFTER AWARD OF CONTRACT

CONTRACT PREPARATION (Low Bidder only)

Phone: (805) 654-3984

FAX: (805) 677-8762

ALL QUESTIONS concerning project

Project Manager: Eric Keller
(805) 378-3025

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**PROPOSAL
FOR**

**VENTURA COUNTY WATERWORKS DISTRICT NO. 1
ROSELAND BOOSTER PUMP STATION**

**LOCATED IN
VENTURA COUNTY, CALIFORNIA**

MAKE BID GUARANTEE TO **VENTURA COUNTY WATERWORKS DISTRICT NO. 1.**

USE FORM PROVIDED (SEE PARAGRAPH 9, INSTRUCTION TO BIDDERS).

SPECIFICATION NO. **WW09-06** INCLUDING **16** SHEETS OF PLANS

BIDS WILL BE RECEIVED ON MAY 28, 2009 AT **2:00 P.M.**

AGENCY IS ALLOWED **90** DAYS TO AWARD A CONTRACT (SEE SECTION 2-1.1).

THE STARTING DATE OF CONTRACT WILL BE **28** CALENDAR DAYS AFTER AWARD OF CONTRACT (SEE SECTION 6-7.4).

COMPLETION TIME IS **125** WORKING DAYS (SEE SECTION 6-7).

LIQUIDATED DAMAGES ARE \$500.00 PER CALENDAR DAY (SEE SECTION 6-9).

CONTRACTOR'S LICENSE CLASSIFICATION REQUIRED IS **CLASS A.**

LIABILITY INSURANCE CLASS REQUIRED PER SECTION 7-4 IS **L-B.**

FEDERAL-AID CONTRACT PROVISIONS ARE **NOT** INCLUDED IN THESE SPECIFICATIONS.

NON-MANDATORY PREBID MEETING: 10:00 AM on 05/12/09 at location. (Section 1000-1.04)

THE NUMBER OF PAGES IN THIS PROPOSAL IS 8.

BIDDER SHALL COMPLETE

NAME: _____

MAILING ADDRESS: _____

CITY: _____ STATE: _____ ZIP CODE: _____

TELEPHONE NUMBER: (____) _____ - _____ FAX No. (____) _____ - _____

eMAIL ADDRESS: _____

PROPOSAL
Instruction to Bidders

1. **LICENSING OF BIDDER.** Before submitting bids, bidders shall be licensed in accordance with the provisions of Sections 7000 through 7145 of the Business and Professions Code of the State of California in the classification required for the work bid on. The bidder's license number, classification, and expiration date shall be inserted on page 7 of the proposal form. The bidder's name shall correspond in all respects with the name shown on the license. License numbers and names are checked with the State.
2. **SITE INSPECTION.** Personally visit the worksite before submitting your bid to ascertain the existence of any surface or subsurface conditions affecting the cost of the work.
3. **MODIFICATION AND INTERPRETATION.** Carefully review the plans and specifications for any errors, omissions, or ambiguities. If you discover any, notify the Engineering Services Department of the Agency far enough in advance of the bid opening to allow time for the issuance of appropriate written addenda. Written addenda shall be the sole means for modifying the plans and/or specifications prior to the bid opening. The Agency shall not be bound by oral communications purportedly modifying or interpreting the plans and/or specifications regardless of when or by whom such oral communications are made and you should not rely upon such oral communications in preparing your bid.
4. **BID ITEMS.** State in figures the unit prices, lump sum prices and extensions as indicated which shall be the prices for which you propose to supply all materials and services and perform all work required by the plans and specifications. All items described are to be construed as complete and in place. Include in the bid amount for items listed on the proposal form the cost of performing all work shown on the plans or required by the specifications for which a specific bid item is not provided. Bid on all items listed under Schedule of Work and Prices unless otherwise indicated in the proposal form.
5. **SIGNING OF BID.** Fill in all indicated blanks in this proposal using typewriter or ink and sign with ink. Proposals signed by an agent other than an owner, partner or corporate officer shall be accompanied by a power-of-attorney. Proposal form must be dated.
6. **NON-COLLUSION AFFIDAVIT.** The non-collusion affidavit required by Public Contract Code 7106 is included on page 5 of this Proposal.
7. **BID FORM NOT TO BE ALTERED.** Do not change the wording of this proposal. Any additions, deletions, conditions, limitations or provisions by the bidder will render the proposal irregular and may cause its rejection.
8. **CORRECTING BID.** Explain over your signature any erasures or deletions of information entered by the bidder in this proposal. Modifications submitted separately from this form will not be accepted

9. **BID GUARANTEE.** Each bid must be accompanied by a bid guarantee in the amount of not less than 10% of the amount bid and guaranteeing that the bidder will enter into a contract in accordance with the terms of the bidding documents if award is made to him. The bid guarantee shall be in one of the following forms: A bid bond written by an admitted surety insurer on the form included with the proposal form, a cashier's check drawn by a national bank, a check certified by a national bank or cash. An electronically transmitted copy (FAX) of the bid bond form included in the proposal form may be used, but the form must have the original signatures of the principal and surety. A FAX of the completed bond will not be accepted. Note: Performance and Payment Bonds are required from the bidder to whom a contract is awarded. See specifications Subsection 2-4 for contract bond requirements including limitations on the sureties that may issue the bonds.

10. **SUBMITTING BID.** Submit your bid on one copy only of this proposal form, with addenda acknowledged by inserting the addenda numbers on page 7 of this proposal and with bid guarantee attached, in a sealed envelope addressed to: Director of Public Works, County Surveyor's Public Counter, 3rd Floor - Hall of Administration, 800 South Victoria Avenue, Ventura, California 93009. To park, go east from Victoria Ave on Telephone Rd. one block to Lark St and turn north into the Government Center continue to the first public parking lot. The envelope must show the project title and the bidder's name and address. Do not return plans and specifications, or enclose other documents in this bid envelope. Late bids will not be opened or considered. Bids must be on this form.

Notwithstanding anything stated, directed or indicated in the other bidding documents, the only items to be included with this proposal are:

1. This proposal form, signed and dated with addenda acknowledged.
2. The bid bond with original signatures of surety representative and contractor, or other bid guarantee as specified in 9 above.
3. Subcontractors and off-job fabricators list completed in accordance with Public Contract Code Section 4104.

IMPORTANT: Proposals received that are not signed will not be considered.

11. **TIME OF BID CLOSURE.** The bid box will be closed promptly at the time specified on the first sheet of the proposal form. The person opening bids will not accept bids that are not in the bid box at closing time. The time used is local standard time as obtained from www.time.gov. Potential bidders should note that clocks in the building may not be set to the correct time and should not be relied upon.

12. **DELIVERY OF BID.** Bids delivered in person must be placed in the bid box at the Surveyor's Public Counter which is located at the head of the escalator on the third floor of the Ventura County Administration Building, 800 South Victoria Avenue, Ventura, California 93009. The Administration Building is on the corner of Victoria Avenue and Telephone Road and is accessible from the Ventura Freeway (U.S. 101) by taking the Victoria Avenue off ramp and proceeding north on Victoria Avenue about one mile to Telephone Road. Access from the Santa Paula Freeway (Cal. 126) is by the Victoria Avenue off ramp, then south about 1/4 mile to Telephone Road. Access to the Administration Building parking lot is from Telephone Road. Bids must be placed in the bid box prior to the hour and date designated on Page 1 of this proposal.

13. MAILED BIDS (Including Express Delivery). Bids received in the County's Mail Room by 8 a.m. on the bid opening date will be considered to have been placed in the bid box on time, whether or not actually delivered to the bid box on time. U. S. Postal Service Special delivery, Registered and Certified mail may slow actual receipt of bids. Bidder is responsible for sending bid early enough to insure delivery to the County on time.

All bids, not placed directly in the bid box, must be prominently marked in large letters on the outside of the delivery envelope "BID DOCUMENTS" and show the Spec no.

Telegraphic bids or modifications will not be considered.

14. WITHDRAWAL OF PROPOSAL. Proposals may be withdrawn by the bidder prior to the time stated for opening bids upon written request, signed by the bidder or his authorized agent and submitted in the same manner as a bid. To retrieve a bid from the bid box may take 10 or more minutes as it requires a written request to withdraw the bid, the positive identification of the person requesting the withdrawal, and the opening of the bid box.

15. ERRORS. Bidder will not be released on account of errors. Where a discrepancy occurs between unit prices and totals, the unit price shall govern in computing the total. If a unit price is omitted, it will be determined from the item total, if entered. If both the unit price and line total for any item are omitted, the bid will be considered non-responsive in accordance with Paragraph 4 above. If the total Bid Price is not equal to the sum of the Item Totals (as corrected) the Total Bid Price will be corrected. If no monetary symbol (\$) or (¢) is entered with a unit price, lump sum or extension, a dollar sign will be assumed to be the bidder's intent.

PROPOSAL

I, the person whose signature is affixed to page 7 of this proposal, submit this proposal to the Board of Supervisors of the County of Ventura and hereby declare:

1. That the bidder has read this proposal and has abided by and agrees to the conditions herein and has carefully examined the project plans and read the specifications and does hereby propose to furnish all materials and do all the work required to complete the work in accordance with the plans and specifications for the unit prices or lump sums named in the Schedule of Work and Prices.

2. That the addenda indicated on page 7 of this proposal are acknowledged.

3. That the bidder, as Principal, acknowledges himself as being bound by the attached bond or other acceptable bid guarantee.

4. That the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Contractor's Name _____

PROPOSAL

Contractor's Name _____

List of Subcontractors and Off-Job Fabricators

Listing shall comply with the provisions of California Public Contract Code, Section 4104.

Name of Subcontractor or Off-Job Fabricator	Business Address	Items of Work

If more space is needed, attach additional sheets.

Public Contract Code Section 4104 provides that bidders must list:

- (a)(1) The name and location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half percent of one percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater.
- (2) [Section not implemented by Agency]
- (b) The portion of the work that will be done by each subcontractor under this act. The prime contractor shall list only one subcontractor for each portion as is defined by the prime contractor in his or her bid."

NOTE: Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract Price. See specifications section 2-3.2 for exceptions.

PROPOSAL**Schedule of work and prices for: VENTURA COUNTY WATERWORKS DISTRICT NO. 1
ROSELAND BOOSTER PUMP STATION**

Item No.	Approx Quantity	Item Description	Payment Reference	Unit-Prices (In Figures)	Item Total (In Figures)
1A	LS	Site Work	1001-4		
1B	LS	Trench Safety Methods	1000-1.29		
2	LS	Pumps, Motors, and Appurtenances. Includes three (3) 7.5 HP Duty Pumps and one (1) 40 HP High-Flow Pump	1002-5		
3	LS	Piping, Valves, and Appurtenances	1003-4		
4	LS	Painting and Coating	1004-4		
5	LS	Disinfection and Testing	1005-4		
6	LS	Package Engine Generator System	1006-2		
7A	LS	Instrumentation	1007-4		
7B	LS	Remote Terminal Unit (RTU) – by Systems Integrated	1007-4		
8	LS	Electrical and Controls	1008-25		
9	Lump Sum	Release on Contract	9-4		\$1.00
		Total Amount Bid			

The following addenda are acknowledged:

(Bidder must fill in number and date of each addenda or may enter the word "None " if appropriate)

Call (805) 654-2068 to determine addenda that have been issued.

Number	Dated

I make the above proposal and certify or declare under penalty of perjury under the laws of the State of California that the statements made on Page 5 of this Proposal, and below my signature, are true and correct.

Dated

Signature

At

(City and State)

Position

(Sole Owner, Partner, President, etc.)

License No. _____

Company Name _____

License Classification _____

Type of Organization _____

(Individual, Partnership, Corp.)

License Expiration Date _____

Enter }
 Name & }
 Address }
 of Bonding }
 Company }

BID BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____, Principal,
 and _____

_____, Surety, are held and firmly
 bound unto

AGENCY NAME Obligee,
 in the sum of Ten Percent of the total amount of the Bid for the payment of which we bind ourselves,
 our legal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has submitted or is about to submit a proposal to Obligee on a contract
 for

VENTURA COUNTY WATERWORKS DISTRICT NO. 1
ROSELAND BOOSTER PUMP STATION

NOW, THEREFORE, if that contract be awarded to Principal and Principal shall, within such
 time as may be specified, enter into the contract in the prescribed form in writing and give such bond
 or bonds as may be specified in the bidding or contract documents with surety acceptable to Obligee
 then this obligation shall be null and void; otherwise to remain in full force and effect.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the
 Surety shall pay all costs incurred by the Obligee in the suit, including reasonable attorney's fee to be
 fixed by the court.

Signed, sealed and dated

 (Principal)

by _____ (Seal)

 (Surety)

by _____
 Attorney-in-Fact

**COUNTY OF VENTURA
PUBLIC WORKS AGENCY**

PREVAILING RATES OF WAGES

As provided in Subsection 7-2.2 of these specifications, and in accordance with Section 1770 et. seq. of the California Labor Code, determinations of the generally prevailing wages for various classes of workers in Ventura County have been made by the California Director of Industrial Relations as required by the California Labor Code.

As required by California Labor Code Section 1777.5, properly indentured apprentices shall be employed on the work. Travel and subsistence shall be paid in accordance with California Labor Code Section 1773.8.

The determinations made by the State are available on the Internet at <http://www.dir.ca.gov/DLSR/PWD/Index.htm> and are on file in the office of the Public Works Agency. A copy will be furnished without cost to the successful bidder.

The Contractor shall post a copy of the wage rates at each jobsite at a location readily available to the workers.

EXCERPTS FROM THE
CALIFORNIA LABOR CODE
AS OF JANUARY 1, 2009

The Labor Code sections furnished are those mentioned in the specifications section 7.2.2.2. They are furnished for the convenience of the contractor and in no way limit the required compliance with all laws.

1771. Except for public works projects of one thousand dollars (\$1,000) or less, not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the public work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed as provided in this chapter, shall be paid to all workers employed on public works.

This section is applicable only to work performed under contract, and is not applicable to work carried out by a public agency with its own forces. This section is applicable to contracts let for maintenance work.

1775. (a) (1) The contractor and any subcontractor under the contractor shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit not more than fifty dollars (\$50) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates as determined by the director for the work or craft in which the worker is employed for any public work done under the contract by the contractor or, except as provided in subdivision (b), by any subcontractor under the contractor.

(2) (A) The amount of the penalty shall be determined by the Labor Commissioner based on consideration of both of the following:

(i) Whether the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the contractor or subcontractor.

(ii) Whether the contractor or subcontractor has a prior record of failing to meet its prevailing wage obligations.

(B) (i) The penalty may not be less than ten dollars (\$10) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, unless the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the contractor or subcontractor.

(ii) The penalty may not be less than twenty dollars (\$20) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the contractor or subcontractor has been assessed penalties within the previous three years for failing to meet its prevailing wage obligations on a separate contract, unless those penalties were subsequently withdrawn or overturned.

(iii) The penalty may not be less than thirty dollars (\$30) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the Labor Commissioner determines that the violation was willful, as defined in subdivision (c) of Section 1777.1.

(C) When the amount due under this section is collected from the contractor or subcontractor, any outstanding wage claim under Chapter 1 (commencing with Section 1720) of Part 7 of Division 2 against that contractor or subcontractor shall be satisfied before applying that amount to the penalty imposed on that contractor or subcontractor pursuant to this section.

(D) The determination of the Labor Commissioner as to the amount of the penalty shall be reviewable only for abuse of discretion.

(E) The difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall be paid to each worker by the contractor or subcontractor, and the body awarding the contract shall cause to be inserted in the contract a stipulation that this section will be complied with.

(b) If a worker employed by a subcontractor on a public works project is not paid the general prevailing rate of per diem wages by the subcontractor, the prime contractor of the project is not liable for any penalties under subdivision (a) unless the prime contractor had knowledge of that failure of the subcontractor to pay the specified prevailing rate of wages to those workers or unless the prime contractor fails to comply with all of the following requirements:

(1) The contract executed between the contractor and the subcontractor for the performance of work on the public works project shall include a copy of the provisions of Sections 1771, 1775, 1776, 1777.5, 1813, and 1815.

(2) The contractor shall monitor the payment of the specified general prevailing rate of per diem wages by the subcontractor to the employees, by periodic review of the certified payroll records of the subcontractor.

(3) Upon becoming aware of the failure of the subcontractor to pay his or her workers the specified prevailing rate of wages, the contractor shall diligently take corrective action to halt or rectify the failure, including, but not limited to, retaining sufficient funds due the subcontractor for work performed on the public works project.

(4) Prior to making final payment to the subcontractor for work performed on the public works project, the contractor shall obtain an affidavit signed under penalty of perjury from the subcontractor that the subcontractor has paid the specified general prevailing rate of per diem wages to his or her employees on the public works project and any amounts due pursuant to Section 1813.

(c) The Division of Labor Standards Enforcement shall notify the contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages.

1776. (a) Each contractor and subcontractor shall keep accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

(1) The information contained in the payroll record is true and correct.

(2) The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.

(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to a representative of the body awarding the contract, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.

(3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through either the body awarding the contract, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to paragraph (2), the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the contractor, subcontractors, and the entity through which the request was made. The public may not be given access to the records at the principal office of the contractor.

(c) The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division. The payroll records may consist of printouts of payroll data that are maintained as computer records, if the printouts contain the same information as the forms provided by the division and the printouts are verified in the manner specified in subdivision (a).

(d) A contractor or subcontractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested the records within 10 days after receipt of a written request.

(e) Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address, and social security number. The name and address of the contractor awarded the contract or the subcontractor performing the contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (29 U.S.C. Sec. 175a) shall be marked or obliterated only to prevent disclosure of an individual's name and social security number. A joint labor management committee may maintain an action in a court of competent jurisdiction against an employer who fails to comply with Section 1774. The court may award restitution to an employee for unpaid wages and may award the joint labor management committee reasonable attorney's fees and costs incurred in maintaining the action. An action under this subdivision may not be based on the employer's misclassification of the craft of a worker on its certified payroll records. Nothing in this subdivision limits any other available remedies for a violation of this chapter.

(f) The contractor shall inform the body awarding the contract of the location of the records enumerated under subdivision (a), including the street address, city, and county, and shall, within five working days, provide a notice of a change of location and address.

(g) The contractor or subcontractor has 10 days in which to comply subsequent to receipt of a written notice requesting the records enumerated in subdivision (a). In the event that the contractor or subcontractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars (\$25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of a subcontractor to comply with this section.

(h) The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section.

(i) The director shall adopt rules consistent with the California Public Records Act (Chapter 3.5 (commencing with Section 6250) of Division 7 of Title 1 of the Government Code) and the Information Practices Act of 1977 (Title 1.8 (commencing with Section 1798) of Part 4 of Division 3 of the Civil Code) governing the release of these records, including the establishment of reasonable fees to be charged for reproducing copies of records required by this section.

1777.5. (a) Nothing in this chapter shall prevent the employment of properly registered apprentices upon public works.

(b) Every apprentice employed upon public works shall be paid the prevailing rate of per diem wages for apprentices in the trade to which he or she is registered and shall be employed only at the work of the craft or trade to which he or she is registered.

(c) Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprentice agreements under Chapter 4 (commencing with Section 3070) of Division 3 are eligible to be employed at the apprentice wage rate on public works. The employment and training of each apprentice shall be in accordance with either of the following:

(1) The apprenticeship standards and apprentice agreements under which he or she is training.

(2) The rules and regulations of the California Apprenticeship Council.

(d) When the contractor to whom the contract is awarded by the state or any political subdivision, in performing any of the work under the contract, employs workers in any apprenticeable craft or trade, the contractor shall employ apprentices in at least the ratio set forth in this section and may apply to any apprenticeship program in the craft or trade that can provide apprentices to the site of the public work for a certificate approving the contractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the contractor, shall arrange for the dispatch of apprentices to the contractor. A contractor covered by an apprenticeship program's standards shall not be required to submit any additional application in order to include additional public works contracts under that program. "Apprenticeable craft or trade," as used in this section, means a craft or trade determined as an apprenticeable occupation in accordance with rules and regulations prescribed by the California Apprenticeship Council. As used in this section, "contractor" includes any subcontractor under a contractor who performs any public works not excluded by subdivision (o).

(e) Prior to commencing work on a contract for public works, every contractor shall submit contract award information to an applicable apprenticeship program that can supply apprentices to the site of the public work. The information submitted shall include an estimate of journeyman hours to be performed under the contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the awarding body if requested by the awarding body.

Within 60 days after concluding work on the contract, each contractor and subcontractor shall submit to the awarding body, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the contract. The information under this subdivision shall be public. The apprenticeship programs shall retain this information for 12 months.

(f) The apprenticeship program that can supply apprentices to the area of the site of the public work shall ensure equal employment and affirmative action in apprenticeship for women and minorities.

(g) The ratio of work performed by apprentices to journeymen employed in a particular craft or trade on the public work may be no higher than the ratio stipulated in the apprenticeship standards under which the apprenticeship program operates where the contractor agrees to be bound by those standards, but, except as otherwise provided in this section, in no case shall the ratio be less than one hour of apprentice work for every five hours of journeyman work.

(h) This ratio of apprentice work to journeyman work shall apply during any day or portion of a day when any journeyman is employed at the jobsite and shall be computed on the basis of the hours worked during the day by journeymen so employed. Any work performed by a journeyman in excess of eight hours per day or 40 hours per week shall not be used to calculate the ratio. The contractor shall employ apprentices for the number of hours computed as above before the end of the contract or, in the case of a subcontractor, before the end of the subcontract. However, the contractor shall endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the jobsite. Where an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Chief of the Division of Apprenticeship Standards, upon application of an apprenticeship program, may order a minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification.

(i) A contractor covered by this section that has agreed to be covered by an apprenticeship program's standards upon the issuance of the approval certificate, or that has been previously approved for an apprenticeship program in the craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the applicable apprenticeship standards, but in no event less than the 1-to-5 ratio required by subdivision (g).

(j) Upon proper showing by a contractor that he or she employs apprentices in a particular craft or trade in the state on all of his or her contracts on an annual average of not less than one hour of apprentice work for every five hours of labor performed by journeymen, the Chief of the Division of Apprenticeship Standards may grant a certificate exempting the contractor from the 1-to-5 hourly ratio, as set forth in this section for that craft or trade.

(k) An apprenticeship program has the discretion to grant to a participating contractor or contractor association a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting the contractor from the 1-to-5 ratio set forth in this section when it finds that any one of the following conditions is met:

(1) Unemployment for the previous three-month period in the area exceeds an average of 15 percent.

(2) The number of apprentices in training in the area exceeds a ratio of 1 to 5.

(3) There is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth of its journeymen annually through apprenticeship training, either on a statewide basis or on a local basis.

(4) Assignment of an apprentice to any work performed under a public works contract would create a condition that would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large, or the specific task to which the apprentice is to be assigned is of a nature that training cannot be provided by a journeyman.

(l) When an exemption is granted pursuant to subdivision (k) to an organization that represents contractors in a specific trade from the 1-to-5 ratio on a local or statewide basis, the member contractors shall not be required to submit individual applications for approval to local joint apprenticeship committees, if they are already covered by the local apprenticeship standards.

(m) (1) A contractor to whom a contract is awarded, who, in performing any of the work under the contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the director determines is the prevailing amount of apprenticeship training contributions in the area of the public works site. A contractor may take as a credit for payments to the council any amounts paid by the contractor to an approved apprenticeship program that can supply apprentices to the site of the public works project. The contractor may add the amount of the contributions in computing his or her bid for the contract.

(2) At the conclusion of the 2002-03 fiscal year and each fiscal year thereafter, the California Apprenticeship Council shall distribute training contributions received by the council under this subdivision, less the expenses of the Division of Apprenticeship Standards for administering this subdivision, by making grants to approved apprenticeship programs for the purpose of training apprentices. The funds shall be distributed as follows:

(A) If there is an approved multiemployer apprenticeship program serving the same craft or trade and geographic area for which the training contributions were made to the council, a grant to that program shall be made.

(B) If there are two or more approved multiemployer apprenticeship programs serving the same craft or trade and geographic area for which the training contributions were made to the council, the grant shall be divided among those programs based on the number of apprentices registered in each program.

(C) All training contributions not distributed under subparagraphs (A) and (B) shall be used to defray the future expenses of the Division of Apprenticeship Standards.

(3) All training contributions received pursuant to this subdivision shall be deposited in the Apprenticeship Training Contribution Fund, which is hereby created in the State Treasury. Notwithstanding Section 13340 of the Government Code, all money in the Apprenticeship Training Contribution Fund is hereby continuously appropriated for the purpose of carrying out this subdivision and to pay the expenses of the Division of Apprenticeship Standards.

(n) The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section. The stipulations shall fix the responsibility of compliance with this section for all apprenticeable occupations with the prime contractor.

(o) This section does not apply to contracts of general contractors or to contracts of specialty contractors not bidding for work through a general or prime contractor when the contracts of general contractors or those specialty contractors involve less than thirty thousand dollars (\$30,000).

(p) All decisions of an apprenticeship program under this section are subject to Section 3081.

1813. The contractor or subcontractor shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars (\$25) for each worker employed in the execution of the contract by the respective contractor or subcontractor for each calendar day during which the worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of this article. In awarding any contract for public work, the awarding body shall cause to be inserted in the contract a stipulation to this effect. The awarding body shall take cognizance of all violations of this article committed in the course of the execution of the contract, and shall report them to the Division of Labor Standards Enforcement.

1815. Notwithstanding the provisions of Sections 1810 to 1814, inclusive, of this code, and notwithstanding any stipulation inserted in any contract pursuant to the requirements of said sections, work performed by employees of contractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon public work upon compensation for all hours worked in excess of 8 hours per day at not less than 1 1/2 times the basic rate of pay.

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**COUNTY OF VENTURA
PUBLIC WORKS AGENCY
STANDARD SPECIFICATIONS
PART 1 - GENERAL PROVISIONS**

SECTION 0 - SSPWC ADOPTION AND MODIFICATIONS

0-1 STANDARD SPECIFICATIONS

Except as hereinafter provided or as modified by the Special Provisions, the provisions of Parts 2 through 6 of the 2009 edition of the Standard Specifications for Public Works Construction (referred to as SSPWC), published by BNi Building News, Los Angeles, are part of these Standard Specifications.

0-2 DELETIONS

The following portions of SSPWC are hereby deleted: Part 1 and Sections 200-1.6.2, and 301-1.4.

0-3 NUMBERING OF SECTIONS

The numbering in these modifications is compatible with the numbering in SSPWC. References to whole sections of SSPWC and these modifications are preceded by the word "Section", references to parts of sections show numbers only, such as "211-5", except at the beginning of a sentence, the word "Section" precedes the number. Standard Special Provisions, if included, are numbered as Sections 401 through 499. The Special Provisions are numbered starting with Section 1000 or higher.

Cross-references contained in SSPWC to sections deleted by 0-2 hereof shall be references to the sections of like number contained herein.

0-4 ADDITIONS

The sections that follow, either, replace sections of like number in SSPWC which were deleted in 0-2 above, modify sections of SSPWC, or add material not in SSPWC.

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

1-1 GENERAL Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like meaning, refer to actions, expressions, and prerogatives of the Engineer.

1-2 TERMS AND DEFINITIONS

Acceptance--The formal written acceptance by the Agency of the Work which has been completed in all respects in accordance with the Plans and Specifications and any Modifications thereof.

Addendum--Written or graphic instrument issued prior to the opening of Bids which clarifies, corrects or changes the bidding or Contract Documents. The term "Addendum" shall include bulletins and all other types of written notices issued to potential bidders prior to opening of Bids.

Agency--The legal entity for which the Work is being performed.

Agreement--See Contract.

Base--A layer of specified material of planned thickness placed immediately below the pavement or surfacing.

Bid--The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work.

Bidder--Any individual, firm, partnership, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Board--The officer or body constituting the awarding authority of the Agency.

Bond--Bid, performance and payment bond or other instrument of security.

Cash Contract--A contract financed by means other than special assessments.

Change Order--A written order to the Contractor signed by the Agency directing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract time issued after the effective date of the Contract. A Change Order may or may not also be signed by the Contractor.

Code--The terms Government Code, Labor Code, etc. refer to codes of the State of California.

Consultant--A professional engineer, architect, landscape architect or other professional who designed the project or performed other services for the Agency on the project.

Contract--The written agreement between the Agency and the Contractor covering the Work.

Contract Documents--Including but not limited to; the Contract, any Addendum (which pertain to the Contract Documents), Notice Inviting Bids, Instruction to Bidders; Bid (including documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Contract, the Bonds, the general conditions, permits from other agencies, the Special Provisions, the Plans, Standard Plans, Standard Specifications, Reference Specifications, and all Modifications issued after the execution of the Contract.

Contractor--The individual, partnership, corporation, joint venture, or other legal entity having a Contract with the Agency to perform the Work. In the case of work being done under permit issued by the Agency, the Permittee shall be construed to be the Contractor. The term "prime contractor" shall mean Contractor.

Contract Price--The total amount of money for which the Contract is awarded.

Contract Unit Price--The amount shown in the Bid for a single unit of an item of work.

County Sealer--The Sealer of Weights and Measures of the county in which the Contract is let.

Days--Days shall mean consecutive calendar days unless otherwise specified.

Daily Extra Work Reports--Reports on Agency furnished forms as required by 3-3.

Disputed Work--Work in which Agency and Contractor are in disagreement.

Due Notice--A written notification, given in due time, of a proposed action where such notification is required by the Contract to be given a specified interval of time (usually 48 hours or two Working Days) prior to the commencement of the contemplated action. Notification may be from Engineer to Contractor or from Contractor to Engineer.

Electrolier--Street light assembly complete, including foundation, standard, luminaire arm, luminaire, etc.

1-2 DEFINITIONS (Continued)

- Engineer--The Director of Public Works Agency acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.
- Field Directive--A written communication from the Engineer to the Contractor that does not make any Modification to the Contract Documents. It is used only to answer Contractor's questions and to provide decisions as specified in the Contract Documents.
- Geotextile--Synthetic fiber used in civil engineering applications, serving the primary function of separation and filtration.
- House Connection Sewer--A sewer, within a public street or right of way, proposed to connect any parcel, lot, or part of a lot with a main line sewer.
- House Sewer--A sewer, wholly within private property, proposed to connect any building to a house connection sewer.
- Luminaire--The lamp housing including the optical and socket assemblies (and ballast if so specified).
- Major Bid Item--A single Contract item constituting 10% or more of the original Contract Price.
- Mast Arm--The structural member or bracket, which, when mounted on a Standard, supports the luminaire.
- Modification--Includes Change Orders and Supplemental Agreements. A Modification may only be issued after the effective date of the Contract.
- Notice of Award--The written notice by the Agency to the successful Bidder stating that upon compliance by it with the required conditions, the Agency will execute the Contract.
- Notice to Proceed--A written notice given by the Agency to the Contractor fixing the date on which the Contract time will start.
- Owner--Same meaning as Agency.
- Person--Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.
- Plans--The drawings, profiles, cross sections, Standard Plans, working drawings, shop drawings, and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions, or details of the Work.
- Private Contract--Work subject to Agency inspection, control, and approval, involving private funds, not administered by the Agency.
- Prompt--The briefest interval of time required for a considered reply, including time required for approval by a governing body.
- Proposal--See Bid.
- Reference Specifications--Those bulletins, standards, rules, methods of analysis or testing, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents. These refer to the latest edition, including amendments in effect and published at the time of advertising the project or issuing the permit, unless specifically referred to by edition, volume, or date.
- Roadway--The portion of a street reserved for vehicular use.
- Service Connection--All or any portion of the conduit, cable, duct, or meter, between a utility distribution line and an individual consumer.
- Sewer--Any conduit intended for the reception and transfer of sewage and fluid industrial waste.
- Special Provisions--Any provisions which supplement or modify the Standard Specifications.
- Specifications--Standard Specifications, Reference Specifications, Standard Special Provisions, Special Provisions, and specifications in Change Orders or Supplemental Agreements between the Contractor and the Board.
- Standard--The shaft or pole used to support street lighting luminaire, traffic signal heads, mast arms, etc.
- Standard Plans--Details of standard structures, devices, or instructions referred to on the Plans or in the Specifications by title or number.
- Standard Special Provisions-- Special Provisions prepared in standardized form numbered in the series 401 through 499.

1-2 DEFINITIONS (Continued)

Standard Specifications--Parts 1 through 6 of this document. See Section 0. References to whole sections will be preceded by the word "Section", references to parts of sections will show numbers only, such as "3-2", except at the beginning of a sentence, the word "Section" precedes the number.

State--The State of California.

State Standard Plans--Standard Plans prepared by State of California, Business and Transportation Agency, Department of Transportation.

Stipulated Unit Price--Unit prices established by Agency in the Contract Documents.

Storm Drain--Any conduit and appurtenances intended for the reception and transfer of storm water.

Street--Any road, highway, parkway, freeway, alley, walk or way.

Subbase--A layer of specified material of planned thickness between a base and the subgrade.

Subcontractor--An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work.

Subgrade--For roadways, that portion of the roadbed on which pavement, surfacing, base, subbase, or a layer of other material is placed. For structures, the soil prepared to support a structure.

Supervision--Supervision, where used to indicate supervision by the Engineer, shall mean the performance of obligations, and the exercise of rights, specifically imposed upon and granted to the Agency in becoming a party to the Contract. Except as specifically stated herein, supervision by the Agency shall not mean active and direct superintendence of details of the Work.

Supplemental Agreement--A written amendment of the Contract Documents signed by both parties.

Surety--See 2-4.

Utility--Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, sewers or storm drains owned, operated or maintained in or across a public right of way or private easement.

Work--That which is proposed to be constructed or done under the Contract or permit, including the furnishing of all labor, materials, equipment, and services.

Working Day--See 6-7.2 and 6.7.2.1.

1-3 ABBREVIATIONS

1-3.1 General. The abbreviations herein, together with others in general use, are applicable to these Standard Specifications and to all other Contract Documents.

All abbreviations and symbols used on Plans for structural steel construction shall conform to those given by the "Manual of Steel Construction" published by the American Institute of Steel Construction, Inc.

1-3.2 Common Usage

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
Aban	Abandon	l	Liters
Aband	Abandoned	Lab	Laboratory
ABS	Acrylonitrile-butadiene-styrene	Lat	Lateral
AC	Asphalt Concrete	LD	Local depression
ACP	Asbestos cement pipe	LED	Light Emitting Diode
Alt	Alternate	LH	Lamp hole
AmerStd	American Standard	LL	Live load
APC	Air Placed Concrete	LOL	Layout line
ARAM	Asphalt Rubber Aggregate Membrane	Long	Longitudinal
ARHM	Asphalt Rubber Hot Mix	LP	Lamp post
AWG	American Wire Gage (non-ferrous wire)	LPS	Low pressure sodium (Light)
B/W	Back of wall	LS	Lump sum
BC	Beginning of curve	LTS	Lime treated soil
BCR	Beginning of curb return	m	Meters
Bdry	Boundary	Maint	Maintenance
BF	Bottom of footing	Max	Maximum
BM	Bench mark	MC	Medium curing
BMPs	Best Management Practices	MCR	Middle of curb return
BVC	Beginning of vertical curve	Meas	Measure
C&G	Curb & Gutter	MH	Manhole, maintenance hole
C&G	Curb and gutter	Mil Spec	Military specification
CAB	Crushed aggregate base	Min	Minimum
CALOSHA	California Occupational Safety and Health Administration	Misc	Miscellaneous
CALTRANS	California Department of Transportation	Mon	Monument
CAP	Corrugated aluminum pipe	Mult	Multiple
CB	Catch Basin	MUTCD	Manual on Uniform Traffic Control Devices

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
Cb	Curb	MVL	Mercury vapor light
CBP	Catch Basin Connection Pipe	N/A	No applicable
CBR	California Bearing Ratio	NRCP	Nonreinforced concrete pipe
C-C	Center to center	Obs	Obsolete
CCFRPM	Centrifugally Cast Fiberglass Reinforced Plastic Mortar	oc	On center
CCR	California Code of Regulations	OD	Outside diameter
CCTV	Closed Circuit TV	OE	Outer edge
CF	Cubic foot	Opp	Opposite
CF	Curb face	Orig	Original
CFR	Code of Federal Regulations	PAV	Pressure Aging Vessel
CFS	Cubic feet per second	PB	Pull box
CHDPE	Corrugated High Density Polyethylene	PC	Point of curvature
CIP	Cast iron pipe	PCC	Point of compound curvature
CIPP	Cast-in-place pipe	PCC	Portland cement concrete
CIPPC	Cast-in-place Concrete Pipe	PCVC	Point of compound vertical curve
CL	Clearance, center line	PE	Polyethylene
CLF	Chain link fence	PG	Performance Graded
CLSM	Controlled Low Strength Material	PI	Point of intersection
CMB	Crushed miscellaneous base	PL	Property line
CMC	Cement mortar-coated	PLI	Pounds per linear inch
CML	Cement mortar-lined	PMB	Processed miscellaneous base
cms	Cubic meters per second	POC	Point on curve
CO	Cleanout (Sewer)	POT	Point on tangent
Col	Column	PP	Power pole
Conc	Concrete	PRC	Point of reverse curve
Conn	Connection	PRVC	Point of reverse vertical curve
Const	Construct, Construction	PSI	Pounds per square inch
Coord	Coordinate	PT	Point of tangency
CQS	Cationic Quick-Setting	PVC	Polyvinyl chloride
CRM	Crumb Rubber Modifier	Pvmt	Pavement
CRS	Cationic Rapid-Setting	Pvt R/W	Private right of way
CSEP	Confined Space Entry Plan	Q	Rate of flow in cms (CFS)
CSP	Corrugated steel pipe	Quad	Quadrangle, Quadrant
CSPA	Corrugated steel pipe arch	R	Radius or Resistance value
CSS	Cationic Slow-Setting	R&O	Rock and Oil
CT	California Test	R/W	Right of way
CTB	Cement treated base	RA	Reclaimed Asphalt or Recycling agent
CV	Check valve	RAC	Recycled asphalt concrete
CY	Cubic yard	RAP	Reclaimed asphalt pavement
D	Depth, Load of pipe	RBAC	Rubberized asphalt concrete
db	Decibels	RC	Reinforced concrete or Rapid Curing
Dbl	Double	RCB	Reinforced concrete box
DF	Douglas Fir	RCE	Registered civil engineer
Dia	Diameter	RCP	Reinforced concrete pipe
DIP	Ductile iron pipe	RCV	Remote control valve
DL	Dead load	Ref	Reference
DT	Drain tile	Reinf	Reinforced or reinforcement
Dwg	Drawing	Res	Reservoir
Dwy Appr	Driveway approach	RGE	Registered geotechnical engineer
Dwy	Driveway	RPPCC	Reclaimed Plastic Portland Cement Concrete
Ea	Each	RR	Railroad
EC	End of curve	RSE	Registered structural engineer
ECR	End of curb return	RTE	Registered traffic engineer
EF	Each face	RTFO	Rolling Thin Film Oven
EG	Edge of gutter	RW	Reclaimed Water
EGL	Energy grade line	S	Slope
EI	Elevation	S/W	Sidewalk
ELC	Electrolier lighting conduit	SC	Slow curing
ELT	Extra long ton of slurry	SCCP	Steel cylinder concrete pipe
Eng	Engineer, Engineering	SCNs	Supplementary Cementitious Materials
EP	Edge of pavement	SD	Storm drain
Esmt	Easement	SDR	Standard dimension ratio
ETB	Emulsion treated base	SE	Sand Equivalent
EVC	End of vertical curve	Sec	Section
Exc	Excavation	SF	Square foot
Exist or Ex	Existing	SG	Specific gravity
Exp Jt	Expansion joint	SI	International System of Units (Metric)
F & C	Frame and cover	Spec	Specifications

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
F & I	Furnish and install	SR	Standard ratio
F/W	Face of wall	SS	Sanitary sewer
Fab	Fabricate	SSB	Select sub-base
FAS	Flashing arrow sign	SSP	Structural steel plate pipe
FD	Floor drain	SSPA	Structural steel plate pipe arch
Fdn	Foundation	St Hwy	State highway
Fed Spec	Federal Specification	Sta	Station
FG	Finished grade	Std	Standard
FL	Flow line	Str Gr	Straight grade
FS	Finished surface	Str	Straight
ft - lb	foot – pound	Struc	Structural/Structure
Ftg	footing	SW	Sidewalk
FW	Face of wall	SWD	Sidewalk drain
Ga	Gauge	SWPPP	Storm Water Pollution Prevention Plan
Galv	Galvanized	SY	Square Yard
GG	Gap graded	T/W	Top of wall
GIP	Galvanized iron pipe	Tan	Tangent
GL	Ground line or grade line	TC	Top of curb
GM	Gas meter	TCP	Traffic control plan
GP	Guy pole	Tel	Telephone
Gr	Grade	TF	Top of footing
Grtg	Grating	Topo	Topography
GSP	Galvanized steel pipe	Tr	Tract
H	High or height	Trans	Transition
HB	Hose bib	TRMAC	Tire rubber modified asphalt concrete
HC	House connection	TS	Traffic signal or transition structure
HDPE	High density Polyethylene	TSC	Traffic signal conduit
HDWL	Headwall	TSS	Traffic signal standard
HGL	Hydraulic grade line	TTC	Temporary traffic control
Hor, Horiz	Horizontal	TW	Top of wall
Hp	Horsepower	Typ	Typical
HPG	High pressure gas	U.S.	United States
HPS	High pressure sodium (Light)	U.S.C.	United States Code
HRWRA	High Range Water Reducing Admixture	USA	Underground Service Alert
Hyd, Hydr	Hydraulic	Var	Varies, Variable
ID	Inside diameter	VB	Valve box
Incl	Include, Including	VC	Vertical curve
Insp	Inspection	VCP	Vitrified clay pipe
Inv	Invert	Vert	Vertical
IP	Iron pipe	Vol	Volume
J	Joules	VTCSH	Vehicle Traffic Controls Signal Heads
JC	Junction chamber	W	Width or Wider
Jct	Junction	WI	Wrought iron
JS	Junction structure	WM	Water meter
Jt	Joint	WPJ	Weakened plane joint
kg	Kilograms	WTAT	Wet Track Abrasion Test
kPa	KiloPascals	X Conn	Cross connection
L	Length	x (as in 2x4)	by
		X-Sec	Cross section

1-3.3 Institutions.

<u>Abbreviation</u>	<u>Word or Words</u>
AAN.....	American Association of Nurserymen
AASHTO.....	American Association of State Highway and Transportation Officials
ACI.....	American Concrete Institute
AGC.....	Associated General Contractors of America
AISC.....	American Institute of Steel Construction
ANSI.....	American National Standards Institute
API.....	American Petroleum Institute
APWA.....	American Public Works Association
AREA.....	American Railway Engineering Association
ASHRAE.....	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME.....	American Society of Mechanical Engineers
ASTM.....	American Society for Testing and Materials
AWPA.....	American Wood Preserver's Association
AWS.....	American Welding Society
AWWA.....	American Water Works Association
CBSC.....	California Building Standards Commission
CRSI.....	Concrete Reinforcing Steel Institute
EIA.....	Electronic Industries Association
EPA.....	Environmental Protection Agency
ETL.....	Electrical Testing Laboratories
FCC.....	Federal Communications Commission
IAPMO.....	International Association of Plumbing and Mechanical Officials
ICC.....	International Code Council
IEEE.....	Institute of Electrical and Electronics Engineers
IMSA.....	International Municipal Signal Association
ITE.....	Institute of Traffic Engineers
NEMA.....	National Electrical Manufacturers Association
NFPA.....	National Fire Protection Association
NOAA.....	National Oceanic and Atmospheric Administration (Department of Commerce)
RUS.....	Rural Utility Service
UL.....	Underwriters' Laboratories, Inc.
USGS.....	United State Geological Survey
WFCB.....	Western Fire Chiefs Association

1-3.4 Building Codes. The Ventura County Building Code (VCBC) and Ventura County Fire Code (VCFC) are applicable to the Work. VCBC and VCFC adopt by reference a number of uniform and national codes. Where such codes are referenced directly in the Specifications, such references shall be to the VCBC or VCFC which adopt and modify certain provisions in the referenced codes.

<u>Abbreviation</u>	<u>Code</u>	<u>Publisher</u>
CBC.....	California Building Code	CBSC
DBC.....	Uniform Code for Abatement of Dangerous Building	ICC
UBC.....	Uniform Building Code.....	ICC
UFC.....	Uniform Fire Code	ICC and WFCB
UHC.....	Uniform Housing Code	ICC
UMC.....	Uniform Mechanical Code	IAPMO
UPC.....	Uniform Plumbing Code	IAPMO
NEC.....	National Electrical Code	NFPA

1-3.5 Reference Documents.

<u>Abbreviation</u>	<u>Document</u>
HDM	Highway Design Manual, State of California, Department of Transportation, Latest Edition
MUTCD	Manual on Uniform Traffic Control Devices
SSP	Standard Plans, State of California, Department of Transportation, latest edition
SPPWC	Standard Plans for Public Works Construction, Latest edition, published by BNi Building News, Los Angeles,
SSPWC	Standard Specifications for Public Works Construction, (See Section 0-1)
SSS	Standard Specifications, State of California, Department of Transportation, latest edition
VCSS	Ventura County Standard Specifications (Division 1, Sections 0 through 10, of which this section is a part)

1-4 UNITS OF MEASURE

1-4.1 General. The International System of Units, also referred to as SI or the metric system, is the principal measurement system in these Specifications and shall be used for construction, unless otherwise stated in the Contract Documents. U. S. Standard Measure, also called U. S. Customary System, are included in parenthesis. SI units and U. S. Standard Measure in parenthesis may or may not be exactly equivalent. If U. S. Standard Measures are specified for use in the Contract Documents, then all values used for construction shall be U. S. Standard Measures shown in parentheses. However, certain material Specifications and test requirements contained herein use SI units specifically and conversions to U. S. Measures have not been included in these circumstances. When U. S. Standard Measures are not included in parentheses, the SI units shall control.

Reference is also made to ASTM E 380 for definitions of various units of the SI system and a more extensive set of conversion factors.

1-4.1.1 Units for Work Where U. S. Standard Measure units are shown on the Plans or are specified, U. S. Standard Measure shall be used for the Work.

1-4.2 Units of Measure, Equivalents and Abbreviations

One U.S. Customary Unit	(abbreviation)	Is Equal To	#	SI Unit
mil (=0.001 in)		25.4	micrometers	(μm)
inch	(in)	25.4	millimeter	(mm)
inch	(in)	2.54	centimeter	(cm)
foot	(ft)	0.3048	meter	(m)
yard	(yd)	0.9144	meter	(m)
mile		1.6093	kilometer	(km)
square foot	(ft^2)	0.0929	square meter	(m^2)
square yard	(yd^2)	0.8361	square meter	(m^2)
cubic foot	(ft^3)	0.0283	cubic meter	(m^3)
cubic yard	(yd^3)	0.7646	cubic meter	(m^3)
acre (=43,560 ft^2)		0.4047	hectare (1ha=10,000 m^2)	(ha)
gallon	(gal)	3.7854	Liter	(L)
fluid ounce	(fl. oz.)	29.5735	milliliter	(mL)
pound mass (avoirdupois)	(lbs)	0.4536	kilogram	(kg)
ounce mass	(oz)	0.02835	kilogram	(kg)
ounce mass	(oz)	28.35	grams	(g)
Ton (=2000 lb avoirdupois)		0.9072	Tonne (1 Tonne = 1000 kg)	
Poise		0.10	Pascal-second	(Pa-s)
centistoke	(cs)	1.00	square millimeter/sec.	(mm^2/s)
pound force	(lbf)	4.4482	Newton	(N)
pound per square inch	(psi)	6.8948	Kilopascal	(kPa)
pound force per foot	(lbf/ft)	14.594	Newton per meter	(N/M)
foot-pound force	(ft-lbf)	1.3558	Joules	(J)
foot-pound force per second	([ft-lbf]/s)	1.3558	Watt	(W)
part per million	(ppm)	1.00	milligram/liter	(mg/L)
Degree Fahrenheit	(°F)	0.5555	Degree Celsius	(°C)

Temperature: Celsius to Fahrenheit	Temperature: Fahrenheit to Celsius
Temperature °F = (1.8 x °C) + 32	Temperature °C = (°F - 32) / 1.8

SI Units Used in Both Systems

Ampere (A)	second (s)	Candela (cd)
Volt (V)	decibel (db)	Lumen (lm)

Common Metric Prefixes

kilo (k)	10^3	milli (m)	10^{-3}	nano (n)	10^{-9}
centi (c)	10^{-2}	micro (μ)	10^{-6}	pico (p)	10^{-12}

1-5 SYMBOLS

° Degree	\overline{P} Property line	% Percent
' Feet or minutes	\overline{S} Survey line or station line	# Number
" Inches or seconds	\overline{C} Center line	/ per or of (between words)
Δ Delta, the central angle or angle between tangents		\angle Angle

SECTION 2 - SCOPE AND CONTROL OF WORK

2-1 AWARD AND EXECUTION OF CONTRACT

2-1.1 Award of Contract The right is reserved to waive minor irregularities in the proposals and to reject any or all proposals. The award of the Contract, if it be awarded, will be to the lowest responsive, responsible Bidder, determined as provided on the Proposal Form, whose Proposal complies with all the requirements prescribed. Such award, if made, will be made within the number of Days stated in the Proposal form. If the lowest responsible Bidder refuses or fails to execute the Contract, the Agency may, within 45 additional Days, consider the next lowest Bidder to be the lowest responsive, responsible Bidder. The periods of time specified above within which the award of Contract may be made shall be subject to extension for such further period as may be agreed upon in writing by the Bidder concerned. If the Bidder's bid guarantee was in the form of a bid bond, the Bidder shall also submit a statement from the Surety that the bond has been extended for the same period.

Proposals not accompanied by a properly executed Noncollusion Affidavit required by Public Contract Code Section 7106 will be considered nonresponsive and will not be considered for award.

All bids will be compared on the basis of the quantities, amounts and unit prices, or lump sums, as shown on the Bid Proposal.

Before award, the Bidder may be required to furnish acceptable evidence of adequate capability, equipment and financial resources to adequately perform the Work. Bidders found not to be so qualified may have their bids rejected. If reasonable cause exists to believe collusion exists among Bidders, or that prices Bid are unbalanced between Bid items, any or all proposals may be rejected.

Award will not be made to a Bidder who is listed by the State Labor Commissioner as ineligible to bid, work on, or be awarded public works projects.

2-1.2 Notice of Award. Within one Day after award of Contract by the Board, the Bidder to whom Contract is awarded will be notified of award by telephone, or if no contact is made by telephone, then by mail. Within three business days after award of Contract, a Notice of Award will be sent, transmitting the Contract Documents to such Bidder for execution. If telephone contact is made, the Bidder may request that the Contract Documents be held in Agency's office to be picked up.

2-1.3 Execution of Contract Documents. On receipt of the Contract Documents, the Bidder shall promptly obtain the required insurance coverage, certificates of insurance, power-of-attorney and Contract bonds, execute the Contract, and transmit all required documents to the Agency.

2-1.4 Failure to Execute Documents. Should the Bidder fail to furnish Agency all required documents, properly executed, prior to the starting day of the Contract time computed as provided in 6-7.4 and stated in the Notice of Award, Agency may thereafter declare the Bidder to be in default and its Proposal guarantee forfeited.

2-1.5 Return of Proposal Guarantees. Within 10 Days after the award of the Contract, Agency will return the Proposal guarantees, other than Bidder's bonds, accompanying such of the proposals as are not to be further considered in making the award. The low and second Bidder's Proposal guarantee will be held until the Contract has been executed, after which all Proposal guarantees, except Bidders' bonds and any guarantees which have been forfeited, will be returned to the respective Bidders whose proposals they accompany.

2-2 ASSIGNMENT. No Contract or portion thereof may be assigned without consent of the Board except that the Contractor may assign money due or which will accrue to it under the Contract. If given written notice, such assignment will be recognized by the Board to the extent permitted by law, but any assignment of money shall be subject to all proper withholdings in favor of the Agency and to all deductions provided for in the Contract. All money withheld, whether assigned or not, shall be subject to being used by the Agency for completion of the Work, should the Contractor be in default.

2-3 SUBCONTRACTS.

2-3.1 General. Each Bidder shall comply with the Chapter of the Public Contract Code including Sections 4100 through 4113. The following excerpts or summaries of some of the requirements of that Chapter are included below for information.

The Bidder shall set forth in the Bid, as provided in 4104:

"(a)(1) The name and location of the place of business of each Subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a Subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the Plans and Specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of one percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater."

"(b) The portion of the work that will be done by each Subcontractor under this act. The prime contractor shall list only one Subcontractor for each portion as is defined by the prime contractor in his or her bid."

The Contractor is prohibited from performing work using a Subcontractor who is listed by the State Labor Commissioner as ineligible to work on public works projects.

If the Contractor fails to specify a Subcontractor, or specifies more than one Subcontractor for the same portion of the Work to be performed under the Contract (in excess of one-half percent of 1 percent of the Contractor's total bid), the Contractor shall be qualified to perform that portion itself, and shall perform that portion itself except as otherwise provided in the Code.

Except as provided in Section 4107, no prime contractor, whose Bid is accepted, shall substitute any person or Subcontractor in place of the Subcontractor listed in the original bid other than for causes and by procedures established in Section 4107.5 which provides procedures to correct a clerical error in the listing of a Subcontractor.

Section 4110 provides that a Contractor violating any of the provisions of the Chapter violates the Contract and the Board may exercise the option either to cancel the Contract or assess the Contractor a penalty in an amount of not more than 10 percent of the subcontract involved, after a public hearing.

2-3.1.1 Use of Debarred Subcontractors Prohibited. The Contractor is prohibited from performing work using a Subcontractor who is listed by the State Labor Commissioner as ineligible to work on public works projects.

2-3.2 Additional Responsibilities. The Contractor shall give personal attention to the fulfillment of the Contract and shall keep the Work under its control.

Except where the required Contractor's License Class is "B", the Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract Price except that any designated "Specialty Items" may be performed by subcontract and the amount of any such "Specialty Items" so performed may be deducted from the Contract Price before computing the amount required to be performed by the Contractor with its own organization. "Specialty Items" will be identified by the Agency in the Bid or Proposal with an "[S]". Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. This will be determined from information submitted by the Contractor, and subject to approval by the Engineer.

Before the work of any Subcontractor is started, the Contractor shall submit to the Engineer for approval a written statement showing the work to be subcontracted giving the name and business of each Subcontractor and description and value of each portion of the work to be so subcontracted.

2-3.3 Status of Subcontractors. Subcontractors shall be considered employees of the Contractor, and the Contractor shall be responsible for their work.

2-3.3.1 Subcontracts. The Contractor shall incorporate into all subcontracts, and the Subcontractor shall incorporate into all lower tier subcontracts, all of the Plans and Specifications which are part of the Contract between the Contractor and the Agency.

2-3.3.2 Contractor Responsible. The Contractor is responsible for properly performing and completing all Work required by the Contract whether or not it employs subcontractors for certain portions of the Work. It shall coordinate the sequence and timing of its efforts and that of its subcontractors to insure the proper and timely completion of the Work.

2-3.3.3 Specialty Contractors. Where a specialty Contractor's license is required by law or by the Specifications in order to perform certain portions of the Work, the Contractor may perform such portion with its own forces if it holds the proper license. Otherwise, it shall employ a properly licensed subcontractor to perform that portion of the Work. Such requirement to employ a subcontractor does not modify the other requirements of 2-3.

2-4 CONTRACT BONDS. Before execution of the Contract by the Agency, the Bidder shall file surety bonds with the Agency to be approved by the Board in the amounts and for the purposes noted below. Bonds issued by a Surety who is listed in the latest version of U.S. Department of Treasury Circular 570, who is authorized to issue bonds in California, and whose bonding limitation shown in said circular is sufficient to provide bonds in the amount required by the Contract shall be deemed to be approved unless specifically rejected by the Agency. Bonds from all other sureties shall be accompanied by all of the documents enumerated in Code of Civil Procedure 995.660(a). The Bidder shall pay all bond premiums, costs, and incidentals.

Each bond shall incorporate, by reference, the Contract and be signed by both the Bidder and Surety and the signature of the authorized agent of the Surety shall be notarized.

The Bidder shall provide two good and sufficient surety bonds. The "Payment Bond" (Material and Labor Bond) shall be for not less than 100 percent of the Contract Price, to satisfy claims of material suppliers and mechanics and laborers employed by it on the Work. The bond shall be maintained by the Contractor in full force and effect until the Work is accepted by the Agency, and until all claims for materials and labor are paid, and shall otherwise comply with the Civil Code.

The "Performance Bond" shall be for 100 percent of the Contract Price to guaranty faithful performance of all Work, within the time prescribed, in a manner satisfactory to the Agency, and that all materials and workmanship will be free from original or developed defects. The bond must remain in effect until the end of all warranty periods set forth in the Contract.

Should any bond become insufficient, the Contractor shall renew the bond within 10 Days after receiving notice from the Agency.

Should any Surety at any time be unsatisfactory to the Board, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the Contract until a new Surety shall qualify and be accepted by the Board.

Changes in the Work, or extensions of time, made pursuant to the Contract, shall in no way release the Contractor or Surety from its obligations. Notice of such changes or extensions shall be waived by the Surety.

2-4.1 Bond Forms. Bonds shall be on forms furnished by Agency.

2-5 PLANS AND SPECIFICATIONS

2-5.1 General. The Contractor shall keep at the work site a copy of the Plans and Specifications, to which the Engineer shall have access at all times.

The Plans, Specifications, and other Contract Documents shall govern the Work. The Contract Documents are intended to be complementary and cooperative. Anything specified in the Specifications and not shown on the Plans, or shown on the Plans and not specified in the Specifications, shall be as though shown or specified in both.

The Plans shall be supplemented by such working drawings and shop drawings as are necessary to adequately control the Work.

The Contractor shall ascertain the existence of any conditions affecting the cost of the Work through reasonable examination of the work site prior to submitting the Bid..

Existing improvements visible at the work site, for which no specific disposition is made on the Plans, but which interfere with the completion of the Work, shall be removed and disposed of by the Contractor.

The Contractor shall, upon discovering any error or omission in the Plans or Specifications, immediately call it to the attention of the Engineer.

2-5.1.1 Specifications Captions. Captions accompanying specification parts, sections and paragraphs are for convenience of reference only and do not limit the content of such part, section or paragraph.

The division of the Plans into parts and the division of the Specifications into divisions and sections are for the ease of reference only and does not imply the division of work between trades or subcontractors.

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

- 1) Permits issued by jurisdictional regulatory agencies.
- 2) Change Orders and/or Supplemental Agreements; whichever occurs last.
- 3) Contract/Agreement.
- 4) Addenda.
- 5) Bid/Proposal.
- 6) Special Provisions.
- 7) Plans.
- 8) Standard Plans.
- 9) Standard Specifications.
- 10) Reference Specifications.

Detail drawings shall take precedence over general drawings.

2-5.3 Submittals.

2-5.3.1 General. Submittals shall be provided, at the Contractor's expense, as required in 2-5.3.2, 2-5.3.3 and 2-5.3.4, when required by the Plans or Special Provisions, or when requested by the Engineer.

Materials shall neither be furnished nor fabricated, nor shall any work for which submittals are required be performed, before the required submittals have been reviewed and accepted by the Engineer. Neither review nor acceptance of submittals by the Engineer shall relieve the Contractor from responsibility for errors, omissions, or deviations from the Contract Documents, unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal. The Contractor shall be responsible for the correctness of the submittals.

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

2-5.3.2 Working Drawings. Working drawings are drawings showing details not shown on the Plans which are required to be designed by the Contractor. Working drawings shall be of a size and scale to clearly show all necessary details.

Six copies and one reproducible shall be submitted. If no revisions are required, three of the copies will be returned to the Contractor. If revisions are required, the Engineer will return one copy along with the reproducible for resubmission. Upon acceptance, the Engineer will return two of the copies to the Contractor and retain the remaining copies and the reproducible.

Working drawings are required in the following subsections:

TABLE 2-5.3.2 (A)

Item	Section Number	Title	Subject
1	7-10.4.1	Safety Orders	Trench Shoring
2	207-2.5	Joints	Reinforced Concrete Pipe
3	207-8.4	Joints	Vitrified Clay Pipe
4	207-10.2.1	General	Fabricated Steel Pipe
5	300-3.2	Cofferdams	Structure Excavation & Backfill
6	303-1.6.1	General	Falsework
7	303-1.7.1	General	Placing Reinforcement
8	303-3.1	General	Prestressed Concrete Construction
9	304-1.1.1	Shop Drawings	Structural Steel
10	304-1.1.2	Falsework Plans	Structural Steel
11	304-2.1	General	Metal Hand Railings
12	306-2.1	General	Jacking Operations
13	306-3.1	General	Tunneling Operations
14	306-3.4	Tunnel Supports	Tunneling Operations
15	306-6	Remodeling Existing Sewer Facilities	Polyethylene Liner Installation
16	306-8	Microtunneling	Microtunneling Operations
17	307-4.3	Controller Cabinet Wiring Diagrams	Traffic Signal Construction

Working drawings listed above as Items 5, 6, 8, 9, 10, 12, 13, 14 and 16 shall be prepared by a Civil or Structural Engineer registered by the State of California.

2-5.3.3 Shop Drawings. Shop drawings are drawings showing details of manufactured or assembled products proposed to be incorporated into the Work. Shop drawings required shall be as specified in the Special Provisions.

2-5.3.4 Supporting Information. Supporting information is information required by the Specifications for the purposes of administration of the Contract, analysis for verification of conformance with the Specifications, the

operation and maintenance of a manufactured product or system to be constructed as part of the Work, and other information as may be required by the Engineer. Six copies of the supporting information shall be submitted to the Engineer prior to the start of the Work unless otherwise specified in the Special Provisions or directed by the Engineer. Supporting information for systems shall be bound together and include all manufactured items for the system. If resubmittal is not required, three copies will be returned to the Contractor. Supporting information shall consist of the following and is required unless otherwise specified in the Special Provisions:

- 1) List of Subcontractors per 2-3.2.
- 2) List of Materials per 4-1.4.
- 3) Certifications per 4-1.5.
- 4) Construction Schedule per 6-1.
- 5) Confined Space Entry Program per 7-10.4.4.
- 6) Concrete mix designs per 201-1.1.
- 7) Asphalt concrete mix designs per 203-6.1.
- 8) Data, including, but not limited to, catalog sheets, manufacturer's brochures, technical bulletins, specifications, diagrams, product samples, and other information necessary to describe a system, product or item. This information is required for irrigation systems, street lighting systems, and traffic signals, and may also be required for any product, manufactured item, or system.

2-5.4 Record Drawings. The Contractor shall prepare and maintain a set of prints in the Engineer's Field Office on which the locations and description of all plumbing, mechanical, and electrical facilities, which were not detailed fully on the Plans, are marked in colored pencil. Such prints shall also indicate any authorized changes from the original Plans. Such prints shall be furnished to the Engineer before final Acceptance of the Work.

2-6 WORK TO BE DONE. The Contractor shall perform all work necessary to complete the Contract in a satisfactory manner. Unless otherwise provided, it shall furnish all materials, equipment, tools, labor and incidentals necessary to complete the Work.

All work under the Contract shall be performed in accordance with the highest standards prevailing in the trades unless otherwise specified on the Plans or in the Special Provisions. Unless otherwise specified, it is the intent that the Contractor will construct a complete facility ready for use.

2-6.1 Manufacturer's Recommendations. Where the manufacturer of any materials or equipment provides written recommendations or instructions for its use or method of installation (including labels, tags, manuals, or trade literature), such recommendations or instructions shall be complied with except where the Contract Documents specifically require deviations.

2-7 SUBSURFACE DATA. All soil and test hole data, groundwater elevations, and soil analyses shown on the Plans or included in the Specifications apply only at the location of the test holes and to the depths shown. Soil test reports for test holes which have been drilled are available for inspection at the office of the Engineer. Additional subsurface exploration may be performed by Bidders or the Contractor at their own expense. The indicated groundwater elevation is that existing at the date specified in the data. It is the Contractor's responsibility to determine and allow for the groundwater elevation on the date the Work is performed. A difference in groundwater elevation between what is shown in soil boring logs and what is actually encountered during construction will not be considered as a basis for Extra Work per 3-3.

Opinions, recommendations or conclusions contained in any soils report, soil boring logs, subsurface materials investigation, geological report or other similar studies, tests or reports, prepared for the Agency, are not a part of the Contract. Contractor shall be responsible for forming its own opinions and conclusions from the facts set forth in such reports.

2-8 RIGHTS-OF-WAY. Rights-of-way, easements or rights-of-entry for the Work will be provided by the Agency. Unless otherwise provided, the Contractor shall make arrangements, pay for, and assume all responsibility for acquiring, using, and disposing of additional work areas and facilities temporarily required. The Contractor shall indemnify and hold the Agency harmless from all claims for damages caused by such actions.

2-9 SURVEYING

2-9.1 Permanent Survey Markers. The Contractor shall notify the Engineer at least 7 Days before starting work to allow for the preservation of survey monuments, lot stakes (tagged), and bench marks. The Engineer, or the owner at its cost, shall file a Corner Record Form referencing survey monuments subject to disturbance in the Office of the County Surveyor prior to the start of construction and also prior to the completion of construction for the replacement of survey monuments. The Contractor shall not disturb survey monuments, lot stakes (tagged), or bench marks without the consent of the Engineer or the owner on Private Contracts. The Contractor shall bear the expense of replacing any that may be disturbed without permission. Replacement shall be done only under the direction of the Engineer by a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying within the state.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, the Contractor shall adjust the monument cover to the new grade within 7 Days of finished paving unless otherwise specified.

2-9.2 Survey Service. The Engineer will set only the horizontal and vertical control survey points shown on the Plans. These will be set prior to the commencement of construction. The Contractor shall preserve these points as well as any other surveys established by the Engineer for use by the Contractor for the duration of their usefulness. If any survey points established by Engineer are lost or disturbed and need to be replaced, such replacement shall be by the Engineer at the expense of the Contractor. The Contractor shall employ engineers or surveyors to perform adequate surveys and staking necessary to construct the Work to the lines, elevations and grades shown on the Plans and for the Engineer's use in checking such work. Copies of the field notes or diagrams used in setting stakes shall be promptly furnished to the Engineer.

2-9.2.1 Open Areas. Where dimensions are not given on the Plans for parking lots, landscaped areas or graded areas, distances shall be scaled. Unless otherwise indicated, straight grades and smooth vertical curves shall be set between indicated elevations. Finished surfaces shall be sloped to drain in order to eliminate ponding of water.

2-9.2.2 Utilities. Section 5-5.1 requires the Contractor's cooperation during the relocation of utilities, which may require the setting of lines and grades when needed by utility owners performing relocations.

2-9.3 Contractor's Surveys. Surveying by private engineers and surveyors on the Work shall conform to the quality and practice required by the Engineer.

2-9.3.1 Errors in Surveys. The Contractor is responsible for the accuracy of all surveys except those performed by the Engineer. To assure that a survey point set by the Engineer has not been disturbed since it was set and that it was accurately set, all surveys by the Contractor shall be based on at least two survey points set by the Engineer or by other governmental surveys, in accordance with good survey practice. Should discrepancies be found between such points, the Engineer shall be notified and construction shall not proceed until the discrepancy has been resolved.

2-9.4 Line and Grade. All Work upon completion shall conform to the lines, elevations, and grades shown on the Plans.

2-9.5 Quantity Surveys. The Engineer will perform all quantity surveys for payment purposes, however, in performing such quantity surveys, it may make use of surveys performed by the Contractor.

2-9.6 Payment for Surveys. Payment for performing all of the surveying and staking as required by the Specifications and such additional surveying and staking as required by the Contractor will be made at the lump sum price set forth in the Proposal and shall be full compensation for furnishing all labor, equipment, instruments and materials necessary to perform the Work. If no bid item for surveying is included in the Proposal, the cost of surveying shall be included in the prices bid for other applicable items of work.

2-10 AUTHORITY OF BOARD AND ENGINEER. The Board has the final authority in all matters affecting the Work. Within the scope of the Contract, the Engineer has the authority to enforce compliance with the Plans and Specifications. The Contractor shall promptly comply with instructions from the Engineer or its authorized representative.

On all questions relating to quantities, the acceptability of material, equipment, or work, the execution, progress or sequence of work, and the interpretation of Specifications or drawings, the decision of the Engineer is final and binding, and shall be precedent to any payment under the Contract, unless otherwise ordered by the Board.

2-10.1 Decisions in Writing. Any and all decisions of the Engineer interpreting Specifications or drawings shall be in writing. Any purported "interpretation" which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

2-11 INSPECTION

The Work is subject to inspection and approval of the Engineer. The Contractor shall notify the Engineer before noon of the working day before inspection is required. Work shall be done only in the presence of the Engineer, unless otherwise authorized. Any work done without proper inspection will be subject to rejection. The Engineer and any authorized representatives shall at all times have access to the Work during its construction at shops and yards as well as the Work site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with these specifications. Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

2-11.1 Permit Inspections. The Contractor shall arrange for code compliance inspections by all agencies issuing permits for the Work. The Work shall not continue beyond mandatory inspection points without clearance from the controlling agency. Each agency involved shall be notified in accordance with the code they enforce or in accordance with their standard operating procedures. No extensions of time will be granted for delays occasioned by such inspections except where, through no fault of the Contractor, the inspection is delayed more than one Day beyond normal response time after proper notification has been given.

It shall be the Contractor's responsibility to see that any required inspection record card is signed off before proceeding with the next phase of the Work and completely signed off on completion of the Work.

2-11.2 Structural Observation. When the plans indicate that "Structural Observation" of specific work is required prior to Permit Inspection, Contractor shall notify Engineer, in writing, at least five working days prior to the date Contractor plans to have the work ready for structural observation. If the work is not ready for structural observation on the date indicated, Contractor shall reimburse Agency the cost of structural observer's visit to the Work site. If the work to be observed is substantially complete but is found to need correction before approval by the structural observer, Contractor shall give notice of a new date, as required above.

2-12 AGENCY PERSONNEL AND AUTHORITY

2-12.1 General. The Board has complete authority for the project within the limits prescribed by law. Pursuant to resolutions duly adopted by the Board, the authority to perform certain functions has been delegated to the Director of Public Works. Agency staff personnel and Consultants delegated thereto by the Director are authorized to perform functions limited as set forth in the following list of personnel and designated duties.

2-12.2 Engineer. The Director of the Public Works Agency of the County of Ventura is the Engineer and has general authority to administer the Contract. The Engineer has the following specific authority:

(a) To issue Contract Change Orders (CCO) and to settle claims subsequent to Acceptance as follows:

<u>Original Contract Amount</u>	<u>Maximum Amount of any Change Order or Claim Settlement</u>
---------------------------------	---

\$50,000 or less.....	\$5,000
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greater than \$50,000

and not over \$250,000.....	10% of the original Contract amount
-----------------------------	--

greater than \$250,000

and not over \$2,750,000.....	\$25,000 plus 5% of the original Contract cost in excess of \$250,000.
-------------------------------	---

greater than \$2,750,000	\$150,000
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CCOs and claim settlements exceeding the amounts set forth above require Board approval.

(b) To make final adjustments of quantities (FAQ) on unit price items.

(c) To accept the Work when the Contractor has completed all obligations of the Contract, in accordance with the Plans, Specifications and other Contract Documents. The Engineer also has authority to make and record the Notice of Completion.

(d) To approve progress and final payments under the Contract, including the provisions for withholding funds.

(e) To determine whether performance on the Work is satisfactory. Satisfactory progress shall be determined as provided in § 9-3.2.

(f) To approve the substitution of a Subcontractor, where allowed by law, if the listed Subcontractor does not object when notified.

(g) To suspend the Work for the benefit of the Agency.

(h) In the absence of the Agency Director, a Public Works Agency Department Director, as Deputy Director of Public Works, may exercise the Engineer's authority. Such action will be indicated by "Acting" with the Department Director's signature.

2-12.3 Department Director (Public Works Agency). The Department Director responsible for the project is designated in the Notice to Proceed. The Department Director has the following authority:

- (a) To issue Contract Change Orders (CCO) as follows:

<u>Original Contract Amount</u>	<u>Maximum Amount of any Change Order</u>
Less than \$500,000.....	\$5,000
\$500,000 to \$1,000,000.....	1% of Bid Price
Greater than \$1,000,000	\$10,000
- (b) To issue extensions of Contract time in accordance with the Contract Documents.
- (c) To make final adjustment of quantities where the total does not exceed the amounts listed in (a) above.
- (d) To approve the substitution of subcontractors, where allowed by law, if the listed Subcontractor does not object when notified.
- (e) To determine when the Work has been completed and acknowledge in writing the completion of the Work.

2-12.4 Project manager. The Project manager responsible for the project is designated in the Notice to Proceed. This person may also be referred to as Project Engineer. The Project manager has the following authority:

- (a) To interpret the Plans and Specifications.
- (b) To make minor changes in the location or features of the Work where no change in cost is involved. Such changes in cost may not be the net of multiple changes.
- (c) To approve substitutes for material and equipment specified by proprietary names when such material and equipment meet the Contract requirements.
- (d) To approve shop drawings and submittals.
- (e) To issue stop work orders when necessary to enforce the provisions of the Contract.
- (f) To make determinations of each Working Day to be charged against the Contract time in accordance with 6-7.3.
- (g) To take over a portion of the Work for Agency's use in accordance with 6-10.
- (h) To receive all correspondence and other documents from the Contractor.
- (i) To inspect the Work and perform Final Inspection subject to review by the Department Director and the Engineer.

2-12.5 Inspector. One or more inspectors will be assigned to the project by the Project manager. Substitutes may be used during absence of the assigned inspector. The Inspector has the following authority subject to review by the Project manager, Department Director and the Engineer:

- (a) To view and inspect the Work, sample and test components (at the Work site and at offsite manufacturing locations), and to discuss the Work with the Contractor's field representative.
- (b) To determine compliance with the Plans, Specifications and other Contract Documents and to issue warnings of noncompliance.
- (c) To issue stop work notices in the following two instances only:
 - 1) Where a safety hazard exists that has an immediate potential for serious injury or death.
 - 2) Where the operation in progress, if continued for even a short period of time, could be adverse to the Agency's interests.

2-12.6 Other Agency Personnel and Consultants.

2-12.6.1 Materials Engineer. The Materials Engineer is designated in the Notice to Proceed. The Materials Engineer may assign one or more Materials Inspectors to the project.

Materials Inspectors have authority to sample and test material at the Work site and at offsite manufacturing or storage locations. They may furnish available written test results to the Contractor's field representative. At batch plants, they may issue warnings of noncompliance, but stop notices require the signature of the Materials Engineer or Project manager.

2-12.6.2 Surveyors & Technicians. Surveyors and technicians shall have free access to the site to perform their duties but have no authority related to Contract administration.

2-12.6.3 Other Persons. Other Agency personnel who are not involved in construction administration and the general public may be present at the site because it is their present place of work, as client/customers, as visitors, as future users of the facility, or as persons who will maintain the completed facility. Where the facility is to continue in use during construction, work access for Agency workers and client/customers shall be maintained as provided in the Special Provisions. Where the facility (or portion where construction is being performed) is not in use during construction, admittance to the Work site by Agency personnel not involved in construction administration and visitors may be allowed by the Contractor or by the inspector, subject to compliance with safety regulations. Such persons have no authority under the Contract and the Agency is not responsible for their comments, suggestions or directions.

2-12.6.4 Consultants. Consultants hired by the Agency shall have free access to the site to perform their duties but have no authority related to Contract administration, unless such duties are specifically identified in writing to the Contractor. When so identified, Consultant may perform the duties of certain Agency personnel described above.

SECTION 3 - CHANGES IN WORK

3-1 CHANGES REQUESTED BY THE CONTRACTOR

3-1.1 General. Changes in specified methods of construction may be made at the Contractor's request when approved in writing by the Engineer. Changes in the Plans and Specifications, requested in writing by the Contractor, which do not materially affect the Work and which are not detrimental to the Work or to the interests of the Agency, may be granted by the Board to facilitate the Work, when approved in writing by the Engineer. Nothing herein shall be construed as granting a right to the Contractor to demand acceptance of such changes.

3-1.2 Payment for Changes Requested by the Contractor. If such changes are granted, they shall be made at a reduction in cost or at no additional cost to the Agency. All costs to the Agency in reviewing the proposed change, or testing materials involved therein, shall be paid for by the Contractor, whether or not the change is approved.

3-2 CHANGES INITIATED BY THE AGENCY

3-2.1 General. The Agency may change the Plans, Specifications, character of the Work, or quantity of work, provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed 25 percent of the Contract Price. Should it become necessary to exceed this limitation, the change shall be by written Supplemental Agreement between the Contractor and Agency, unless both parties agree to proceed with the change by Change Order.

Change orders shall be in writing and state the dollar value of the change or establish method of payment, any adjustment in Contract time, and, when negotiated prices are involved, shall provide for the Contractor's signature indicating its acceptance.

3-2.2 Payment for Changes Initiated by the Agency.

3-2.2.1 Contract Unit Prices. If a change is ordered in an item of work covered by a Contract unit price, and such change does not involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made based upon the increase or decrease in quantity and the Contract unit price. In the case of such an increase or decrease in a Major Bid Item, the use of this basis for the adjustment of payment will be limited to that portion of the change which, together with all previous changes to that item, is not in excess of 25% of the total cost of such item based on the original quantity and Contract unit price.

If a change is ordered in an item of work covered by a Contract unit price, and such change does involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made in accordance with 3-2.2.3.

Should any Contract item be deleted in its entirety, payment will be made only for actual costs incurred prior to notification of such deletion.

3-2.2.2 Stipulated Unit Prices. Stipulated unit prices are those established by the Agency in the Contract Documents, as distinguished from Contract unit prices submitted by the Contractor. Stipulated unit prices may be used for the adjustment of Contract changes.

3-2.2.3 Pricing. Adjustments in payments for changes other than those set forth in 3-2.2.1 and 3-2.2.2 will be determined by agreement between Contractor and Agency. If unable to reach agreement, the Agency may direct the Contractor to proceed on the basis of Extra Work in accordance with 3-3 or as set forth in 3-2.2.4.

3-2.2.4 Non-Agreed Prices. Agency may issue a change order directing the Contractor to proceed at a price set by the Agency or on the basis of Extra Work. If the Agency sets a price for the work covered by the change order, Contractor is entitled to payment for such work in accordance with 3-3 to the extent payment in accordance with 3-3 exceeds the price set by the Agency.

3-3 EXTRA WORK

3-3.1 General. New or unforeseen work will be classed as "Extra Work" when the Engineer determines that it is not covered by Contract Unit Prices or Stipulated Unit Prices.

3-3.2 Payment.

3-3.2.1 General. When the price for the Extra Work cannot be agreed upon, the Agency will pay for the Extra Work based on the accumulation of costs as provided herein.

3-3.2.2 Basis for Establishing Costs

(a) **Labor.** The cost of labor will be the actual cost for wages prevailing for each craft or type of workers performing the Extra Work at the time the Extra Work is done, plus payment of health and welfare, pension, vacation, apprenticeship funds, and other direct costs included in the prevailing rates applicable to the project, as well as assessments or benefits required by lawful collective bargaining agreements. To the total of these labor costs, the labor surcharge set forth in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication shall be applied.

The use of a labor classification which would increase the Extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs.

Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for the equipment rental. The labor cost for foremen shall be proportioned to all of their assigned work and only that applicable to Extra Work shall be paid. A foreman is defined as a lead working journeyman.

Nondirect labor costs including superintendence, payroll taxes, all types of insurance, and all other labor costs, not specifically provided for, shall be considered to be paid for as part of the markup of 3-3.2.3(a)(1).

(b) **Materials.** The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the Work site in the quantities involved, plus sales tax, freight and delivery.

The Agency reserves the right to approve materials and sources of supply, or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Agency.

(c) **Tool and Equipment Rental.** No payment will be made for the use of tools which have a replacement value of \$200 or less.

Regardless of ownership, the rates to be used for determining equipment rental costs shall not exceed the following:

- (1) For equipment that is listed in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication, the rates shown therein. The right of way delay and overtime/multiple shift factors contained therein shall be used as applicable.
- (2) For equipment not listed in said CALTRANS publication, the listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed.
- (3) For equipment rental that includes operators and helpers, the applicable cost from (1) or (2) above, plus the applicable labor costs as determined in accordance with (a) above.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the Extra Work shall be added to the other costs.

If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Agency than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the Agency.

All equipment shall be acceptable to the Engineer, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

The reported rental rates for equipment already at the work site shall be for the duration of its use on the Extra Work, commencing at the time it is first put into actual operation on the Extra Work, plus the time required to move it from its previous site, and move it back to its previous site or to a closer site of next use.

3-3.2.2 Basis for Establishing Costs (Continued)

(d) Other Items. The Agency may authorize other items which may be required on the Extra Work. Such items include labor, service, material and equipment which are different in their nature from those required for the Work specified in the Contract and which are of a type not ordinarily available from the Contractor or any of its subcontractors.

Invoices covering all such items in detail shall be submitted with the request for payment.

(e) Invoices. Vendors' invoices for material, equipment rental, and other expenditures, shall be submitted with the request for payment. If the request for payment is not substantiated by invoices or other documentation, the Agency may establish the cost of the item involved at the lowest price which was current at the time of the report.

3-3.2.3 Markup

(a) Work by Contractor. The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits, and all other cost not specifically provided for:

- | | | |
|-----|----------------------------------|-----|
| (1) | Labor | 33% |
| (2) | Materials | 15% |
| (3) | Equipment Rental | 15% |
| (4) | Other Items and Expenditures ... | 15% |

To the sum of the cost and markups provided for in this section, 1 percent shall be added as compensation for bonding.

(b) Work by Subcontractor. When all or any part of the Extra Work is performed by a Subcontractor, the markup established in 3-3.2.3(a) shall be applied to the Subcontractor's actual cost of such work. A markup of 10% on the first \$5,000 of the subcontracted portion of the Extra Work and a markup of 5% on work in excess of \$5,000 of the subcontracted portion of the Extra Work may be added by the Contractor.

3-3.3 Daily Extra Work Reports by Contractor. When the price for the Extra Work cannot be agreed upon, the Contractor shall submit a Daily Extra Work Report to the Engineer on forms furnished by the Agency, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, and for other services and expenditures when authorized. Failure to submit the Daily Extra Work Report, showing the labor and equipment hours and the quantity of materials used, by the close of the next Working Day may waive any rights for that day. Failure to submit fully completed Daily Extra Work Reports, with the required supporting documentation, within ten calendar days after the Engineer makes a written request for the such reports shall waive all rights for the work covered by the requested reports. An attempt shall be made to reconcile the Daily Extra Work Report daily, and it shall be signed by the Engineer and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the Daily Extra Work Report. Daily Extra Work Reports by Subcontractors or others shall be submitted through the Contractor.

The Daily Extra Work Report shall:

- 1) Show names of workers, classifications, and hours worked.
- 2) Describe and list quantities of materials used.
- 3) Show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable.
- 4) Describe other services and expenditures in such detail as the Agency may require.

In addition to the Daily Extra Work Reports, the Contractor shall furnish Certified Payroll Records for the labor included in the reports before payment will be made.

3-4 CHANGED CONDITIONS. The Contractor shall notify the Engineer in writing of the following work site conditions, hereinafter called changed conditions, promptly upon their discovery and before they are disturbed:

- 1) Subsurface or latent physical conditions differing materially from those represented in the Contract;
- 2) Unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character being performed; and
- 3) Material differing from that represented in the Contract which the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law.

The Engineer will promptly investigate conditions which appear to be changed conditions. If the Engineer determines that the conditions are changed conditions and that they will materially increase or decrease the costs of any portion of the Work, a Change Order will be issued adjusting the compensation for such portion of the Work in accordance with 3-2.2. If the Engineer determines that conditions are changed conditions and that they will materially affect the performance time, the Contractor, upon submitting a written request, will be granted an extension of time subject to the provisions of 6-6.

If the Engineer determines that the conditions of which it has been notified by the Contractor do not justify an adjustment in compensation, the Contractor will be so notified in writing. This notice will also advise the Contractor of its obligation to notify the Engineer, in writing, if the Contractor disagrees.

Should the Contractor disagree with such determination, it may submit a written notice of potential claim to the Engineer before commencing the disputed work. In the event of such a disagreement, the Contractor shall not be excused on account of that disagreement from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. However, the Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties. The Contractor shall proceed as provided in 3-5.

The Contractor's failure to give notice of changed conditions promptly upon their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith.

3-5 DISPUTED WORK. If the Contractor and the Agency are unable to reach agreement on disputed work, the Agency may direct the Contractor to proceed with the Work. Payment shall be as later determined by mediation or arbitration, if the Agency and the Contractor agree thereto, or as fixed in a court of law.

Although not to be construed as proceeding under Extra Work provisions, the Contractor shall keep and furnish records of disputed work in accordance with 3-3.

SECTION 4 - CONTROL OF MATERIALS

4-1 MATERIALS AND WORKMANSHIP

4-1.1 General. All materials, parts, and equipment furnished by the Contractor in the Work shall be new, high grade, and free from defects. Quality of work shall be in accordance with the generally accepted standards. Material and work quality shall be subject to the Engineer's approval.

Materials and work quality not conforming to the requirements of the Specifications shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the Contractor, at its expense; when so directed by the Engineer.

If the Contractor fails to replace any defective or damaged work or material after reasonable notice, the Engineer may cause such work or materials to be replaced. The replacement expense will be deducted from the amount to be paid to the Contractor.

Used or secondhand materials, parts, and equipment may be used only if permitted by the Specifications.

4-1.1.1 Materials Furnished by Agency. Materials furnished by the Agency will be available at locations designated in the Special Provisions or if not designated in the Special Provisions, they will be delivered to a single location of Agency's choice within the project area. They shall be hauled to the site of installation by the Contractor at its expense, including any necessary loading and unloading that may be involved. The cost of handling and placing materials furnished by the Agency shall be considered as included in the price paid for the Contract item involving such furnished materials.

The Contractor will be held responsible for all materials furnished to it, and it shall pay all demurrage and storage charges. Furnished materials, after delivery to Contractor, lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the Agency for the cost of replacing lost or damaged furnished material and such costs may be deducted from any monies due or to become due the Contractor.

4-1.2 Protection of Work and Materials. The Contractor shall provide and maintain storage facilities and employ such measures as will preserve the specified quality and fitness of materials to be used in the Work. Stored materials shall be reasonably accessible for inspection. The Contractor shall also adequately protect new and existing work and all items of equipment for the duration of the Contract.

The Contractor shall not, without the Agency's consent, assign, sell, mortgage, hypothecate, or remove equipment or materials which have been installed or delivered and which may be necessary for the completion of the Contract.

4-1.3 Inspection Requirements

4-1.3.1 General. Unless otherwise specified, inspection is required at the source for asphalt concrete pavement mixtures, structural concrete, metal fabrication, metal casting, welding, concrete pipe manufacture, protective coating application, and similar shop or plant operations. Steel pipe in sizes less than 450 mm (18 inches), vitrified clay and cast iron pipe in all sizes are acceptable upon certification as to compliance with the Specifications, subject to sampling and testing by the Agency. Standard items of equipment such as electric motors, conveyors, elevators, plumbing fixtures, etc., are subject to inspection at the Work site only. Special items of equipment such as designed electrical panel boards, large pumps, sewage plant equipment, etc., are subject to inspection at the source, normally only for performance testing. The Specifications may require inspection at the source for other items not typical of those listed in this section.

4-1.3.2 Inspection of Materials Not Locally Produced. When the Contractor intends to purchase materials, fabricated products, or equipment from sources located more than 80 km (50 miles) outside the geographical limits of the Agency, an inspector or accredited testing laboratory (approved by the Engineer), shall be engaged by the Contractor at its expense, to inspect the materials, equipment or process. This approval shall be obtained before producing any material or equipment. The inspector or representative of the testing laboratory shall evaluate the materials for conformance with the Plans and Specifications. The Contractor shall forward reports required by the Engineer. No materials or equipment shall be shipped nor shall any processing, fabrication or treatment of such materials be done without proper inspection by the approved agent. Approval by said agent shall not relieve the Contractor of responsibility for complying with the Contract requirements.

4-1.3.3 Inspection by the Agency. The Agency will provide all inspection and testing laboratory services within 80 km (50 miles) of the geographical limits of the Agency.

4-1.3.4 Certificates of Compliance. The Engineer may require certificates of compliance with the Specifications for materials or manufactured items produced outside of the Work site. Such certificates will not relieve the Contractor from the requirements of providing material and manufactured items complying with the Specifications even though they have been incorporated into the Work.

4-1.4 Tests of Materials. Before incorporation in the Work, the Contractor shall submit samples of materials, as the Engineer may require, at no cost to the Agency. The Contractor, at its own expense, shall deliver the materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing and a reasonable amount of retesting shall be performed under the direction of the Engineer, and at no expense to the Contractor. If the Contractor is to provide and pay for testing, the Specifications will so state.

The Contractor shall notify the Engineer in writing, at least 15 Days in advance, of its intention to use materials for which tests are specified, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of material.

If the notice of intent to use is sent before the materials are available for testing or inspection, or is sent so far in advance that the materials on hand at the time will not last but will be replaced by a new lot prior to use on the Work, it will be the Contractor's responsibility to re-notify the Engineer when samples which are representative may be obtained.

4-1.5 Certification. The Engineer may waive materials testing requirements of the Specifications and accept the manufacturer's written certification that the materials to be supplied meet those requirements. Materials test data may be required as part of the certification.

4-1.6 Trade Names or Equals. The Contractor may supply any of the materials specified or offer an equivalent. The Engineer shall determine whether the material offered is equivalent to that specified. Adequate time shall be allowed for the Engineer to make this determination.

Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words **or equal**. A listing of materials is not intended to be comprehensive, or in order of preference. The Contractor may offer any material, process, or equipment considered to be equivalent to that indicated. The substantiation of offers shall be submitted as provided in the Contract Documents.

The Contractor shall, at its expense, furnish data concerning items offered by it as equivalent to those specified. The Contractor shall have the material tested as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the item will fulfill its intended function.

Test methods shall be subject to the approval of the Engineer. Test results shall be reported promptly to the Engineer, who will evaluate the results and determine if the substitute item is equivalent. The Engineer's findings shall be final. Installation and use of a substitute item shall not be made until approved by the Engineer.

If a substitute offered by the Contractor is not found to be equal to the specified material, the Contractor shall furnish and install the specified material.

The specified Contract completion time shall not be affected by any circumstance developing from the provisions of this section.

4-1.6.1 Compatibility with Design. Where the size, configuration, weight, fastening locations, fastening strength, utility rough-in locations, and utility capacities of equipment or devices offered by the Contractor as equivalents do not conform to those provided for in the Contract Documents or those which are necessary for equipment or devices indicated by brand names, the Contractor shall bear all costs of redesign and changes in construction necessary to adapt the offered equipment or device to the Work.

Equipment or devices will not be considered "equal" where the life cycle cost of operation, utilities and maintenance of the offered alternate is greater than those listed by brand names. Life cycle costs shall mean utility charges (demand and usage charges), maintenance, operating personnel and replacement (equipment, installation and down time expenses) all reduced to an average annual rate using the current interest rate earned on funds invested by the County Treasurer.

4-1.6.2 Trade Names Listed. Where the Agency has listed products by brand or trade name on the Plans or in the Specifications, or both, this shall not be construed as meaning every product may be used without furnishing shop drawings, without redesign of the facility or without a change in utility rough-in requirements.

Where use of products listed on the Plans or in the Specifications, or both, or where use of a substitute proposed as an "equal" product requires shop drawings, redesign of the facility, or revisions in the size and location of rough-in utility connections, or in connecting work, the Contractor shall provide any necessary shop drawings, or shall cause the preparation of any necessary redesign or revisions to the Plans at its own expense and shall bear the full cost of any necessary additional construction or reconstruction work. No work described in shop drawings, a redesign, or a revision to the Plans shall be undertaken until such shop drawings, redesign, or revisions have been approved by the Engineer. Any proposed redesign or revision to the Plans shall be accompanied by complete computations and details prepared by an appropriate licensed design professional.

4-1.7 Weighing Equipment. All scales used for proportioning materials shall be inspected for accuracy and certified within the past 12 months by the State of California Bureau of Weights and Measures, by the County Director or Sealer of Weights and Measures, or by a scale mechanic registered with or licensed by the County.

The accuracy of the work of a scale service agency, except as stated herein, shall meet the standards of the California Business and Professions Code and the California Code of Regulations pertaining to weighing devices. A certificate of compliance shall be presented, prior to operation, to the Engineer for approval and shall be renewed whenever required by the Engineer at no cost to the Agency.

All scales shall be arranged so they may be read easily from the operator's platform or area. They shall indicate the true net weight without the application of any factor. The figures of the scales shall be clearly legible. Scales shall be accurate to within 1 percent when tested with the plant shut down. Weighing equipment shall be so insulated against vibration or moving of other operating equipment in the plant area that the error in weighing with the entire plant running will not exceed 2 percent for any setting nor 1.5 percent for any batch.

4-1.8 Calibration of Testing Equipment. Testing equipment, such as, but not limited to, pressure gages, metering devices, hydraulic systems, force (load) measuring instruments, and strain-measuring devices shall be calibrated by a testing agency acceptable to the Engineer at intervals not to exceed 12 months and following repairs, modification, or relocation of the equipment. Calibration certificates shall be provided when requested by the Engineer.

4-1.9 (No Text)

SECTION 5 - UTILITIES

5-1 LOCATION. The Permittee (in the case of Private Contracts) and the Agency (in the case of Cash or Assessment Act Contracts), will search known substructure records and furnish the Contractor with copies of documents which describe the location of utility substructures, or will indicate on the Plans for the project those substructures (except for service connections) which may affect the Work. Information regarding removal, relocation, abandonment, or installation of new utilities will be furnished to prospective bidders.

Where underground main distribution conduits such as water, gas, sewer, electric power, telephone, or cable television are shown on the Plans, the Contractor shall assume that every property parcel will be served by a service connection for each type of utility.

As provided in Section 4216 of the California 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 California Department of Transportation is not required by Section 4216 to become a member of the regional notification center. The Contractor shall contact it for location of its subsurface installations.

The Contractor shall determine the location and depth of all utilities, including service connections, which have been marked by the respective owners and which may affect or be affected by its operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

5-2 PROTECTION. The Contractor shall not interrupt the service function or disturb the support of any utility without authority from the owner or order from the Agency. All valves, switches, vaults, and meters shall be maintained readily accessible for emergency shutoff.

Where protection is required to ensure support of utilities located as shown on the Plans or in accordance with 5-1, the Contractor shall, unless otherwise provided, furnish and place the necessary protection at its expense.

Upon learning of the existence and location of any utility omitted from or shown incorrectly on the Plans, the Contractor shall immediately notify the Engineer in writing. When authorized by the Engineer, support or protection of the utility will be paid for as provided in 3-2.2.3 or 3-3.

The Contractor shall immediately notify the Engineer and the utility owner if any utility is disturbed or damaged. The Contractor shall bear the costs of repair or replacement of any utility damaged if located as noted in 5-1.

When placing concrete around or contiguous to any non-metallic utility installation, the Contractor shall at its expense:

1. Furnish and install a 50 mm (2 inch) cushion of expansion joint material or other similar resilient material; or
2. Provide a sleeve or other opening which will result in a 50 mm (2 inch) minimum-clear annular space between the concrete and the utility; or
3. Provide other acceptable means to prevent embedment in or bonding to the concrete.

Where concrete is used for backfill or for structures which would result in embedment, or partial embedment, of a metallic utility installation; or where the coating, bedding or other cathodic protection system is exposed or damaged by the Contractor's operations, the Contractor shall notify the Engineer and arrange to secure the advice of the affected utility owner regarding the procedures required to maintain or restore the integrity of the system.

5-3 REMOVAL. Unless otherwise specified, the Contractor shall remove all interfering portions of utilities shown on the Plans or indicated in the Bid documents as "abandoned" or "to be abandoned in place". Before starting removal operations, the Contractor shall ascertain from the Agency whether the abandonment is complete, and the costs involved in the removal and disposal shall be included in the Bid for the items of work necessitating such removals.

5-4 RELOCATION. When feasible, the owners responsible for utilities within the area affected by the Work will complete their necessary installations, relocations, repairs, or replacements before commencement of work by the Contractor. When the Plans or Specifications indicate that a utility installation is to be relocated, altered, or constructed by others, the Agency will conduct all negotiations with the owners and work will be done at no cost to the Contractor, except as provided in 301-1.6. Utilities which are relocated in order to avoid interference shall be protected in their position and the cost of such protection shall be included in the Bid for the items of work necessitating such relocation.

After award of the Contract, portions of utilities which are found to interfere with the Work will be relocated, altered or reconstructed by the owners, or the Engineer may order changes in the Work to avoid interference. Such changes will be paid for in accordance with 3-2.

When the Plans or Specifications provide for the Contractor to alter, relocate, or reconstruct a utility, all costs for such work shall be included in the Bid for the items of work necessitating such work. Temporary or permanent relocation or alteration of utilities requested by the Contractor for its convenience shall be its responsibility and it shall make all arrangements and bear all costs.

The utility owner will relocate service connections as necessary within the limits of the Work or within temporary construction or slope easements. When directed by the Engineer, the Contractor shall arrange for the relocation of service connections as necessary between the meter and property line, or between a meter and the limits of temporary construction or slope easements. The relocation of such service connections will be paid for in accordance with provisions of 3-3. Payment will include the restoration of all existing improvements which may be affected thereby. The Contractor may agree with the owner of any utility to disconnect and reconnect interfering service connections. The Agency will not be involved in any such agreement.

5-5 DELAYS. The Contractor shall notify the Engineer of its construction schedule insofar as it affects the protection, removal, or relocation of utilities. Said notification shall be included as a part of the construction schedule required in 6-1. The Contractor shall notify the Engineer in writing of any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities.

The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, noted, and completed in accordance with 5-1.

The Contractor may be given an extension of time for unforeseen delays attributable to unreasonably protracted interference by utilities in performing work correctly shown on the Plans.

The Agency will assume responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities within the area affected by the Work if such utilities are not identified in the Contract Documents. The Contractor will not be assessed liquidated damages for any delay caused by failure of Agency to provide for the timely removal, relocation, or protection of such existing facilities.

If the Contractor sustains loss due to delays attributable to interferences, relocations, or alterations not covered by 5-1, which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the Contractor such amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss as was unavoidable and the Contractor may be granted an extension of time.

5-5.1 Cooperation During Utility Relocation. When utilities are to be relocated during construction, the Contractor shall cooperate and coordinate with the respective utility owners so they may relocate their facilities to clear the Work. Delays in relocation of utilities which result from failure to cooperate and coordinate will not be a cause for an extension of time or Non-Working Days.

5-6 COOPERATION. When necessary, the Contractor shall so conduct its operations as to permit access to the Work site and provide time for utility work to be accomplished during the progress of the Work.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK.

The requirements of this section concerning submission of construction schedules shall not apply to projects where the time allowed to complete the Work is less than 25 Working Days or the total Contract Price bid is less than \$75,000 unless required by the special provisions.

The Contractor shall submit a construction schedule concurrently with the submittal of signed Contract, Contract bonds, and certificate of insurance. The Notice to Proceed will be delayed until the schedule is received. See 6-7.4, Starting of Contract Time.

When required by the Special Provisions, a revised schedule shall be submitted monthly prior to each progress payment closure date. Processing of the progress payment will be delayed until such revised schedule complying with this section is received.

The construction schedule shall be in the form of a Construction Element vs. Time Chart as shown in Appendix B-1 and a Work Complete vs. Time Chart as shown in Appendix B-2.

The B-1 Chart shall be in sufficient detail to show the chronological relationship of all activities of the project including, but not limited to, estimated starting and completion dates of various activities, submittal of shop drawings to the Engineer for approval, procurement of materials, and scheduling of equipment. The B-1 Chart shall recognize the requirements of 5-5. The B-1 Chart shall reflect obtaining all materials and completing all Work under the Contract within the specified time and in accordance with these Specifications. If the Contractor intends to complete the Work prior to the time for completion, the intended date of completion shall be set forth in the B-1 Chart and the Contractor shall execute a Contract Change Order that changes the number of Working Days allowed for completion to conform with such intended completion date. The Change Order shall not change the Contract Price.

The Contractor may submit a computer generated schedule in lieu of the form in Appendix B-1 and B-2, provided all of the elements shown on that form or specified herein are included.

An updated construction schedule shall be submitted prior to the next progress payment closure date whenever the actual percent Work complete versus percent time elapsed curve falls below and to the right of the dotted line shown on Appendix B-2.

If the Contractor desires to make a major change in its method of operations after commencing construction, or if its schedule fails to reflect the actual progress, it shall submit to the Agency a revised construction schedule in advance of beginning revised operations.

Revised and updated schedules shall show actual completion to the date of the revision in the lower segmented bar for each item.

The construction schedule shall be prepared as follows (see examples in Appendices C-1 and C-2):

1. On the B-1 Chart:
 - a. Enter the project name and Specification No. as shown on the notice inviting bids and the Contractors name.
 - b. List the items of Work either individually or combined where items are part of the same element of the Work.
 - c. Assign a value for each horizontal space plotting interval in Working Days as follows: 1 working day for total Contract time of less than 100 working days, 2 for 100 to 200 working days and 5 for longer projects. Enter the value used in the space provided in the lower part of the form.
 - d. At the end of performance time and draw a vertical line and label it "End Performance Time". Enter numbers at 10 times the plotting interval at the top of intermediate vertical lines.
 - e. Shade in a bar in the upper segmented section for each work item to indicate the period during which Work will be performed. Move-in time and delivery time for materials shall be shown if significant to the schedule.

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK. (Continued)

2. On the B-2 Chart:

- a. Enter the project name and Specification No. as shown on the notice inviting bids.
- b. At time intervals of 10 or 20 working days:
 - (1) Compute the cumulative dollar value of Work which is expected to be completed for each item of Work, including the value of the completed portion of lump-sum items.
 - (2) Divide the values computed in "b(1)" by the Total Contract Price to determine the percentage of the entire Contract planned for completion at the end of each time interval.
 - (3) Divide the days of performance time at the end of each time interval by the total Contract performance time to obtain the percentage of elapsed performance time.
- c. Plot each percentage of completion value figure computed in "b(2)" against the corresponding percentage of completion time computed in "b(3)" using scales on the bottom and left side of chart.
- d. Connect points plotted in "c" with a line which will show the planned progress for the entire job.

If the proposed percent Work complete versus percent time elapsed line falls below and to the right of the dotted line drawn on the B-2 Chart, the Contractor shall provide sufficient information and backup to show that the Work can be completed on time.

6-1.1 Beginning of Work. The issuance of Notice to Proceed by Agency shall constitute the Contractor's authority to enter upon the site of the Work and to begin operations provided it has also notified Engineer at least 24 hours in advance. Entry upon the site without authority will be treated as trespassing.

6-1.2 Starting Work. The Contractor may start work at any time after the Notice to Proceed is issued but work shall begin within 15 Days after the starting date for the Contract, or at such other time as may be indicated in the Special Provisions. The actual date on which the Contractor starts work will not affect the required time for completion as provided for in 6-7 and 6-7.1.

6-1.3 Work Sequence. If required by the Special Provisions, the Contractor shall start construction operations on that part of the Work designated by the Engineer.

6-1.4 Resources Required. The Work shall be conducted in such a manner and with sufficient materials, equipment, and labor to insure its completion in accordance with the Plans and Specifications within the time set forth in the Contract.

6-2 PROSECUTION OF WORK. To minimize public inconvenience and possible hazard and to restore streets and other Work areas to their original condition and former state of usefulness as soon as practicable, the Contractor shall diligently prosecute the Work to completion. If, in the Engineer's opinion, the Contractor fails to prosecute the Work to the extent that the above purposes are not being accomplished, the Contractor shall, upon orders from the Engineer, immediately take the steps necessary to fully accomplish said purposes. All costs of prosecuting the Work as described herein shall be absorbed in the Contractor's bid. Should the Contractor fail to take the necessary steps to fully accomplish said purposes, after orders of the Engineer to do so, the Engineer may suspend the Work in whole or in part, until the Contractor takes said steps.

As soon as possible under the provisions of these Specifications, the Contractor shall backfill all excavations and restore to usefulness all improvements existing prior to the start of the Work.

If Work is suspended through no fault of the Agency, all expenses and losses incurred by the Contractor during such suspensions shall be borne by the Contractor. If the Contractor fails to properly provide for public safety, traffic, and protection of the Work during periods of suspension, the Agency may elect to do so, and deduct the cost thereof from monies due the Contractor. Such action will not relieve the Contractor from liability.

6-3 SUSPENSION OF WORK

6-3.1 General. The Work may be suspended in whole or in part when determined by the Engineer that the suspension is necessary in the interest of the Agency. The Contractor shall comply immediately with any written order of the Engineer. Such suspension shall be without liability to the Contractor on the part of the Agency except as otherwise specified in 6-6.3.

6-3.2 Archaeological and Paleontological Discoveries. If discovery is made of items of archaeological or paleontological interest, the Contractor shall immediately cease excavation in the area of discovery and shall not continue until ordered by the Engineer. When resumed, excavation operations within the area of discovery shall be as directed by the Engineer.

Discoveries which may be encountered may include, but not be limited to, dwelling sites, stone implements or other artifacts, animal bones, human bones and fossils.

The Contractor shall be entitled to an extension of time and compensation in accordance with the provisions of 6-6.

6-3.3 Temporary Suspension of Work. Should suspension of Work be ordered by reason of the failure of the Contractor to carry out orders or to perform any provisions of the Contract; or by reason of weather conditions being unsuitable for performing any item or items of Work; the Contractor, at its expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension. In the event that the Contractor fails to perform the work above specified, the Agency may perform such work and the cost thereof will be deducted from monies due or to become due the Contractor.

If the Engineer orders a suspension of all of the Work, or a portion of the Work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the Work, the days on which the suspension is in effect shall not be considered Working Days.

If a portion of Work at the time of such suspension is not a current controlling operation or operations, but subsequently does become the current controlling operation or operations, the determination of Working Days will be made on the basis of the then current controlling operation or operations.

If a suspension of Work is ordered by the Engineer due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the Contract, the Days on which the suspension order is in effect shall be considered Working Days if such days are Working Days as defined.

6-4 DEFAULT BY CONTRACTOR. If the Contractor fails to begin delivery of material and equipment, to commence the Work within the time specified, to maintain the rate of delivery of material, to execute the Work in the manner and at such locations as specified, or fails to maintain a Work schedule which will insure the Agency's interest, or, if the Contractor is not carrying out the intent of the Contract, the Engineer may serve written notice upon the Contractor and the Surety on its Faithful Performance Bond demanding satisfactory compliance with the Contract.

The Contract may be canceled by the Board without liability for damage, when in the Board's opinion the Contractor is not complying in good faith, has become insolvent, or has assigned or subcontracted any part of the Work without the Board's consent. In the event of such cancellation, the Contractor will be paid the actual amount due based on Contract Unit Prices or lump sums bid and the quantity of the Work completed at the time of cancellation, less damages caused to the Agency by acts of the Contractor. The Contractor, in having tendered a bid, shall be deemed to have waived any and all claims for damages because of cancellation of Contract for any such reason. If the Agency declares the Contract canceled for any of the above reasons, written notice to that effect shall be served upon the Surety. The Surety shall, within 5 Days, assume control and perform the Work as successor to the Contractor.

If the Surety assumes any part of the Work, it shall take the Contractor's place in all respects for that part, and shall be paid by the Agency for all work performed by it in accordance with the Contract. If the Surety assumes the entire Contract, all money due the Contractor at the time of its default shall be payable to the Surety as the Work progresses, subject to the terms of the Contract.

If the Surety does not assume control and perform the Work within 5 Days after receiving notice of cancellation, or fails to continue to comply, the Agency may exclude the Surety from the premises. The Agency may then take possession of all material and equipment and complete the Work by Agency forces, by letting the unfinished Work to another Contractor, or by a combination of such methods. In any event, the cost of completing the Work shall be charged against the Contractor and its Surety, and may be deducted from any money due or becoming due from the Agency. If the sums due under the Contract are insufficient for completion, the Contractor or Surety shall pay to the Agency within 5 Days after the completion, all costs in excess of the sums due.

The provisions of this subsection shall be in addition to all other rights and remedies available to the Agency under law.

6-5 TERMINATION OF CONTRACT. The Board may terminate the Contract at its own discretion or when conditions encountered during the Work make it impossible or impracticable to proceed, or when the Agency is prevented from proceeding with the Contract by act of God, by law, or by official action of a public authority.

6-6 DELAYS AND EXTENSIONS OF TIME

6-6.1 General. If delays are caused by unforeseen events beyond the control of the Contractor, such delays will entitle the Contractor to an extension of time as provided herein, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3. Such unforeseen events may include war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating cessation of work, other similar action of the elements, inability to obtain materials, equipment or labor, required Extra Work, or other specific events as may be further described in the Specifications.

No extension of time will be granted for a delay caused by the Contractor's inability to obtain materials unless the Contractor furnishes to the Engineer documentary proof of the inability to obtain such materials in a timely manner in accordance with the sequence of the Contractor's operations and the approved construction schedule.

If delays beyond the Contractor's control are caused by events other than those mentioned above, but substantially equal in gravity to those enumerated, and an extension of time is deemed by the Engineer to be in the best interests of the Agency, an extension of time may be granted, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3.

If delays beyond the Contractor's control are caused solely by action or inaction by the Agency, such delays will entitle the Contractor to an extension of time as provided in 6-6.2.

6-6.2 Extensions of Time. Extensions of time, when granted, will be based upon the effect of delays to the Work as a whole and will not be granted for noncontrolling delays to minor included portions of Work unless it can be shown that such delays did, in fact, delay the progress of the Work as a whole.

6-6.3 Payment for Delays to Contractor. The Contractor will be compensated for damages incurred due to delays for which the Agency is responsible if such delays are unreasonable in the circumstances involved and were not within the contemplation of the parties when the Contract was awarded to the Contractor and delay the Work as a whole. Such actual costs will be determined by the Engineer. The Agency will not be liable for, and in making this determination the Engineer will exclude, all damages which the Engineer determines the Contractor could have avoided by any reasonable means including, without limitation, the judicious handling of forces, equipment, or plant.

6-6.4 Written Notice and Report. If the Contractor desires payment for a delay as specified in 6-6.3 or an extension of time, it shall, within 30 Days after the beginning of the delay, file with the Agency a written request and report as to the cause and extent of the delay. The request for payment or extension must be made at least 15 Days before the specified completion date. Failure by the Contractor to file these items within the time specified will be considered grounds for refusal by the Agency to consider such request.

6-6.4.1 Documentation of Delays. When the Contractor requests an extension of time for delay due to inability to obtain materials or equipment, the documentary proof required by 6-6.1 shall include the following:

1. Date Engineer was notified of delay.
2. Date the delay began.
3. Exact description of material or equipment causing delay.
4. Documentation showing when and from whom ordered.
5. Documentation of promise to deliver.
6. Documentation of actual delivery date.
7. Description of how late delivery caused delay (include construction schedule).
8. Documentation of measures taken to get prompt delivery.
9. Documentation of attempts to get delivery from other sources.
10. Description of steps taken in project scheduling to minimize effects of late delivery.
11. Description of steps taken to get project back on schedule after actual delivery.
12. Statement of actual time lost as a result of late delivery.

6-7 TIME OF COMPLETION

6-7.1 General. The Contractor shall complete the Work within the time set forth in the Contract. The Contractor shall complete each portion of the Work within such time as set forth in the Contract for such portion. Unless otherwise specified, the time of completion of the Contract shall be expressed in Working Day

6-7.2 Working Day. A Working Day is any day within the period between the start of the Contract time as defined in 6-1 and the date provided in the Contract for completion or upon field acceptance by the Engineer of all Work provided for in the Contract, whichever occurs first, other than:

- (1) Saturday,
- (2) Sunday,
- (3) any day designated as a holiday by the Agency,
- (4) any other day designated as a holiday in a Master Labor Agreement entered into by the Contractor or on behalf of the Contractor as an eligible member of a Contractor Association,
- (5) any day the Contractor is prevented from working at the beginning of the workday for cause as defined in 6-6.1,
- (6) any day the Contractor is prevented from working during the first 5 hours of the workday with at least 60 percent of the normal work force for cause as defined in 6-6.1.

6-7.2.1 Holidays. Solely for the purposes of paragraph (3) of 6-7.2, the following days are designated as holidays by the Agency.

MONTH	A	B
	AGENCY EMPLOYEE HOLIDAYS	OTHER DESIGNATED HOLIDAYS
January	1st day; 3rd Monday	None
February.....	3rd Monday.....	12th day
March	None.....	31st day
March-April.....	None.....	One Friday between March 21 and April 23 designated as Good Friday
May	Last Monday.....	None
June	None.....	None
July.....	4th day.....	None
August.....	None.....	None
September	1st Monday	9th day
October	None.....	2nd Monday
November	4th Thursday	11th day; the Friday following the 4th Thursday
December	25th	23rd day, only if Thursday or Friday; 24th day; 31st day

If any day listed above falls on Saturday, the preceding Friday is the holiday. If any day listed above falls on Sunday, the succeeding Monday is the holiday.

No extra holiday shall result when such Friday or Monday is already designated as a holiday.

A copy of a Working Day calendar incorporating the above-listed holidays and used by the Agency for Contract time accounting purpose will be furnished to the Contractor upon request.

The term "holiday" as used in this section shall not be construed as being the same as "holiday" within the meaning of 7-2.2.

The Contractor may perform work on the holidays designated in Column A above provided it has obtained prior written approval of the Engineer at least two Days in advance of performing the work. The Contractor may perform work on the holidays designated in Column B above provided the Contractor notifies the Engineer two Days in advance of the holiday.

6-7.2.2 Landscape Maintenance Period. Where a landscape maintenance period is specified, the portion of the time in such period that follows the completion of all other Work required by the Contract shall not be Working Days for Contract time accounting.

6-7.3 Contract Time Accounting. The Engineer will make a daily determination of each Working Day to be charged against the Contract time. These determinations will be discussed and the Contractor will be furnished a periodic statement showing the allowable number of Working Days of Contract time, as adjusted, at the beginning of the reporting period. The statement will also indicate the number of Working Days charged during the reporting period and the number of Working Days of Contract time remaining. If the Contractor does not agree with the statement, the Contractor must file a written protest within 15 Days after receipt, setting forth the facts of the protest. Otherwise, the statement will be deemed to have been accepted.

6-7.4 Starting Date for Contract Time and Notice to Proceed. The starting date for Contract time accounting will be determined by adding the number of Days indicated on the Proposal form to the date the Contract is awarded, however the Agency may, at its option, delay the starting date by not more than 60 calendar Days if necessary to obtain permits, rights-of-way, or approval of federal or State authorities, or when prevented from starting the project due to causes beyond its control. Notice to Proceed will be issued within 7 calendar Days after the Contract, bonds, certificates of insurance and other documents have been returned, properly completed by the Contractor, unless the starting date is delayed as herein provided. If the Agency delays the Contract starting date, Notice to Proceed will be issued at least 7 calendar Days prior to the new starting date. Any delay caused by failure of the Contractor to properly complete or timely return the Contract Documents shall not change the Contract starting date and shall not be a cause for extending the Contract time. The Notice of Award will indicate a probable Contract starting date. The Notice to Proceed will indicate the actual Contract starting date, computed as herein described.

6-8 COMPLETION, ACCEPTANCE AND WARRANTY.

6-8.1 Completion and Acceptance. Acknowledgment of completion of the Work will occur prior to Acceptance by the Agency. Acceptance will only occur after all Contract requirements have been fulfilled, such as training, submission of warranties, maintenance manuals, record drawings, Release on Contract and the like. Acceptance by the Agency will occur when the Engineer signs the Notice of Completion.

The Work will be inspected by the Engineer promptly upon receipt of the Contractor's written assertion that the Work has been completed. If, in the Engineer's judgment, the Work has been completed in accordance with the Plans and Specifications, the Engineer will acknowledge completion of the Work. Completion of the Work, as used above, shall include the Contractor showing evidence of having received an occupancy clearance from Building and Safety, or other permit issuing agency, when a building, plumbing electrical, grading, or other permit is required for the Work. The Engineer will, in acknowledging completion of the Work, set forth in writing the date when the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect the Work. This will also be the date to which liquidated damages will be computed.

6-8.2 Warranty The Work shall be warranted by the Contractor against defective workmanship and materials for a period of 1 year from the date the Work was completed. The Contractor shall replace or repair any such defective workmanship and materials in a manner satisfactory to the Engineer, after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such replacement or repair within the time specified in the notice, the Agency may perform the replacement or repair and the Contractor and its sureties shall be liable for the cost thereof.

6-8.3 No Waiver of Legal Rights. The Agency shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and Acceptance of the Work and payment therefor from showing the true amount and character of the Work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, nor that the Work or materials do not in fact conform to the Contract.

The Agency shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor or its sureties, or both, such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract.

Neither the Acceptance by the Engineer or by its representative, nor any payment for or Acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Engineer shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.

A waiver of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach.

6-8.4 Landscape Maintenance Period. Final Acceptance of the Contract shall follow the satisfactory completion of all Contract Work, including the landscape maintenance period if one is specified.

6-8.5 Non-complying Work. Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Agency, shall constitute an Acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

6-8.6 Written Warranties. The Contractor shall obtain and deliver to the Engineer all written warranties required to be furnished by the Specifications. Each of such warranty shall be underwritten by the Contractor for the full period prescribed therein, and shall bear its endorsement to such effect.

6-9 LIQUIDATED DAMAGES. Failure of the Contractor to complete the Work within the time allowed will result in damages being sustained by the Agency. Such damages are, and will continue to be, impracticable and extremely difficult to determine. For each consecutive calendar day in excess of the time specified, as adjusted in accordance with 6-6, for completion of the Work the Contractor shall pay to the Agency, or have withheld from monies due it, the sum of \$250, unless otherwise provided in the Contract Documents.

Execution of the Contract under these Specifications shall constitute agreement by the Agency and Contractor that \$250 per day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the Work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

6-10 USE OF IMPROVEMENT DURING CONSTRUCTION. The Agency reserves the right to take over and utilize all or part of any completed facility or appurtenance. The Contractor will be notified in writing in advance of such action. Such action by the Agency will relieve the Contractor of responsibility for injury or damage to said completed portions of the improvement resulting from use by public traffic or from the action of the elements or from any other cause, except injury or damage resulting from the Contractor's operations or negligence. The Contractor will not be required to reclean such portions of the improvement before field completion, except for cleanup made necessary by its operations. Nothing in this section shall be construed as relieving the Contractor from full responsibility for correcting defective work or materials.

In the event the Agency exercises its right to place into service and utilize all or part of any completed facility or appurtenance, the Agency shall assume the responsibility and liability for injury to persons or property arising out of or resulting from the utilization of the facility or appurtenance so placed into service, except for any willful or negligent act or omission by the Contractor, Subcontractor, their officers, employees or agents.

6-10.1 Use of Improvements - Exceptions. The provisions of 6-10 shall not apply to projects for the repair, modification, enlargement or improvement of existing facilities that are to remain in use during construction except where a portion of the project which is completely independent from the rest of the Work can be completed and put into use by the Agency.

On projects on public roads, after satisfactory completion of an isolated section of the Work involving roadway improvements or repairs, when all temporary signs and other temporary Contractor facilities have been removed, the section is not being used as a detour, the section is no longer under the Contractor's control, and the section is opened to public traffic through the end of the Contract period, that section of the Work shall be taken over by the Agency as provided in 6-10. The Contractor shall indicate to the Engineer in writing when the conditions of this paragraph have been complied with and shall specify the limits of the section involved. Any taking over of the Work by the Agency shall be effective only when formal written notification is issued by the Agency.

6-11 NOTICE OF POTENTIAL CLAIM FOR ADDITIONAL COMPENSATION. Procedures for notice of claims in specific situations and circumstances are provided in the following sections:

- 3-4 Changed Conditions
- 6-6.4 Delay and Extensions of Time
- 6-7.3 Contract Time Accounting

Compliance with this section is not prerequisite to assertion of a claim involving those sections or based on differences in measurements or errors of computation as to Contract quantities.

Compliance with the provisions of this section is required in all other situations and circumstances.

It is the intention of this section that differences arising between the parties under and by virtue of the Contract be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action taken to resolve such differences.

The Contractor shall give the Engineer written notice of a potential claim, setting forth: (1) the reasons for which the Contractor believes additional compensation will or may be due; (2) the nature of the costs involved; and (3) insofar as possible, the amount of the potential claim.

If the claim is based upon an act or failure to act by the Engineer, the said notice must be given to the Engineer prior to the date when the work giving rise to the potential claim is commenced; in all other cases the said notice must be given to the Engineer within 15 Days after the happening of the event, thing or occurrence giving rise to the potential claim.

The Contractor shall not be entitled to the payment of any additional compensation where the written notice of potential claim has not been given to the Engineer in the manner required by and within the time limitations of this section.

6-12 DISPUTES AND CLAIMS; PROCEDURE.

6-12.1 GENERAL. Any and all decisions made on appeal pursuant to this section shall be in writing. Any "decision" purportedly made pursuant to this section which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

Filing or giving the notices required under 3-4, 6-6.4, 6-7.3 and 6-11 is prerequisite to recovery under a Contractor's claim for additional compensation; nothing in this section shall excuse the Contractor from its duty to file or give the required notices, or from performing other duties required by the Contract Documents.

6-12.2 ADMINISTRATIVE REVIEW. Prior to filing a Complaint in Arbitration, the Contractor shall exhaust its administrative remedies by attempting to resolve its dispute or claim with Agency's staff in the following sequence:

Project manager
Department Director (Public Works Agency)
Director of the Public Works Agency (the Engineer)

Should the Project manager or the Department Director (Public Works Agency) fail to address a request by the Contractor for review of a disputed decision within 14 calendar Days after receiving such request, the Contractor may proceed directly to the next person on the list.

At the option of the Agency, the person to whom the request for review is directed may elect to take such request to a higher level and the Contractor's request shall be deemed to be properly submitted to such higher level.

The Engineer shall address disputes or claims within 28 calendar Days after receiving such request and all necessary supporting data. The Engineer's decision on the dispute or claim shall be the Agency's final decision.

Requests for review made to the Project manager may be either oral or written. Requests for review made to the Department Director (Public Works Agency) and The Engineer shall be made in writing and shall include:

- a. A copy of the disputed decision.
- b. A statement as to why the Contractor believes the decision is in error.
- c. All correspondence and evidence that the Contractor wishes to have considered in the review. Where the request for review is made to the Engineer, in lieu of resubmitting correspondence and evidence which has already been submitted to the Department Director (Public Works Agency), the request may include a list of the correspondence and evidence which should be considered by the Engineer. Any additional correspondence and evidence not previously submitted to the Department Director (Public Works Agency) shall be included with the request to the Engineer, if the Contractor wishes it to be considered. If relevant evidence is not available at the time the request is made to the Department Director (Public Works Agency) or the Engineer, such evidence shall be identified and a statement included as to when such evidence will be submitted.

Each request for review shall be submitted by the Contractor within 21 calendar Days of receipt of the decision which it wishes reviewed.

6-12.3 ARBITRATION. Claims and disputes arising under or related to the performance of the Contract, except for claims which have been released by execution of the "Release on Contract" as provided in 9-4, shall be resolved by arbitration unless the Agency and the Contractor agree in writing, after the claim or dispute has arisen, to waive arbitration and to have the claim or dispute litigated in a court of competent jurisdiction. Arbitration shall be pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2 of the Public Contract Code and the regulations promulgated thereto, Chapter 4 (commencing with Section 1300) of Division 2 of Title 1 of the California Code of Regulations. The arbitration decision shall be decided under and in accordance with California law, supported by substantial evidence and, in writing, contain the basis for the decision, findings of fact, and conclusions of law.

Arbitration shall be initiated by a Complaint in Arbitration made in compliance with the requirements of said Chapter 4. A Complaint in Arbitration by the Contractor shall be filed not later than 90 calendar Days after receipt of the final written decision of the Agency on the claim or dispute or within 300 Days after Acceptance of the Work by the Agency if no written decision has been issued. For the purposes of this section, "Acceptance of the Work by the Agency" shall be defined as the date the Notice of Completion is filed.

Where an election is made by either party to use the Simplified Claims Procedure provided under Sections 1340-1346 of said Chapter 4, the parties may mutually agree to waive representation by counsel.

All contracts valued at more than \$25,000 between the Contractor and its subcontractors and suppliers shall include a provision that the subcontractors and suppliers shall be bound to the Contractor to the same extent that the Contractor is bound to the Agency by all terms and provisions of the Contract, including this arbitration provision.

6-13 CONTRACTOR'S WORK HOURS

6-13.1 Working Hours Limitations. Except as otherwise specified, no work shall be performed by the Contractor at the Work site between the hours of 7:00 p.m. and 7:00 a.m. the following day, nor shall work be performed on Saturdays, Sundays or holidays listed in 6-7.2.1.

6-13.2 Regular Work Schedule. The Contractor shall furnish a work schedule with the Construction Schedule required by 6-1 and inform the Engineer at least two Days in advance of changing the schedule. The schedule shall include the times for starting and ending work on each day. Such starting and ending times shall not be more than 10 1/2 hours apart.

6-13.3 Exceptions. The limitations on working hours and days shall not apply to emergency work made necessary by unusual conditions where such work is necessary to protect the Work, to protect the property of others, to protect life, or to ensure the orderly flow of traffic.

The limitations of this section shall not apply where work at times other than allowed by 6-13.1 and 6-13.2 is necessary in order to make utility connections or is required by other provisions contained in these Specifications in order to perform the work in the manner specified. In these cases, the Contractor shall obtain prior written approval of the Engineer at least two Days in advance of performing the work.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-1 THE CONTRACTOR'S EQUIPMENT AND FACILITIES.

7-1.1 General. The Contractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work.

The Contractor shall provide and maintain enclosed toilets for the use of employees engaged in the Work.

These accommodations shall be maintained in a neat and sanitary condition, and regularly pumped out.

7-1.2 Temporary Utility Services. The Contractor shall, at its own expense, make all arrangements necessary for the provision of temporary utility services necessary for its own use during performance of the Work.

The Contractor shall not draw water from any fire hydrant (except to extinguish a fire), without obtaining permission from the water utility owner.

7-1.3 Crushing and Screening Operations. Unless otherwise specified in the Special Provisions, the establishment and operation of portable screens and crushers will not be allowed on or adjacent to the Work site.

7-2 LABOR

7-2.1 General. Only competent workers shall be employed on the Work. Any person employed, who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform its work properly and acceptably, shall be immediately removed from the Work by the Contractor and not be reemployed on the Work.

7-2.1.1 Special Qualifications. Where the Engineer determines certain portions of the Work require experience, training, certification or other special qualifications that may not be possessed by the average journeyman, such portions of the Work will be specifically identified in the Special Provisions and the special qualifications identified.

When work requiring special qualifications is being performed, a person with such qualifications must be in immediate charge of the work. The person may be a lead journeyman, foreman or trade superintendent. The general superintendent or a foreman who is not specifically assigned to the area where the identified work is being performed will not be considered to be in immediate charge of the work.

Written certification of the required qualifications shall be furnished to the Engineer at least one week prior to the time work is commenced on the work requiring such qualifications. Such certification is subject to review and acceptance by the Engineer. If, during performance of work requiring special qualifications, the qualified person becomes temporarily or permanently unavailable to the Contractor, work shall not proceed until a qualified replacement has been accepted by the Engineer. The Engineer will promptly consider the certification of the replacement.

If identified work is performed without a person having the special qualifications in charge, the Engineer may, at its sole discretion, order such work removed and replaced at the Contractor's expense.

If, after certification is accepted, the Engineer finds that the certification was inaccurate, or work on the project indicates a lack of the knowledge and experience to supervise the work, the Engineer may order the work stopped until an acceptable replacement has been certified, accepted and is in charge.

7-2.2 Laws. The Contractor, its agents, and employees shall be bound by and comply with all applicable provisions of the Labor Code and with Federal, State, and local laws related to labor.

The Contractor shall strictly adhere to the provisions of the Labor Code regarding minimum wages, the 8 hour day and the 40 hour week, overtime, Saturday, Sunday, and holiday work, and non-discrimination because of race, color, national origin, sex or religion. The Contractor shall forfeit to the Agency the penalties prescribed in the Labor Code for violations.

In accordance with the Labor Code, the Board has on file and will publish a schedule of prevailing wage rates for the types of work to be done under the Contract. The Contractor shall not pay less than these rates.

Each worker shall be paid subsistence and travel as required by the collective bargaining agreements on file with the State of California, Department of Industrial Relations.

The Contractor's attention is directed to Section 1776 of the Labor Code which imposes responsibility upon the Contractor for the maintenance, certification, and availability for inspection of such records for all persons employed by the Contractor or Subcontractor in connection with the Work. The Contractor shall agree through the Contract to comply with this Section and the remaining provisions of the Labor Code.

7-2.2.1 Apprentices. Apprentices shall be employed on the Work in accordance with Labor Code Section 1777.5. The Contractor is responsible for compliance with Labor Code Section 1777.5 for all apprenticeable occupations whether employed directly or through subcontractors.

7-2.2.2 Contractors' Duties Concerning Labor Code Compliance. Labor Code Sections 1771, 1775, 1776, 1777.5, 1813 and 1815 are required to be included in the contract between the Contractor and subcontractors. The Contractor agrees to comply with these sections and all remaining provisions of the Labor Code.

7-3 INDEPENDENCE OF CONTRACTOR, INDEMNIFICATION AND POLLUTION

7-3.1 Independence of Contractor. It is understood and agreed that Contractor is at all times an independent contractor and that no relationship of employer-employee exists between the parties hereto. Contractor will not be entitled to any benefits payable to employees of County, including but not limited to overtime, retirement benefits, workers' compensation benefits, injury leave or other leave benefits. County is not required to make any tax or benefit deductions from the compensation payable to Contractor under the provisions of this Agreement. As an independent contractor, Contractor hereby holds County harmless from any and all claims that may be made against County based upon any contention by any third party that an employer-employee relationship exists by reason of the Agreement.

If, in the performance of this Agreement, any third persons are employed by Contractor, such persons will be entirely and exclusively under the direction, supervision and control of Contractor. All terms of employment, including hours, wages, working conditions, discipline, hiring and discharging or any other terms of employment or requirements of law, will be determined by Contractor. County will have no right or authority over such persons or the terms of such employment, except as provided in this Agreement.

7-3.2 Indemnification and Hold Harmless Clause. All activities arising out of or relating to the performance of the Work covered by this Contract shall be at the risk of Contractor. To the fullest extent permitted by law, Contractor shall defend (at County's request), indemnify and hold harmless Agency, and the County of Ventura if the County of Ventura is not the entity defined as Agency under this Contract, including all of their boards, agencies, departments, officers, employees, agents and volunteers, against any and all claims, suits, actions, legal or administrative proceedings, judgments, debts, demands, damages, including injury or death to any person or persons, and damage to any property including loss of use resulting therefrom, incidental and consequential damages, liabilities, interest, costs, attorneys' fees and expenses of whatsoever kind of nature, whether arising before, during or after commencement or completion of this Contract, whether against Contractor, Agency or the County of Ventura or which are in any manner, directly, indirectly, in whole or in part, arising from any act, omission, fault or negligence, whether active or passive, of Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable in connection with or incident to the Contract, even though the same may have resulted from the joint, concurring or contributory negligence, whether active or passive, of Agency, the County of Ventura or any other person or persons, unless the same be caused by the sole negligence or willful misconduct of Agency or County of Ventura.

The Agency will notify the Contractor of the receipt of any third party claims.

7-3.3 Contamination and Pollution. Contractor, solely at its own cost and expense, will provide clean up of any premises, property or natural resources contaminated or polluted due to Contractor activities. Any fines, penalties, punitive or exemplary damages assigned due to contaminating or polluting activities of the Contractor will be borne entirely by the Contractor.

7-4 INSURANCE REQUIREMENTS

Contractor, at its sole cost and expense, shall obtain and maintain in full force during the term of this Contract the following types of insurance:

7-4.1 Workers' Compensation Insurance.

7-4.1.1 Coverage. Workers' Compensation coverage, in full compliance with Labor Code 3700, for all employees of Contractor and Employer's Liability in the minimum amount of \$1,000,000. The Agency, the County of Ventura, its officers, employees or Consultants, will not be responsible for any claims in law or equity occasioned by failure of Contractor to comply with this paragraph.

7-4.1.2 Certification. Before execution of the Contract by Agency, Contractor shall file with the Engineer the following signed certification:

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

7-4.2 Commercial General Liability Insurance

7-4.2.1 Insurance Classes. "Occurrence" coverage in the minimum amount of: _

	<u>Coverage Class</u>	<u>Coverage</u>
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L-A	\$1,000,000 combined single limit (CSL) bodily injury and property damage each occurrence and \$1,000,000 aggregate
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L-B	\$1,000,000 CSL bodily injury and property damage each occurrence and \$2,000,000 aggregate
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L-C	\$5,000,000 CSL bodily injury and property damage each occurrence and \$5,000,000 aggregate
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including but not limited to coverages for premises/operations; products/completed operations; independent contractors; underground, explosion and collapse hazards; personal injury; broad form property damage; broad form blanket contractual.

If no coverage class is specified in "Proposal", coverage class L-B shall apply.

7-4.2.2 Coverage Exceptions. On projects where no explosives will be used and no demolition is involved, the coverage for explosion may be omitted. On projects where no excavation is involved, the coverage for underground hazard may be omitted. The omission of said coverages is at Agency's option, and shall not abrogate Contractor's responsibilities for indemnification as set forth in these Specifications.

7-4.2.3 Excess Liability Policies. All Excess Liability policies, if used, shall be on an "umbrella" or following form or the primary layer of coverage.

7-4.3 Commercial Automobile Liability Insurance

Coverage in the minimum amount of \$1,000,000 CSL bodily injury and property damage, including automobile liability, any auto.

7-4.4 Property Insurance

Contractor shall arrange for its own "Course of Construction" insurance on the project to protect its interests, as Agency does not have this coverage.

Contractor is responsible for delivering to Agency Work completed in accordance with the Contract except as provided in 7-18 (Acts of God). Should the Work being constructed be damaged by fire or other causes during construction, it shall be replaced by Contractor in accordance with the requirements of the Plans and Specifications without additional expense to Agency.

7-4.5 Other Insurance Provisions.

7-4.5.1 Insurance Company Qualifications. All insurance required shall be issued by (a) an admitted company or admitted companies authorized to transact business in the State of California which have a BEST rating of B+ or higher and a Financial Size Category (FSC) of VII or larger or (b) a California approved Surplus Line carrier or carriers which have a BEST rating of A or higher and a Financial Size Category (FSC) of VII or larger.

Workers compensation insurance not meeting the above requirements but meeting all other requirements of the specifications, will be accepted.

7-4.5.2 Primary Coverage. All insurance required shall be primary coverage as respects Agency and any insurance or self-insurance maintained by Agency or the County of Ventura shall be in excess of Contractor's insurance coverage and shall not contribute to it.

7-4.5.3 Aggregate Limits Exceeded. Agency shall be notified immediately if any aggregate insurance limit is exceeded. Contractor shall purchase additional coverage to meet requirements.

7-4.5.4 Liability in Excess of Limits. Insurance coverage in the minimum amounts set forth herein shall not be construed to relieve Contractor for liability in excess of such coverage, nor shall it preclude Agency or the County of Ventura from taking such other actions as is available to it under any other provisions of this Contract or otherwise in law.

7-4.5.5 Additional Insured Endorsements. The Agency and the County of Ventura, including its boards, all special Districts governed by the Board of Supervisors, agencies, departments, officers, Consultants, employees, agents and volunteers, shall be named as Additional Insured as respects Work done by Contractor under the terms of the Contract on all policies required (except Workers' Compensation).

7-4.5.6 Waiver of Subrogation Rights. Contractor agrees to waive all rights of subrogation against the Agency, the County of Ventura, its boards, districts, agencies, departments, officers, employees, agents and volunteers for losses arising directly or indirectly from the activities or Work performed by Contractor under the Contract (applies only to Workers' Compensation and Commercial General Liability).

7-4.5.7 10 Day Notice Required. Policies shall not be canceled, non-renewed or reduced in scope of coverage until after 10 Days written notice by mail has been given to Agency. Policies shall not be cancelled for non-payment of premium until after 10 Days written notice by mail has been given to Agency.

7-4.5.8 Documentation Required. Prior to execution of the Contract by Agency, Contractor shall provide Agency with Certificates of Insurance for all required coverages (see Appendix A for example) and indicating that the endorsement(s) required have been issued.

It is the responsibility of the Contractor to confirm that all terms and conditions of Section 7-4 Insurance Requirements are complied with by any and all subcontractors that Contractor may use in the completion of this Agreement.

7-5 PERMITS. The Agency will obtain, at no cost to the Contractor, all encroachment and building permits necessary to perform Contract Work in streets, highways, railways or other rights of way, unless the necessity for such permit(s) is created by a method of operation chosen by the Contractor. The Contractor shall obtain and pay for all costs incurred for permits necessitated by its operations such as, but not limited to, those permits required for night Work, overload, blasting and demolition.

The Contractor shall pay all business taxes or license fees that are required for the Work.

7-5.1 Highway and Railroad Permits. The Engineer will obtain the basic State highway and railroad encroachment permits which will include checking of plans. However, the Contractor must also obtain permits from these agencies. Inspection fees charged by these agencies must be paid by the Contractor.

7-5.2 Grading Ordinance

7-5.2.1 General. All excavation, filling and grading operations in Ventura County are governed by the Ventura County Grading Ordinance or City Ordinances, except within the project right of way shown on the Plans.

7-5.2.2 Permits Required. Work outside the project right of way which involves excavation or filling of soils is subject to all requirements of the applicable grading ordinance. The requirements may include, but are not limited to, submitting of a grading plan prepared by a Civil Engineer, obtaining a grading permit, paying the permit fee, posting a grading bond, hiring professionals for engineering and testing services, compacting fills, constructing drainage facilities and providing erosion protection.

7-5.2.3 Imported and Exported Material. To insure that neither the Agency nor the Contractor is a party to aiding or abetting any property owner (who is ultimately responsible) to violate the applicable grading ordinance, no material shall be imported from or exported or wasted outside the project right of way until the Contractor has furnished the Engineer a copy of the grading permit or certificate of exemption covering such operation on land where material is to be deposited or excavated.

7-5.2.4 Exemptions from Permit. No grading permit is required of the Contractor for Work performed within the project right of way shown on the Plans or on borrow or disposal areas shown on the Plans or described in the Special Provisions and which are specifically designated as being exempt from such permit requirements.

7-5.3 Building Permit.

7-5.3.1 Agency Furnished Permits. Except as provided in 7-5.3.2, Agency will submit the plans for the Work to Department of Building and Safety, and other building related permit issuing agencies, for plan check and make the corrections necessary for the issuance of building and related permits. Agency will Pay plan check and permit fees for the Work. The Contractor may be required to furnish information to the permit issuing agencies, as required for the issuance of permits, and sign the permit.

7-5.3.2 Contractor Furnished Permits. Components or systems, required by the Contract, may require the preparation of plans and calculations to obtain approvals or permits from state or local building, fire prevention, public health, safety, environmental protection and other agencies in addition to the basic permits arranged for by the Agency as provided in 7-5.3.1. Contractor shall take all actions in a timely manner to obtain such approvals or permits so as not to delay completion of the Work beyond the time provided in 6-7. Contractor shall include all costs and consider the time required to obtain approvals or permits in the Contract price bid.

7-5.4 Coastal Zone Permits

7-5.4.1 Agency Furnished Permits. Permits required for Work on the project within rights of way furnished by the Agency within the Coastal Zone will be obtained by the Agency.

7-5.4.2 Contractor Furnished Permits. Permits required for the Contractor's operations outside of rights of way furnished by the Agency must be obtained by the Contractor. Such permits are required for brush removal, grading, dredging, disposal of material and many other operations within the Coastal Zone.

7-6 THE CONTRACTOR'S REPRESENTATIVE. Before starting work, the Contractor shall designate in writing a representative who shall have complete authority to act for it. An alternative representative may be designated as well. The representative or alternate shall be present at the Work site whenever work is in progress or whenever actions of the elements necessitate its presence to take measures necessary to protect the Work, persons, or property. Any order or communication given to this representative shall be deemed delivered to the Contractor. A joint venture shall designate only one representative and alternate. In the absence of the Contractor or its representative, instructions or directions may be given by the Engineer to the superintendent or person in charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or its representative.

In order to communicate with the Agency, the Contractor's representative, superintendent, or person in charge of specific work shall be able to speak, read, and write the English language.

7-7 COOPERATION AND COLLATERAL WORK. The Contractor shall be responsible for ascertaining the nature and extent of any simultaneous, collateral, and essential work by others. The Agency, its workers and contractors and others, shall have the right to operate within or adjacent to the Work site during the performance of such work.

The Agency, the Contractor, and each of such workers, contractors and others, shall coordinate their operations and cooperate to minimize interference.

The Contractor shall include in its Bid all costs involved as a result of coordinating its work with others. The Contractor will not be entitled to additional compensation from the Agency for damages resulting from such simultaneous, collateral, and essential work. If necessary to avoid or minimize such damage or delay, the Contractor shall redeploy its work force to other parts of the Work.

Should the Contractor be delayed by the Agency, and such delay could not have been reasonably foreseen or prevented by the Contractor, the Engineer will determine the extent of the delay, the effect on the Work, and any extension of time.

7-8 WORK SITE MAINTENANCE

7-8.1 General Throughout all phases of construction, including suspension of the Work, and until acceptance per 6-8, the Contractor shall keep the Work site clean and free from rubbish and debris. Rubbish and debris collected on the Work site shall only be stored in roll-off, enclosed containers prior to disposal. Stockpiles of such will not be allowed.

When required by the Special Provisions, the Contractor shall provide a self-loading motorized street sweeper equipped with a functional water spray system. The sweeper shall clean all paved areas within the Work site and all paved haul routes at least once each working day.

The Contractor shall ensure there is no spillage along haul routes. Any such spillage shall be removed immediately and the area cleaned.

Should the Contractor fail to keep the Work site free from rubbish and debris, the Engineer may suspend the Work per 6-3 until the condition is corrected.

7-8.2 Air Pollution Control The Contractor shall not discharge smoke, dust, equipment exhaust, or any other air contaminants into the atmosphere in such quantity as will violate any Federal, State, or local regulations.

The Contractor shall also abate dust nuisance by cleaning, sweeping and spraying with water, or other means as necessary. The use of water shall conform to 7-8.6.

7-8.3 Noise Control. Noise generated from the Contractor's operations shall be controlled as specified in the Special Provisions.

7-8.4 Storage of Equipment and Materials.

7-8.4.1 General Materials and equipment shall be removed from the Work site as soon as they are no longer necessary. Before inspection by the Engineer for acceptance, the Work site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance.

Excess excavated material shall be removed from the Work site immediately unless otherwise specified in the Special Provisions.

Forms and form lumber shall be removed from the Work site as soon as practicable after stripping.

7-8.4.2 Storage in Public Streets. Construction materials and equipment shall not be stored in streets, roads, or highways for more than 5 days after unloading unless otherwise specified in the Special Provisions or approved by the Engineer. All materials or equipment not installed or used in construction within 5 days after unloading shall be stored at a location approved by the Engineer.

Excavated material, except that which is to be used as backfill in the adjacent trench, shall not be stored in public streets unless otherwise specified in the Special Provisions or approved by the Engineer. Immediately after placing backfill, all excess material shall be removed from the Work site.

7-8.5 Sanitary Sewers.

7-8.5.1 General. The flow of sewage shall not be interrupted. Should the Contractor disrupt the operation of existing sanitary sewer facilities, or should disruption be necessary for performance of the Work, the Contractor shall bypass the sewage flow around the Work. Sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches nor be covered by backfill.

Whenever sewage bypass and pumping is required by the Plans or Specifications, or the Contractor so elects to perform, the Contractor shall submit per 2-5.3 a working drawing conforming to 7-8.5.2 detailing its proposed plan of sewage bypass and pumping.

7-8.5.2 Sewage Bypass and Pumping Plan. The plan shall indicate the locations and capacities of all pumps, sumps, suction and discharge lines. Equipment and piping shall be sized to handle the peak flow of the section of sewer line to be bypassed and pumped. Equipment and piping shall conform to 7-10, the Plans, and the Special Provisions. Bypass piping, when crossing areas subject to traffic loads, shall be constructed in trenches with adequate cover and otherwise protected from damage due to traffic. Lay-flat hose or aluminum piping with an adequate casing and/or traffic plates may be allowed if so approved by the Engineer. Bypass pump suction and

discharge lines that extend into manholes shall be rigid hose or hard pipe. Lay flat hose will not be allowed to extend into manholes. The Contractor shall provide a backup bypass pumping system in case of malfunction. The backup bypass system shall provide 100 percent standby capability, and be in place and ready for immediate use.

Each standby pump shall be a complete unit with its own suction and discharge piping. In addition to the backup system, the Contractor shall furnish and operate vacuum trucks when required by the Plans or Special Provisions.

7-8.5.3 Spill Prevention and Emergency Response Plan. The Contractor shall prepare and submit per 2-5.3 a spill prevention and emergency response plan. The plan shall address implementation of measures to prevent sewage spills, procedures for spill control and containment, notifications, emergency response, cleanup, and spill and damage reporting.

The plan shall account for all storm drain systems and water courses within the vicinity of the Work which could be affected by a sewage spill. Catch basins that could receive spilled sewage shall be identified Unless otherwise specified in the Special Provisions, these catch basins shall be sealed prior to operating the bypass and pumping system. The Contractor shall remove all material used to seal the catch basins when the bypass and pumping system operations are complete.

The Contractor shall be fully responsible for containing any sewage spillage, preventing any sewage from reaching a watercourse, recovery and legal disposal of any spilled sewage, any fines or penalties associated with the sewage spill imposed upon by the Agency and/or the Contractor by jurisdictional regulatory agencies, and any other expenses or liabilities related to the sewage spill.

7-8.6 Water Pollution Control The Contractor shall prevent, control, and abate discharges of pollutants from the construction site in order to protect the storm drain system, which includes pipes, channels, streams, waterways, and other bodies of water, by the construction, installation or performance of water pollution control measures as shown on the Stormwater Pollution Control Plan (SWPCP) or Stormwater Pollution Prevention Plan (SWPPP) depending on the land area affected by the construction activity.

7-8.6.1 Size of Work or affected area. If the Work involves construction activity including clearing, grading or excavation that results in soil disturbance of 1 or more acres of total land area, or results in soil disturbances of less than 1 acre but is part of a work area larger than 1 acres, the Contractor shall, in addition to the other requirements, comply with the requirements of the State General Permit for Stormwater Discharges Associated with Construction Activity, NPDES General Permit No. CAS000002. Agency will submit, if it has not previously done so, a Notice of Intent to the State Water Resources Control Board, Division of Water Quality. The Contractor shall prepare and implement a Storm Water Pollution Prevention Plan for the Work.

7-8.6.2 Plan. The Engineer will furnish a SWPCP/SWPPP template, with any Agency supplied data entered, together with the other Contract document forms, as provided in 2-1.3. The SWPCP/SWPPP shall be prepared in accordance with the requirements of the Ventura Countywide Stormwater Quality Management Program, National Pollutant Discharge Elimination System (NPDES) Permit No. CAS004002 and County Ordinance No. 4142. The SWPCP/SWPPP shall identify potential pollutant sources on the construction site that may affect the quality of discharges, whether non-stormwater or stormwater, from the site and design the use and placement of water pollution control measures, Best Management Practices, to effectively prohibit the entry of pollutants from the site into the storm drain system during construction. The SWPCP/SWPPP shall utilize the measures recommended in the California Stormwater Quality Association Stormwater Best Management Practices Handbook for Construction dated January 2003. The Contractor shall complete, sign and submit the SWPCP/SWPPP for review and approval prior to issuance of the Notice to Proceed as provided in 6-7.4.

7-8.6.3 Measures. All water pollution control measures shall conform to the requirements of the submitted SWPCP/SWPPP. If circumstances during the course of construction require changes to the original SWPCP/SWPPP, a revised SWPCP/SWPPP shall be promptly submitted to the Project manager in each instance. If measures being taken are inadequate to control water pollution effectively, the Project manager may direct the Contractor to revise the operations and no further work shall be performed until adequate water pollution control measures are implemented. No responsibility shall accrue to the Agency as a result of the plan or as a result of knowledge of the plan. All work installed by the Contractor in connection with the SWPCP/SWPPP but not specified to become a permanent part of the Work shall be removed and the site restored in so far as practical to its original condition prior to completion of the Work.

7-8.6.4 Dewatering Activities. All dewatering activities shall be performed in accordance with applicable regulatory requirements issued by the Los Angeles Regional Water Quality Control Board, including specific requirements contained in the Waste Discharge Requirements (WDR) when issued for the Work.

7-8.6.5 Payment. The Contract lump sum price for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in water pollution control as specified herein. Payment for water pollution control will be made as the Work proceeds, and is in compliance with the approved Water Pollution Control Plan, on the following basis.

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of water pollution control pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of water pollution control pay item	Percentage of the original Contract total.
5	10	10	1
10	20	20	2
20	50	50	3
50	Completion of Work	75	5
Completion of Work		100	

Where no Bid Item is provided for water pollution control, payment for water pollution control shall be considered to be included in the other Bid items.

7-8.7 Drainage Control. The Contractor shall maintain drainage within and through the Work areas. Earth dams will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete or other acceptable material will be permitted when necessary to protect the Work, provided their use does not create a hazard or nuisance to the public. Such dams shall be removed from the site as soon as their use is no longer necessary.

7-8.8 Final Cleaning. At the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the project, as well as all tools, construction equipment, temporary facilities, machinery, and surplus materials.

At completion of construction and just prior to final inspection, the Contractor shall thoroughly clean the interior and exterior of the buildings, including hardware, floors, roofs, sills, ledges, glass, or other surfaces where debris, plaster, paint, spots, and dirt or dust may have collected. All glass shall be washed clean and polished. Remove all grease, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces. Repair, patch, and touch up marred surfaces to match adjacent finishes.

The Contractor shall use only experienced workmen or professional cleaners for final cleaning. It shall use only cleaning materials recommended by the manufacturer of the surface to be cleaned, and use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

It shall broom-clean all paved surfaces and rake-clean other surfaces of grounds.

The Contractor shall replace air conditioning filters if units were operated during construction, and clean all ducts, blowers, and coils if air conditioning units were operated without filters during construction.

After cleaning, the Contractor shall maintain the building in a clean condition until it is accepted by the Agency.

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. The Contractor shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property.

The Contractor shall repair or replace all existing improvements within the right-of-way which are not designated for removal (e.g., curbs, sidewalks, driveways, fences, walls, signs, utility installations, pavement, structures, etc.) which are damaged or removed as a result of its operations. When a portion of a sprinkler system within the right-of-way must be removed, the remaining lines shall be capped. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

Maintenance of street and traffic signal systems that are damaged, temporarily removed or relocated shall be done in conformance with 307-1.5.

Trees, lawns, and shrubbery that are not designated to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original condition and location as is reasonably possible. Lawns shall be reseeded and covered with suitable mulch.

The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers and other improvements which are designated for removal and would be destroyed because of the Work.

All costs to the Contractor for protecting, removing, and restoring existing improvements shall be absorbed in its bid.

In existing buildings, all surfaces, equipment, furniture and other property shall be protected from loss or damage by or as result of the Contractor's operations. The Contractor shall replace damaged property or shall repair and restore it to its previous condition. Patching, painting, replacement of wall, ceiling and floor covering and similar Work shall be done in such a manner that the repaired Work will not be readily noticeable.

7-10 PUBLIC CONVENIENCE AND SAFETY

7-10.1 Traffic and Access. The Contractor's operations shall cause no unnecessary inconvenience. The access rights of the public shall be considered at all times. Unless otherwise authorized, traffic shall be permitted to pass through the Work, or an approved detour shall be provided.

Safe and adequate pedestrian and vehicular access shall be provided and maintained to: fire hydrants; commercial and industrial establishments; churches, schools and parking lots; service stations and motels; hospitals; police and fire stations; and establishments of similar nature. Access to these facilities shall be continuous and unobstructed unless otherwise approved by the Engineer.

Safe and adequate pedestrian zones and public transportation stops, as well as pedestrian crossings of the Work at intervals not exceeding 90m (300 feet), shall be maintained unless otherwise approved by the Engineer.

Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time. If backfill has been completed to the extent that safe access may be provided, and the street is opened to local traffic, the Contractor shall immediately clear the street and driveways and provide and maintain access.

The Contractor shall cooperate with the various parties involved in the delivery of mail and the collection and removal of trash and garbage to maintain existing schedules for these services.

Grading operations, roadway excavation and fill construction shall be conducted by the Contractor in a manner to provide a reasonably satisfactory surface for traffic. When rough grading is completed, the roadbed surface shall be brought to a smooth, even condition satisfactory for traffic.

Unless otherwise authorized, work shall be performed in only one-half the roadway at one time.

One half shall be kept open and unobstructed until the opposite side is ready for use. If one-half a street only is being improved, the other half shall be conditioned and maintained as a detour.

The Contractor shall include in its Bid all costs for the above requirements.

7-10.2 Storage of Equipment and Materials in Public Streets. Construction materials may not be stored in streets, roads, or highways for more than 5 Days after unloading. All materials or equipment not installed or used in the construction within 5 Days after unloading shall be stored elsewhere by the Contractor at its expense unless it is authorized additional storage time.

Construction equipment shall not be stored at the Work site before its actual use on the Work nor for more than 5 Days after it is no longer needed on the Work. Time necessary for repair or assembly of equipment may be authorized by the Engineer.

Excavated material, except that which is to be used as backfill in the adjacent trench, may not be stored in public streets, roads or highways unless otherwise permitted. After placing backfill, all excess material shall be removed immediately from the site.

7-10.3 Street Closures, Detours, Barricades. The Contractor shall comply with all applicable State, County and City requirements for closure of streets. The Contractor shall provide barriers, guards, lights, signs, temporary bridges, flagpersons and watchpersons, advising the public of detours and construction hazards. The Contractor shall also be responsible for compliance with additional public safety requirements which may arise during construction. The Contractor shall furnish and install, and upon completion of the Work, promptly remove all signs and warning devices.

At least 48 hours in advance of closing, or partially closing, or of reopening, any street, alley, or other public thoroughfare, the Contractor shall notify the Police, Fire, Traffic and Engineering Departments of jurisdictional agencies involved, and comply with their requirements. Deviations must first be approved in writing by the Engineer.

The Contractor shall secure approval, in advance, from authorities concerned for the use of any bridges proposed by it for public use. Temporary bridges shall be clearly posted as to load limit, with signs and posting conforming to current requirements set forth in the "CALTRANS Manual on Uniform Traffic Control Devices" published by the California Department of Transportation, covering "signs." This manual shall also apply to the street closures, barricades, detours, lights, and other safety devices required.

All costs involved shall be included in the bid.

7-10.4 Public Safety

7-10.4.1 Safety Orders. The Contractor shall have at the Work site, copies or suitable extracts of: Construction Safety Orders, Electrical Safety Orders, and General Industrial Safety Orders issued by the State Division of Industrial Safety. It shall comply with provisions of these and all other applicable laws, ordinances, and regulations.

Before excavating any trench 1.5 meters (5 feet) or more in depth, the Contractor shall submit to the Agency a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for the workers' protection from the hazard of caving ground during the excavation of such trench. If the plan varies from the shoring system standards, the plan shall be prepared by a Registered Civil Engineer. No excavation shall be commenced until the Engineer has accepted the plan and the Contractor has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the Engineer.

Payment for performing all Work necessary to provide safety measures shall be included in the prices bid for other items of Work except where separate bid items for excavation safety are provided, or required by law.

7-10.4.2 Use of Explosives. Explosives may be used only when authorized in writing by the Engineer, or as otherwise stated in the Specifications. Explosives shall be handled, used, and stored in accordance with all applicable regulations.

The Engineer's approval of the use of explosives shall not relieve the Contractor from its liability for claims caused by its blasting operations.

7-10.4.3 Special Hazardous Substances and Processes. Materials that contain hazardous substances or mixtures may be required on the Work. A Material Safety Data Sheet as described in Section 5194 of the California Code of Regulations shall be requested by the Contractor from the manufacturer of any hazardous product used.

Material usage shall be accomplished with strict adherence to California Division of Industrial Safety requirements and all manufacturers' warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.

The Contractor shall notify the Engineer if a specified product cannot be used under safe conditions.

7-10.4.4 Confined Spaces.

- (a) Confined Space Entry Program. The Contractor shall be responsible for implementing, administering and maintaining a confined space entry program (CSEP) in accordance with Sections 5156, 5157, and 5158 Title 8, CCR.

Prior to starting the Work, the Contractor shall prepare and submit its comprehensive CSEP to the Engineer. The CSEP shall address all potential physical and environmental hazards and contain procedures for safe entry into confined spaces, including, but not limited to the following:

- 1) Training of personnel
- 2) Purging and cleaning the space of materials and residue
- 3) Potential isolation and control of energy and material inflow
- 4) Controlled access to the space
- 5) Atmospheric testing of the space
- 6) Ventilation of the space
- 7) Special hazards consideration
- 8) Personal protective equipment
- 9) Rescue plan provisions

The Contractor's submittal shall include the names of its personnel, including subcontractor personnel, assigned to the project who will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

- (b) Permit-Required Confined Spaces. Entry into permit-required confined spaces as defined in Section 5157, Title 8, CCR may be required as a part of the Work. All manholes, tanks, vaults, pipelines excavations, or other enclosed or partially enclosed spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Contractor shall implement a permit space program prior to performing any Work in a permit-required confined space. A copy of the permit shall be available at all times for review by Contractor and Agency personnel at the work site.
- (c) Payment. Payment for implementing, administering, and providing all equipment and personnel to perform the CSEP shall be included in the bid items for which the CSEP is required.

7-10.4.5 Asbestos Safety & Prohibited Use

7-10.4.5.1 Asbestos Warning Signs. If any work is to be performed in an area of an existing building where there is the potential for employees working in the building to come into contact with, or release or disturb, asbestos or asbestos-containing construction materials, the Contractor shall post that area with a clear and conspicuous warning notice. The posted warning notice shall read, in print which is readily visible because of its large size and bright color, as follows:

"CAUTION. ASBESTOS. CANCER AND LUNG DISEASE HAZARD. DO NOT DISTURB WITHOUT PROPER TRAINING AND EQUIPMENT."

7-10.4.5.2 Products Containing Asbestos. No product containing any asbestos fibers shall be used on the Work or by the Contractor on the Work site unless specifically identified on the Plans or in the Special Provisions as containing asbestos and not being subject to this section. Asbestos Cement (AC) pipe may be used, when specified, providing all worker safety regulations and manufacturer's recommendations are complied with.

7-11 PATENT FEES OR ROYALTIES. The Contractor shall absorb in its Bid, the patent fees or royalties on any patented article or process which may be furnished or used in the Work. The Contractor shall indemnify and hold the Agency harmless from any legal action that may be brought for infringement of patents.

7-12 ADVERTISING. The names of contractors, subcontractors, architects, or engineers, with their addresses and the designation of their particular specialties, may be displayed on removable signs. The size and location of such signs shall be subject to the Engineer's approval.

Commercial advertising matter shall not be attached or painted on the surfaces of buildings, fences, canopies, or barricades.

7-13 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of State and National laws and County and Municipal ordinances and regulations which in any manner affect those employed in the Work or the materials used in the Work or in any way affect the conduct of the Work. It shall at all times observe and comply with all such laws, ordinances and regulations.

7-13.1 Mined Materials. Mined material from California surface mines, used on the Work, shall be from a mine identified in the list published by the California Department of Conservation (referred to as 3098 List), as required by Public Contract Code 20676. This list is available on the Internet at www.conservation.ca.gov/OMR/ab_3098_list/index.htm.

7-14 ANTITRUST CLAIMS. Section 7103.5 of the Public Contract Code provides:

"In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgement by the parties."

7-15 RECYCLABLE CONSTRUCTION & DEMOLITION WASTES. Ventura County Ordinance Code Section, 4770 et seq. requires that If any recyclable solid wastes or marketable reusable materials will be generated on the site of the Work, the Contractor shall prepare a Construction & Demolition Debris Waste Diversion Plan and submit it to the Ventura County Public Works Agency, Water & Sanitation Department - Integrated Waste Management Division (IWMD). The Contractor shall prepare and file Construction & Demolition Debris Waste Diversion Reporting Forms as required by the IWMD.

The Contractor shall submit an IWMD Form B-Recycling Plan approved by IWMD prior to issuance of the Notice to Proceed as provided in 6-7.4.

The Contractor shall submit an IWMD Form C-Reporting Form approved by IWMD prior to the Engineer preparing the final estimate as provided in 9-3.2.

7-16 AFFIRMATIVE ACTION. The Ventura County Affirmative Action Policy for Contractors and Vendors (Appendix E) shall be complied with. The Contractor shall sign and return a copy of Appendix E as part of the Contract Documents.

7-17 LOSS OR DAMAGE TO THE WORK. The Contractor is responsible for delivering to the Agency Work completed in accordance with the Contract except as provided in 7-18. Should the Work being constructed be damaged by fire or other causes before Acceptance by the Agency, it shall be replaced in accordance with the requirements of the Plans and Specifications without additional expense to the Agency. The Agency does not carry "Course of Construction" insurance on the Work. Contractor should arrange for its own insurance to protect its interests.

7-18 ACTS OF GOD. As provided in Section 7105 of the California Public Contract Code, the Contractor shall not be responsible for the cost of repairing or restoring damaged portions of the Work determined to have been proximately caused by an act of God in excess of 5 percent of the contracted amount, provided that the Work damaged was built in accordance with accepted and applicable building standards and the Specifications and Drawings. The Contractor shall obtain insurance to indemnify the Agency for any damage to the Work caused by an act of God if the premium of said insurance coverage is called for as a separate bid item in the bidding schedule for the Work. For purposes of this section, the term "acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale, and tidal waves.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-1 GENERAL. A field office shall be provided when required by the Plans or Special Provisions. The field office shall be at a suitable location approved by the Engineer.

A field office shall be a weather-tight building of suitable proportions with 16 m² (120 sq. ft.) of floor area, at least one door, and a window area of 2 m² (22 Sq. Ft.). A field office may be a building or a separate room in a building the Contractor may be required to provide or that it may desire to provide for its own use. In either case, the room shall have a separate exterior door. All doors shall be provided with hasps for padlocks.

The office shall be convenient to the Work. It shall be adequately heated, ventilated, electrically lighted, and provided with telephone service, all at the expense of the Contractor or plant owner. Offices are for the exclusive use of Agency personnel, unless otherwise provided herein.

Field offices at the worksite shall be removed upon completion of the Work.

All costs incurred in furnishing, maintaining, servicing, and removing a field office required at the Work site shall be included in the price bid for such item. If such item is required by the Plans or Specifications and no bid item is provided in the Proposal, the costs shall be absorbed in the other items for which bids are entered. Buildings and equipment furnished by the Contractor at the Work site under the provisions of this section are the property of the Contractor.

The first progress payment will not be approved until all facilities are in place and fully comply with the Specifications.

8-2 EQUIPMENT FOR FIELD OFFICES. Unless otherwise specified, a field office shall be equipped with:

- Plan table, 0.75 m x 1.5 m (2 1/2 ft. x 5 ft.) or larger
- Plan rack, capacity to hold two sets of project Plans plus all shop drawings
- Desk and chair
- Two lockers with hasps for padlocks

SECTION 9 - MEASUREMENT AND PAYMENT

9-1 MEASUREMENT OF QUANTITIES FOR UNIT PRICE WORK

9-1.1 General. Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling, fencing, and timber shall be considered as being the true length measured along longitudinal axis.

Unless otherwise provided in Specifications, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension. The planimeter shall be considered an instrument of precision adapted to measurement of all areas.

9-1.2 Methods of Measurement. Materials and items of Work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the particular sections involved.

9-1.3 Certified Weights. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall furnish the Engineer with duplicate licensed weighmaster's certificates showing actual net weights. The Agency will accept the certificate as evidence of weights delivered.

9-1.4 Units of Measurement. Measurements shall be in accordance with 1-4.1 and 1-4.2. A metric ton or "tonne" is equal to 1000 kilograms and the unit of liquid measure is a Liter (in U.S. Standard Measures, a pound is an avoirdupois pound; a ton is 2000 pounds avoirdupois; and the unit of liquid measure is a gallon).

9-2 LUMP SUM BID ITEMS. Items for which quantities are indicated as "Lump Sum", "L.S." or "Job" shall be paid for at the price indicated in the Proposal. Such payment shall be full compensation for the items of Work and all Work appurtenant thereto.

When required by the Specifications or requested by the Engineer, the Contractor shall submit to the Engineer within 15 Days after award of Contract, a detailed schedule in triplicate, to be used only as a basis for determining progress payments on a lump sum contract or any designated lump sum bid item. This schedule should equal in total the lump sum bid and shall be in such form and sufficiently detailed as to satisfy the Engineer that it correctly represents a reasonable apportionment of the lump sum. If Mobilization or Water Pollution Control are included in the detailed schedule, those items will be paid for as provided in 9-3.4.2 and 7-8.6.4, receptively.

9-3 PAYMENT

9-3.1 General. The quantities listed in the Bid schedule will not govern final payment unless identified by Agency on the Proposal as [F]. The symbol "[F]" indicates that the quantities shown on the Proposal form are the final pay quantities. Payment to the Contractor (except those items identified as [F]) will be made only for the actual quantities of Contract items constructed in accordance with the Plans and Specifications. Upon completion of construction, if the actual quantities show either an increase or decrease from the quantities given in the Bid schedule, the Contract Unit Prices will prevail subject to the provisions of 3-2.2.1. Payment for those items identified as [F] will be based on the quantities shown on the Proposal unless changed as provided in 3-2.2.1.

The unit and lump sum prices to be paid shall be full compensation for the items of work and all appurtenant work, including furnishing all materials, labor, equipment, tools and incidentals.

Payment for items shown on the Plans or required by the Specifications, for which no pay item is provided, shall be considered included in the prices named for the other items shown on the Proposal.

Payment will not be made for materials wasted or disposed of in a manner not called for under the Contract. This includes rejected material not unloaded from vehicles, material rejected after it has been placed and material placed outside of the Plan lines. No compensation will be allowed for disposing of rejected or excess material.

Whenever any portion of the Work is performed by the Agency at the Contractor's request, the cost thereof shall be charged against the Contractor, and may be deducted from any amount due or becoming due from the Agency.

Whenever immediate action is required to prevent injury, death, or property damage, and precautions which are the Contractor's responsibility have not been taken and are not reasonably expected to be taken, the Agency may, after reasonable attempt to notify the Contractor, cause such precautions to be taken and shall charge the cost thereof against the Contractor, or may deduct such cost from any amount due or becoming due from the Agency. Agency action or inaction under such circumstances shall not be construed as relieving the Contractor or its Surety from liability.

9-3.1 General. (Continued)

Payment shall not relieve the Contractor from its obligations under the Contract; nor shall such payment be construed to be Acceptance of any of the Work. Payment shall not be construed as the transfer of ownership of any equipment or materials to the Agency. Responsibility of ownership shall remain with the Contractor who shall be obligated to store, protect, repair, replace, rebuild, or otherwise restore any fully or partially completed work or structure for which payment has been made; or replace any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen or otherwise degraded in any way prior to completion of the Work under the Contract, except as provided in 6-10.

Warranty periods shall not be affected by any payment but shall commence on the date equipment or material is placed into service at the written direction of the Engineer. In the event such items are not placed into service prior to partial or final completion of the Work, the warranty periods will commence on the date set forth as the date of field completion in the Engineer's acknowledgement of completion.

If, within the time fixed by law, a properly executed notice to stop payment is filed with the Agency, due to the Contractor's failure to pay for labor or materials used in the Work, all money due for such labor or materials will be withheld from payment to the Contractor in accordance with applicable laws.

At the expiration of 35 Days from the date of recording of the Notice of Completion, or as prescribed by law, the amount deducted from the final estimate and retained by the Agency will be paid to the Contractor except such amounts as are required by law to be withheld by properly executed and filed notices to stop payment, or as may be authorized by the Contract to be further retained.

9-3.2 Partial and Final Payment. The Engineer will, after award of Contract, establish a closure date for the purpose of making monthly progress payments. The Contractor may request in writing that such monthly closure date be changed. The Engineer may approve such request when it is compatible with the Agency's payment procedure.

Each month, the Engineer will make an approximate measurement of the Work performed to the closure date and, as a basis for making monthly payments, estimate its value based on the Contract Unit Prices or as provided for in 9-2. When the Work has been satisfactorily completed, the Engineer will determine the quantity of Work performed and prepare the final estimate.

Work not conforming to the Contract Documents shall not be measured for payment.

Satisfactory progress is determined to occur if, on the closure date, the percentage of the Work yet to be performed is not more than twice the percentage of Contract time remaining.

Satisfactory performance shall be, in addition to constructing the Work in accordance with the Contract Documents, the Contractor's compliance with those portions of the Contract Documents not directly related to the completed Work, including but not limited to: construction and maintenance of detours; diversion and control of water; protection and repair of existing facilities of the Agency and adjacent owners; site maintenance; coordination with utilities and other contractors on the site; proper survey procedures and records; obtaining required permits and inspections; complying with working hour limitations; providing a Contractor's representative while Work is being performed; complying with environmental requirements; maintaining access and safety for users of facilities that are to remain in service during construction; and obeying all laws affecting the Work.

Payment for Extra Work will be made only on approved Daily Extra Work Reports with supporting documentation as required in 3-3.

From each progress estimate, 10 percent will be deducted and retained by the Agency, and the remainder less the amount of all previous payment will be paid to the Contractor. After 50 percent of the Work has been completed, if progress on the Work is, and remains satisfactory, the deduction to be made from the remaining progress estimates may be limited to 10 percent of the first half of the total Contract amount. During any period that performance or progress is unsatisfactory, the deduction for retention from payments shall be 10 percent of the total value of all Work completed.

No progress payment made to the Contractor or its sureties will constitute a waiver of the liquidated damages under 6-9.

9-3.2 Partial and Final Payment. (Continued)

As provided for in Sections 22300 of the California Public Contract Code, the Contractor may substitute securities for any monies withheld by the Agency to ensure performance under the Contract. In substituting securities, the Contractor may either:

- a. Deposit qualifying securities already owned by the Contractor with the Escrow prior to the Contract payment date, or
- b. Direct the Agency to send retained funds to the Escrow to be invested by the Escrow in qualifying securities as directed by the Contractor.

9-3.2.1 Release of Withheld Contract Funds. Pursuant to Public Contract Code Section 22300, Contractor has the option to deposit securities with an Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the construction Contract between the Agency and the Contractor. A form of Escrow Agreement for Security Deposits in Lieu of Retention has been adopted by the Agency as one of the Contract Documents; procedures for implementing the provisions of the Escrow Agreement are contained in Escrow Instructions which shall become effective upon exercise of the option by the Contractor.

The Contractor shall take the following steps if it desires to substitute securities:

- a. Execute the Escrow Agreement for Security Deposits in Lieu of Retention.
- b. Furnish to the Escrow Agent a power of attorney and other forms necessary to empower the Escrow Agent to convert the securities to cash.
- c. Furnish to the Escrow Agent the securities described.
- d. Pay the Escrow Agent's fees and costs.

When the Contractor deposits with the Escrow Agent securities in lieu of money required to be withheld from progress payments, a sum of money equivalent to the current cash value of the securities as determined by the Escrow Agent shall be released to the Contractor by, or upon the direction of, the Agency.

If the total of the money plus the current cash conversion value of securities on deposit should fall below the aggregate amount of the sums required to be withheld from progress payments pursuant to 9-3.1 and 9-3.2, an amount equal to the difference shall be withheld from the next regular progress payment in addition to the amount which would ordinarily be withheld pursuant to 9-3.1 and 9-3.2. If the next regular progress payment is less than the total of the amounts to be withheld therefrom, the Contractor shall immediately either deposit with the Agency cash in the amount of the difference or deposit with the Escrow Agent additional securities having a current cash conversion value equal to or greater than the difference.

The Contractor shall be the beneficial owner of any such securities on deposit with the Escrow Agency and shall be entitled to any interest earned thereon prior to conversion. The Agency may direct the Escrow Agency to convert securities with the Escrow Agency into cash, and to deliver the cash to the Agency, in any case where the Contractor is in default, including the following:

- a. where the Agency would be entitled to use funds withheld pursuant to 9-3.1 and 9-3.2 to satisfy claims of workers, materials suppliers or subcontractors, or to complete or correct work which the Contractor has failed or refused to complete or correct, or
- b. where the Contractor has failed to comply with the requirements of this section respecting the deposit of additional cash or securities to make up for a fall in the value of securities already on deposit with the Escrow Agency.

The Agency may hold and use cash resulting from such a conversion of securities in the same manner as it would be entitled to hold and use funds withheld pursuant to 9-3.1 and 9-3.2.

9-3.2.2 Timely Progress Payments. As required by Public Contract Code Section 20104.50, the Contractor is informed that should a progress payment not be made within 30 Days after receipt of an undisputed and properly submitted payment request from the Contractor, the Agency shall pay interest to the Contractor on the unpaid amount at the rate set forth in the Code of Civil Procedures, Section 685.010(a). Agency shall promptly review payment requests, and if not determined to be proper, document to the Contractor, within 7 Days, the reasons why the request is not proper.

Contractor should refer to the code sections cited for further information.

9-3.3 Delivered Materials. Payment for the cost of materials and equipment delivered to the Work site but not incorporated in the Work will be included in the progress estimate if, prior to the closure date for the monthly progress payment, the material or equipment is listed by the Contractor on the Agency's form together with date of delivery, vendor's or Subcontractor's name and cost; is accompanied by a copy of an invoice showing the cost thereof; has an aggregate cost in excess of \$5,000 for each progress payment; is currently on the Work site at an approved location and in good condition; and is one of the following:

1. Precast concrete units weighing more than 100 kilograms (200 pounds) each.
2. Structural steel members weighing more than 100 kilograms (200 pounds) each.
3. Individual pieces of electrical equipment costing over \$1,000 each.
4. Individual pieces of mechanical equipment costing over \$1,000 each.
5. Reinforced concrete pipe of any size.
6. Storm drainage pipe 900 mm (36") in diameter and larger.
7. Water and sewer pipe 300 mm (12") in diameter and larger.
8. Finish hardware for doors.
9. Other individual items of equipment costing over \$1,000 each
10. Materials where the aggregate value of a single type of material exceeds \$1,000 and is either:
 - a) Fabricated or cut to fit the Work before delivery, or
 - b) Of a size or type not available from any manufacturer without a special production run.

On unit price Bid items, the amount paid for materials or equipment delivered but not incorporated in the Work shall not exceed 75% of the amount of the Bid item which includes such material or equipment.

On lump sum Bid items, the amount paid for materials and equipment delivered and not incorporated in the Work shall not exceed 75% of the item in the approved schedule submitted in accordance with 9-2 of which such materials or equipment is a part.

Should materials or equipment previously paid for be damaged, destroyed, stolen or removed from the Work site, the payment previously made therefor will be deducted from the next progress payment, unless such materials or equipment are replaced prior thereto.

On the closure date for progress payments, as provided in 9-3.2, the Contractor shall certify that all materials and equipment not incorporated into the Work, for which payment has previously been made or is being requested, is still at the Work site and in good condition. Failure to provide such certification will be cause for deducting previous payments for materials not incorporated in the Work from the amount due the Contractor in the progress payment.

Payment for materials or equipment, as provided herein, shall not constitute approval or acceptance thereof nor shall such payment modify or abridge any of the rights the Agency has under the Specifications or at law nor relieve the Surety of any of its obligations under the bonds.

9-3.4 Mobilization

9-3.4.1 Scope. Mobilization includes preliminary services, work and operations, including but not limited to, furnishing required bonds, obtaining necessary permits and work areas, providing a specified field office, the movement of labor, supplies, equipment and incidentals to the Work site, and for all other work, services and operations which must be performed or for which costs are incurred prior to performing work of the other Contract items.

9-3.4.2 Payment. The Contract lump sum price bid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in mobilization as specified herein. Payment for mobilization will be made as the Work proceeds on the following basis except that where a field office is required by the Specifications, no payment for mobilization will be made until the specified field office has been provided:

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of mobilization pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of mobilization pay item	Percentage of the original Contract total.
5	10	50	5
10	20	75	7.5
20	50	95	9.5
50	Completion of Work	100	10
Completion of Work		100	

Where no Bid item is provided for mobilization, payment for mobilization shall be considered to be included in the other Bid items.

9-4 TERMINATION OF AGENCY LIABILITY. Within 45 calendar days of "completion" as that word is defined in subdivision (c) of section 7107 of the Public Contract Code, Contractor shall execute and submit to Agency a Release on Contract Form. Said form shall release and discharge the Agency from all claims of and liability to the Contractor for all manner of debts, demands, accounts, claims, and causes of action under or by virtue of said Contract except:

- a. The claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, and any amounts retained as required by Stop Notices or Labor Code provisions.
- b. Any unsettled claims or disputes listed on the Release on Contract form which have been processed in compliance with the requirements for making claims under the Contract, including given timely notice pursuant to the applicable provisions of the Contract and following the procedure set forth in 6-12.

Acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

When executing the Release on Contract, the Contractor shall certify that each unsettled claim or dispute listed thereon has been processed in compliance with the requirements for making claims under the Contract, including giving timely notice pursuant to the applicable provisions of the Contract and following the procedures for resolution of disputes or claims set forth in 6-12 and that acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

If Contractor fails to execute and submit a Release on Contract within the 45 day time period set forth above, the Release on Contract shall be deemed to have been submitted with no unsettled claims or disputes listed on the Release on Contract. A payment of \$1.00 will be made to the Contractor for such Release on Contract and waiver.

SECTION 10 - DIVERSION, CONTROL AND REMOVAL OF WATER

10-1 DESCRIPTION. This section covers the diversion, control and removal of all water entering into the construction area or otherwise affecting construction activities.

10-2 REQUIREMENTS. All permanent construction shall be performed in a site free from water unless otherwise provided for in the Special Provisions. The Contractor shall construct, maintain, and operate all necessary cofferdams, pumps, channels, flumes, drains, well points and/or other temporary diversion, protective, and water removal works required for diversion, control and removal of all water, whether surface or groundwater, whatever its source, during construction.

Inundation of partially completed Work due to lack of control during non-working periods will not be permitted, and may be cause for requiring removal and replacement of Work already completed.

The Contractor shall be responsible for obtaining the use of any property in addition to that provided for in the Plans and Specifications, which may be required for the diversion, protective, and water removal works so as not to create a hazard to persons or property or to interfere with the water rights of others.

It shall be understood and agreed that the Contractor shall hold the Agency and the Engineer harmless from legal action taken by any third party with respect to construction and operations of the diversion and protective works.

10-3 DIVERSION AND CONTROL WORKS.

Prior to beginning of work involving diversion, control and removal of water, the Contractor shall submit a water control plan to the Engineer. In the event circumstances during the course of construction require changes to the original water control plan, a revised water control plan shall be promptly submitted to the Engineer in each instance. No responsibility shall accrue to the Engineer or the Agency as a result of the plan or as a result of knowledge of the plan.

Construction and operation of the diversion, control and removal works shall be in accordance with the water control plan submitted, except deviations therefrom may be specifically approved by the Engineer.

All works installed by the Contractor in connection with dewatering, control, and diversion of water but not specified to become a permanent part of the Work, shall be removed and the site restored, insofar as practical, to its original condition prior to completion of construction or when directed by the Engineer.

10-4 PAYMENT. No separate Bid item is included. Payment for this item of Work will be considered to be included in the payments made for other items of Contract Work to which water control is incidental.

PART 2 CONSTRUCTION MATERIALS

SECTION 200 - ROCK MATERIALS

200-1 ROCK PRODUCTS

200-1.6 Stone for Riprap

200-1.6.1A Alternate Stone for Riprap. As an alternate to the requirements of Subsection 200-1.6, the sample may be subject to the following tests:

TESTS	TEST METHOD NO.	REQUIREMENTS
Apparent Specific Gravity	ASTM C 127	2.40 Min.
Resistance to Abrasion	ASTM C 535, Grading 1	35% Max.
Soundness	Section 211-8	10% Max.
Wet and Dry Loss	Section 211-9	5% Max.
Solubility	Section 211-10	No Loss

All rock shall be angular or subangular in shape. Angular shall be defined as having sharp corners and straight planes on all faces, with no evidence of wear caused by wind, water or abrasion. Subangular shall be defined the same as angular except that evidence of wear by wind, water or abrasion may be allowed. Determination of angularity will be made by the Engineer.

200-1.6.2 Riprap Size

The individual classes of rock used for riprap shall conform to the following:

Rock Sizes	RIPRAP CLASSES					
	1-Tonne (1 Ton)	½-Tonne (½ Ton)	¼-Tonne (¼ Ton)	Light	Facing	Cobble
	PERCENTAGE LARGER THAN					
2-Tonne (2-Ton)	0-5					
1-Tonne (1-Ton)	50-100	0-5				
½-Tonne (½-Ton)		50-100	0-5			
¼-Tonne (¼-Ton)	90-100		50-100	0-5		
100 kg (200-lb)		90-100		50-100	0-5	
35 kg (75-lb)			90-100	90-100	50-100	0-5
10 kg (25-lb)					90-100	95-100
0.5 kg (1-lb)	100	100	100	100	100	100

The amount of material smaller than the smallest size listed in the table for any class of riprap shall not exceed the percentage limit listed in the table determined on a weight basis.

Compliance with the percentage limit shown in the table for all other sizes of the individual pieces of any class of riprap shall be determined by the ratio of the number of individual pieces larger than the specified size compared to the total number of individual pieces larger than the smallest size listed in the table for that class.

Flat or needle shapes will not be accepted unless the thickness of individual pieces is greater than 1/3 the length.

Before placing in final location, depositing, or stockpiling within the project limits, each individual load of riprap must meet the size requirements of the class specified.

SECTION 206 - MISCELLANEOUS METAL ITEMS

206-3 GRAY IRON CASTINGS

206-3.3 Manhole Frame and Cover Sets

206-3.3.1 Selection. Unless otherwise specified, manhole frames and covers shall be in accordance with the following Standard Plans contained in the SPPWC:

Clear Opening Diameter mm (Inches)	SPPWC Plan No.	Catalog Numbers	
		Alhambra Foundry	Long Beach Iron Works
600 (24)	630-1	A-1495	X-162
675 (27)	631-1	A-1496	X-164
750 (30)	632-1	A-1497	X-163
900 (36)	633-1	A-1498	X-106A

206-5 METAL RAILINGS.

206-5.2 Flexible Metal Guard Rail Materials.

206-5.2A Flexible Metal Guard Rail Materials; Modification. The "Construction" grade Douglas Fir for "posts, including blocks" does not have to be "free of heart center".

SECTION 210 - PAINT AND PROTECTIVE COATINGS

210-6 STORM DRAIN HARDWARE. All storm drain hardware, including manhole frames and covers, grates, protection bars, steps, etc., shall be protected from corrosion.

Storm drain hardware made of cast iron shall be protected by painting with, or dipping in, a commercial grade asphalt paint. Storm drain hardware made of steel shall be galvanized.

SECTION 211 - MATERIAL TESTS

211-3 SIEVE ANALYSIS. Sieve analysis shall be performed in accordance with ASTM-C136.

211-4 Sand Equivalent Test. This test is intended to serve as a field test to indicate the presence or absence of plastic fine material. The test shall be run in accordance with Calif. test 217 or ASTM D2419. When testing material containing asphalt, this test method shall be modified by drying the sample at a temperature not exceeding 38°C (100°F).

211-5 R-VALUE. Resistance (R-value) shall be determined by California Test 301.

211-6 SPECIFIC GRAVITY AND ABSORPTION. Apparent specific gravity, bulk specific gravity and absorption shall be determined by California Test 206, 207, 208, 209, 224, 225, or 308, Method C where zinc stearate may be substituted for paraffin.

211-7 LOS ANGELES RATTLER TEST. Loss in Los Angeles Rattler shall be determined by California Test 211.

211-8 SOUNDNESS. For riprap, the soundness shall be determined in accordance with Calif. Test 214, excluding sections D, E, G.2.b, and H, and adding the following:

- a. The test sample shall be prepared by breaking or sawing a representative sampling of riprap into particles passing the 75 mm (three inch) and retained on the 50 mm (two inch) sieve. If there are a variety of rock types or degrees of weathering within a rock type, each unique type or condition must meet the loss requirement.
- b. The test sample size shall be 25,000 grams (55 lbs.) \pm 1 percent.
- c. All particles of test sample which break into three or more pieces during testing shall be discarded. The remaining sample shall be washed on a 4.75 mm (#4) sieve and all particles retained shall be oven dried.
- d. The loss in weight shall be determined by subtracting from the original weight of the test sample the final weight of all particles retained on the 4.75 mm (#4) sieve. Divide the loss in weight by the original weight and multiply by 100 to determine the percent loss.
- e. Report the following:
 - (1) The percent loss.
 - (2) The number of pieces affected, classified as to number disintegrating, splitting, crumbling, cracking, flaking, etc.

211-9 WET AND DRY LOSS. Wet and dry loss shall be determined as follows:

A sample of rock shall be crushed, screened, oven dried, and 1,000 g (2.2 lbs.) to 1,500 g (3.3 lbs.) of the 19 mm (3/4-inch) to 9.5 mm (3/8-inch) fraction shall be taken for the test.

The crushed and graded sample shall be submerged in tap water for 8 hours at room temperature, after which the sample shall be drained and oven dried at 78°C (140°F). When dry, the sample shall be cooled to room temperature. This completes one cycle.

After 10 cycles, the percent loss shall be computed as follows:

$$\% \text{ Loss} = \frac{100 \times \text{Weight of Material Passing 4.75 mm (No. 4) Sieve}}{\text{Total Weight of Sample}}$$

Total Weight of Sample

211-10 SOLUBILITY. Approximately 0.5 kg (one pound), air dried samples shall be immersed in local tap water and in Pacific Ocean water (or a 3.5% sodium chloride solution) for 8 hours each at 78°C (140°F). After immersion, the samples shall be washed with tap water, air dried and reweighed.

211-11 Permeability Test. Permeability tests for granular soils shall be performed in accordance with ASTM D2434, using samples compacted to the specified field density.

PART 3 CONSTRUCTION METHODS

SECTION 301 - TREATED SOILS, SUBGRADE PREPARATION MATERIALS

AND PLACEMENT OF BASE

301-1 SUBGRADE PREPARATION

301-1.3 Relative Compaction

301-1.3.1 Firm, Hard and Unyielding. The term "firm, hard and unyielding" as used in 301-1.3 shall mean that when the heaviest construction and hauling equipment used on the Work drives over the subgrade, no permanent deformation shall occur either before or during pavement construction.

301-1.4 Subgrade Tolerances. Subgrade for pavement, sidewalk, curb and gutter, driveways, or other roadway structures shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section. Subgrade for subbase or base material shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section.

Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

301-2 UNTREATED BASE

301-2.3 Compacting

301-2.3.1 Tolerances. The tolerance requirement in 301-2.3 is modified from 6 mm (0.02 foot) to 15 mm (0.05 foot).

SECTION 302 - ROADWAY SURFACING

302-5 ASPHALT CONCRETE PAVEMENT

302-5.1 General

302-5.1.1 Asphalt Concrete Berms. Asphalt concrete berms shall be constructed of Class III-D-PG70-10 asphalt concrete by mechanical means to conform to the details and location as shown on the Plans.

A tack coat, as provided in 302-5.4, shall be applied to the existing or new pavement preceding the placement of the asphalt concrete berms.

302-5.4 Tack Coat

302-5.4.1 Fog Seal. When specified, a fog seal consisting of material meeting the requirements of 203-3 shall be applied to the surfaces of all completed asphalt concrete at the rate of 0.36 liter per square meter (0.08 gallon per square yard) of the combined emulsion or such lesser rate ordered by the Engineer. Surface to be sealed shall be free from dust, dirt, and other foreign material. Surface shall be sealed within 7 Days after paving.

302-5.9 Measurement and Payment

302-5.9.1 Measurement and Payment for Asphalt Berm. Asphalt concrete berms will be paid for at the Contract Unit Price per linear meter (feet) of berm in place. No separate measurement or payment will be made for asphalt, aggregate, or tack coat.

302-5.9.2 Measurement and Payment for Fog Seal, Tack Coat, and Prime Coat. Measurement and payment for the specified material shall be by the tonne (ton) in place. Emulsions shall be measured after the specified dilution has been made.

SECTION 303 - CONCRETE AND MASONRY CONSTRUCTION

303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, ALLEY INTERSECTIONS, ACCESS RAMPS AND DRIVEWAYS

303-5.1 Requirements

303-5.1.4 Concrete Substitution. Class 280-C-14 (470-C-2000) may be used in lieu of Class 310-C-17 (520-C-2500) and Class 280-D-14 (470-D-2000) in lieu of Class 310-D-17 (520-D-2500) as specified in 201-1.1.2 for street surface improvements, excluding concrete pavement, when no class is specified on the Plans or in the Special Provisions.

SECTION 306 - UNDERGROUND CONDUIT CONSTRUCTION

306-1 OPEN TRENCH OPERATIONS

306-1.2 Installation of Pipe

306-1.2.1 Bedding

306-1.2.1.1 Bedding Material. When native material is allowed for backfill in the bedding zone, no rocks larger than 40 mm (1½") in maximum dimensions shall be included. Material containing ashes, cinders, and types of refuse or other deleterious material shall not be used as bedding.

306-1.2.1.2 Sewer Pipe Bedding. Bedding for sewer pipe from 100 mm (4") below the pipe to the spring line (horizontal diameter) of the pipe shall be free draining, granular material with a maximum size of 15 mm (½ inch), unless another bedding method is shown on the Plans.

Densification of the bedding material may be by the application of water or by mechanical means. Unless otherwise specified, all bedding material shall be densified to a relative density of 90%. Acceptability of densification in the bedding zone will be determined by visual inspection and probing to determine that no voids exist in the backfill material. In this paragraph, the word "voids" does not include intergranular voids in the soil structure.

306-1.2.1.3 Flexible Pipe Bedding. Bedding for flexible drainage and sewer pipe shall be granular material having a sand equivalent of at least 50. The bedding material shall be placed and compacted from 150 mm (six inches) below the pipe to the top of the bedding as defined in 306-1.2.1. A 1 m (three-foot) long section of low permeability material (50% passing 75 µm (200) sieve) shall be installed and mechanically compacted in lieu of the above specified bedding material at intervals of 60 m (200 feet) or as otherwise indicated on the Plans.

306-9 DISINFECTION. All water mains and appurtenances shall be disinfected before being placed in service in accordance with AWWA C651 except as specified herein:

- a. The water mains shall be chlorinated so that a chlorine residual of not less than 20 ppm remains in the water after standing in the pipe for 24 hours.
- b. The Agency will perform sampling and testing of bacteriologic samples. Disinfection shall be repeated until two or more consecutive samples are negative for coliform organisms.

The pressure in the line being chlorinated shall be maintained at least 35 kPa (5 psi) lower than that existing in any Agency line to which it is connected.

306-10 WATERWORKS APPURTENANCES

306-10.1 Valves. Valves shall be located as shown on the drawings.

Each valve shall be operated prior to its installation to assure proper functioning. Valves shall be installed plumb and in alignment with the water main. Valves shall be anchored by metal ties to a concrete base. Line valves may be moved to the closest joint upon approval of the Engineer.

306-10.2 Valve Boxes. Each underground valve shall be provided with a valve box. The valve boxes shall be installed plumb and centered over the operating nut of the valve. Valve boxes shall be installed with concrete collars.

Where valve boxes are to be placed in asphaltic type pavement, they shall not be set to grade until after paving has been completed.

Where valve boxes are to be placed in concrete pavement, they shall be set to grade prior to paving operations.

306-10.3 Thrust Devices. A reaction or thrust device shall be provided on all dead ends, tees, elbows, and bends with more than 5 degrees deflection on pressure pipe lines.

Thrust devices shall be cast-in-place concrete, poured against undisturbed or compacted earth. Thrust devices shall be sized and constructed in accordance with the Plans.

Thrust devices and anchor blocks shall be constructed of Class 280-C-14 (420-C-2000) concrete. Thrust devices and anchor blocks shall be cured at least 7 Days where Type IP or II cement is used or at least 48 hours where Type III cement is used.

Metal tie-rods or clamps shall be of adequate strength to prevent movement of pipe. All metal shall be coated in accordance with AWWA C110.

306-10.4 Fire Hydrants. Fire Hydrants shall be installed as shown on the Plans.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb, except that hydrants having only two hose nozzles 90 degrees apart shall be set with each nozzle facing the curb at an angle of 45 degrees.

In uncurbed public road rights of way, fire hydrants shall be located as far as possible from the traveled way while providing a 1 m (3-foot) wide clear space between the fire hydrant and the right of way line. In curbed public road rights of way, fire hydrants shall be installed so that there is 300 mm (12 inches) clear between the face of curb and the fire hydrant.

306-10.5 Fire Hydrant Barricades. Fire hydrant barricades shall consist of 100 mm (4-inch) standard steel pipe, schedule 40, filled with concrete, and having a total length of 2 m (72 inches). They shall be embedded in concrete blocks 300 mm (12 inches) in diameter and 1000 mm (40 inches) deep below ground surface with the barricade pipe embedded to 100 mm (4 inches) above the bottom of the concrete so 1 m (36 inches) extends above ground surface. The steel pipe above ground shall be painted chrome yellow in accordance with AWWA C503.

Barricades shall be installed between the fire hydrant and vehicle traffic paths at locations indicated on the Plans or where required by the water purveyor or Fire Department. Barricades shall not be installed within public road rights of way.

Fire hydrant barricades shall not obstruct the hydrant outlets.

SECTION 310 - PAINTING

310-5 Painting Various Surfaces

310-5.6 Painting Traffic Striping, Pavement Markings, and Curb Markings.

310-5.6.8A Application of Paint - Two Coats All painted traffic striping and markings shall be applied in two coats. The price named in any Bid item for painting traffic striping and markings shall include all costs for both applications, including any delays entailed for the required drying time between applications. If bleeding, curling or discoloration occurs following application of the second coat, unsatisfactory areas shall be given an additional coat, or coats, of paint. No additional payment will be made for work necessary to correct bleeding, curling or discoloration.

PART 4

SECTION 400 - ALTERNATE ROCK PRODUCTS, ASPHALT CONCRETE, PORTLAND CEMENT CONCRETE AND UNTREATED BASE MATERIAL

Alternate rock material, Type S, as specified in Section 400 may be used on the Work.

Suppliers of portland cement concrete and asphalt concrete shall file mix designs as required by 400-1.1.2

400-4 ASPHALT CONCRETE

400-4.1 General

400-4.1.1A Asphalt Concrete - Alternate Grade. Unless otherwise specified, III-B3-PG64-10 asphalt concrete shall be used. On roads with PCC curbs, where the width between curbs is 12 m (40 feet) or less, III-C3-PG64-10 shall be used.

ACORDTM CERTIFICATE OF LIABILITY INSURANCE		DATE (MM/DD/YY)
PRODUCER	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.	
	INSURERS AFFORDING COVERAGE	
INSURED	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
X	GENERAL LIABILITY				EACH OCCURRENCE	\$
	COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire)	\$
	<input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR				MED EXP (Any one person)	\$
	DEDUCTIBLE \$				PERSONAL & ADV INJURY	\$
					GENERAL AGGREGATE	\$
					PRODUCTS - COMP/OP AGG	\$
	GEN'L AGGREGATE LIMIT APPLIES PER:					
X	POLICY <input type="checkbox"/> PRO- JECT <input type="checkbox"/> LOC <input type="checkbox"/>					
X	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT (Ea accident)	\$
	ANY AUTO				BODILY INJURY (Per person)	\$
	ALL OWNED AUTOS				BODILY INJURY (Per accident)	\$
	SCHEDULED AUTOS				PROPERTY DAMAGE (Per accident)	\$
	HIRED AUTOS					
	NON-OWNED AUTOS					
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	\$
	ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	\$
					AGG	\$
X	EXCESS LIABILITY				EACH OCCURRENCE	\$
	<input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE				AGGREGATE	\$
						\$
	DEDUCTIBLE					\$
	RETENTION \$					\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				X WC STATU- TORY LIMITS	OTH- ER
	E.L. EACH ACCIDENT				\$1,000,000	
	E.L. DISEASE - EA EMPLOYEE				\$1,000,000	
	E.L. DISEASE - POLICY LIMIT				\$1,000,000	
	OTHER					

DESCRIPTION OF OPERATIONS/ LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

<<Agency Name>> - <<Project Name>> Spec No. <<SpecNo>>

The Agency and the County of Ventura, including its boards, all special Districts governed by the Board of Supervisors, agencies, departments, officers, consultants, employees, agents and volunteers, is named as Additional Insured as respects work done by Contractor under the terms of the contract on General Liability and Auto Liability Policies. Waiver of Subrogation is applicable to the Agency and the County of Ventura, its boards, districts, agencies, departments, officers, employees, agents and volunteers for Work Comp and General Liability. Endorsements required for referenced contract will be issued by the Insurance Company.

CERTIFICATE HOLDER	ADDITIONAL INSURED; INSURER LETTER: _____	CANCELLATION
County of Ventura Public Works Agency L-1670 800 South Victoria Avenue Ventura, CA 93009-1670		SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL XXXXXXXXXXXX MAIL <u>10</u> DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, XX. AUTHORIZED REPRESENTATIVE

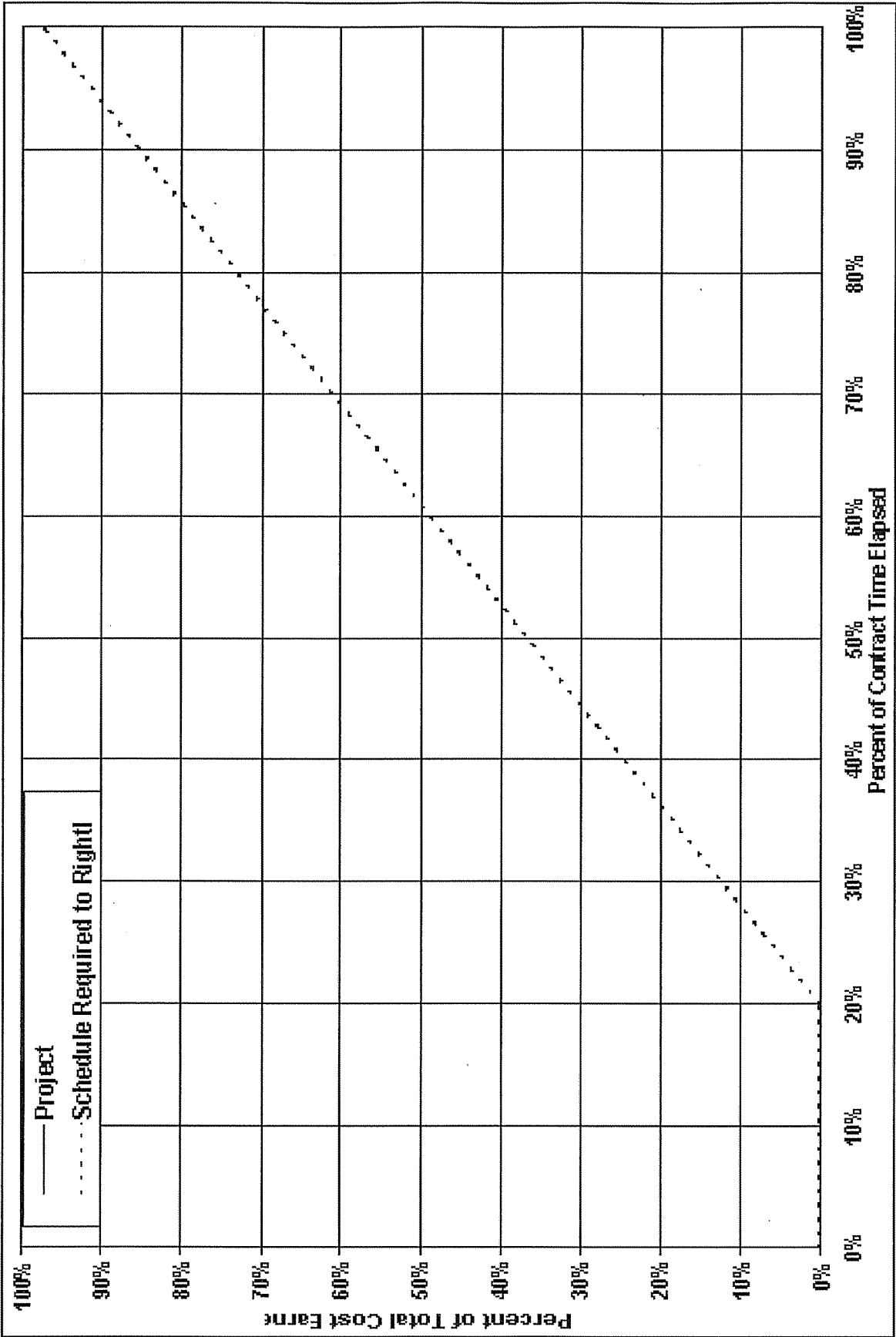
ACORD 25-S (7/97)

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[illegible]

Spec. No.

Project Name



EACH HORIZONTAL INTERVAL EQUALS 1 WORKING DAYS OF CONTRACT TIME

Contractor

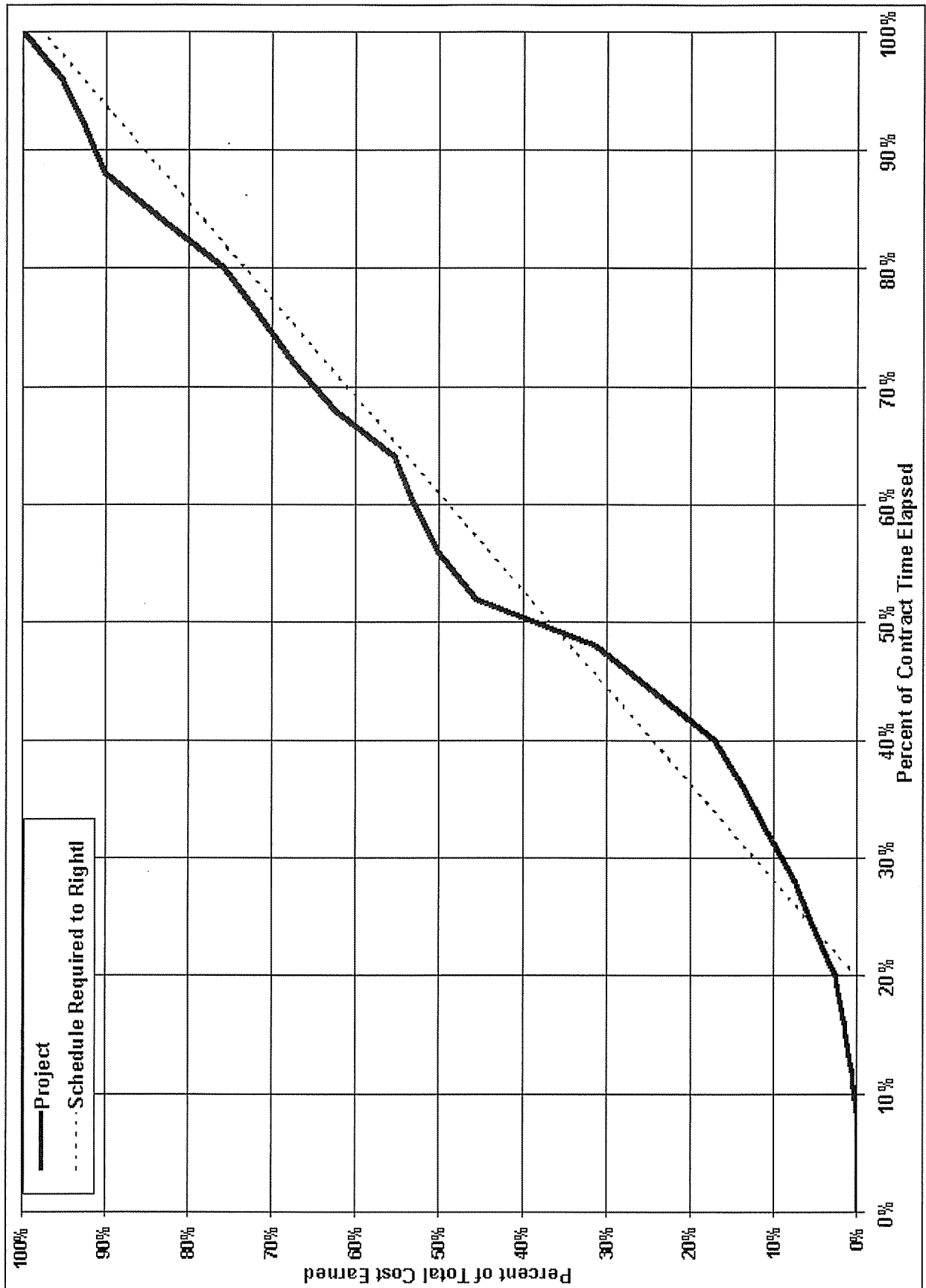
5/22/97

Date _____

Title President

FC97-32

Arroyo Santa Margurita



ESCROW AGREEMENT FOR
SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between
("Agency") whose address is _____ and
("Contractor") whose address is _____ and
("Escrow Agent") whose address is _____.

For the consideration hereinafter set forth, the Agency, Contractor and Escrow Agent agree as follows:

(1) Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the Construction Contract entered into between the Agency and Contractor for _____ in the amount of dated _____, (hereinafter referred to as the "Contract") which Contract is identified by Spec. No. _____ and Auditor Controller's Contract No. _____. Alternatively, on written request of the Contractor, the Agency shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Agency within ten days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Agency and Contractor. Securities shall be held in the name of _____, and shall designate the Contractor as the beneficial owner.

(2) The Agency shall make progress payments to the Contractor for those funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

(3) When the Agency makes payments of retentions earned directly to Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Agency pays the Escrow Agent directly.

(4) Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the escrow account. These expenses and payment terms shall be determined by the Agency, Contractor and Escrow Agent.

(5) The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Agency.

(6) Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Agency to the Escrow Agent that Agency consents to the withdrawal of the amount sought to be withdrawn by Contractor.

(7) The Agency shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days' written notice to the Escrow Agent from the Agency of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Agency.

(8) Upon receipt of written notification from the Agency certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, the Escrow Agent shall release to the Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

(9) Escrow Agent shall rely on the written notifications from the Agency and the Contractor pursuant to Sections (1) to (8), inclusive, of this Agreement and the Agency and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

(10) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Agency and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Agency:

_____, Director,
Public Works Agency

_____, Director
Central Services Department

_____, Director
Engineering Services Department

Address for all of the above:
Public Works Agency
800 South Victoria Avenue
Ventura, CA 93009

SAMPLE FORM

Form used for escrow will have names and
signatures of persons authorized in accordance
with paragraph 10.

On behalf of Contractor:

Title

Name

Signature

Street Address

City & State

Zip Code

On behalf of Escrow Agent:

Title

Name

Signature

Street Address

City & State

Zip Code

At the time the Escrow Account is opened, the Agency and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

Agency:
(Agency name)

Title

Name

Signature

Contractor:
(Contractor company name)

Title

Name

Signature

EXHIBIT "A"
ESCROW INSTRUCTIONS

The parties to this escrow are _____ ("Agency") and _____ ("Contractor") and _____ ("Escrow Agent"). Agency and Contractor have entered into a contract for the construction of _____ which contract is identified by Spec. No. _____ and Auditor-Controller's Contract No. _____ and was entered into by and between Agency and Contractor ("Construction Contract"). Pursuant to Public Contract Code Section 22300, Contractor may substitute certain securities for an equivalent amount of money required to be withheld from progress payments by Agency to Contractor pursuant to the Construction Contract.

The Escrow Agent is hereby instructed as follows:

1. Contractor may deliver to Escrow Agent:
 - (a) Securities of the types specified in Sections 22300 of the Public Contract Code and Section 16430 of the Government Code.
 - (b) Such other documents as are necessary to enable Escrow Agent to convert such securities into cash.
2. Upon receipt of such securities and other documents, Escrow Agent shall notify Agency within ten days of the deposit, and shall examine them to determine whether they are in a form sufficient to effect conversion of the securities into cash. Escrow Agent shall thereupon send written notice of its determination to Agency.
3. Escrow Agent shall hold such securities as trustee for Agency. The right of Agency to such securities is superior to any other lien or claim of lien; provided, however, that Contractor shall be entitled to any interest earned by such securities prior to their conversion to cash pursuant to section 5 hereof, and further provided that such interest may be withdrawn by Contractor at any time and from time to time without notice to Agency.

Securities may be substituted by Contractor, but any securities substituted for securities previously deposited shall not reduce the current cash value of securities held below that last reported to Agency by Escrow Agent.
4. Escrow Agent shall determine the current cash value of such securities held by it as of the close of business on the first business day following the _____ day of each month and, in addition, on any other days which the Agency may from time to time specify in a written notice to Escrow Agent. Current cash value shall be determined as follows:
 - (a) For securities traded over-the-counter or on a stock exchange:
 - (1) Determine either the current bid price for the securities as of the close of business or the face value of the securities, whichever is less.
 - (2) Subtract the cost of sale (broker commission).
 - (3) Subtract all unpaid escrow fees and costs associated therewith.
 - (b) For certificates of deposit:
 - (1) Determine the face amount.
 - (2) Subtract the potential interest penalty for immediate conversion.
 - (3) Subtract all unpaid escrow fees and costs associated therewith.
 - (c) Determine the value of other securities by procedures calculated to determine net realizable value. Promptly upon making each such determination, Escrow Agent shall notify Agency of the securities held and current cash value of such securities.

5. At any time or times that Agency believes it has a right to do so under the provisions of the Construction Contract, Agency may, without the consent of Contractor, deliver to Escrow Agent a written demand that Escrow Agent convert to cash all or any part of such securities. Upon seven days' written notice from Agency of such demand, Escrow Agent shall convert to cash all or part of such securities as demanded and shall distribute the cash as instructed by the Agency.
6. When the Construction Contract has been satisfactorily completed on the part of Contractor and any stop notices filed against the Construction Contract have been released, Agency shall give written notice to Escrow Agent that such securities may be returned to Contractor. Upon receipt of such written notice and payment of all escrow fees and costs, the Escrow Agent shall deliver to Contractor all money, interest, securities and other documents remaining in escrow and the escrow shall terminate.
7. Contractor, and not Agency, shall be liable to Escrow Agent for all of Escrow Agent's fees and costs associated with this escrow.
8. The Director of the Ventura County Public Works Agency, a Department Director of said Agency, or other person authorized in writing by such Director or Department Director is authorized to give written notice and to make written demands on behalf of Agency pursuant to sections 4, 5 and 6 hereof.
9. All written notices and demands pursuant to the escrow agreement and these Instructions shall be addressed as follows:
 - (a) To Agency:

Director, Ventura County Public Works Agency
800 South Victoria Avenue
Ventura, California 93009
 - (b) To Contractor:
 - (c) To Escrow Agent:

DATED: _____

By _____	By _____	By _____
Title _____	Title _____	Title _____

AGENCY

CONTRACTOR

ESCROW AGENT
 Bank Charter: State ☐ Federal ☐
 Escrow Agent's Address:

COUNTY OF VENTURA
AFFIRMATIVE ACTION POLICY FOR CONTRACTORS AND VENDORS

Name of Contractor

Spec. No.

During the performance of this contract, the undersigned Contractor agrees to adopt this policy to affirm its support of a program of equal employment opportunity and to assure compliance with Title VII of the Civil Rights Act of 1964, Executive Order 11246 and Section 503 of the Rehabilitation Act of 1973, if applicable, the California Fair Employment and Housing Act, and the Ventura County Affirmative Action Compliance policy for contractors and vendors.

This Contractor agrees to assert leadership within the community and to put forth good faith efforts to achieve full employment and utilization of the capabilities and productivity of all our citizens without regard to race, age, color, sex, religion, ancestry, national origin, marital status or handicap.

This Contractor further recognizes that the effective application of a policy of equal employment opportunity involves more than just a policy statement and will, therefore, undertake affirmative action to make known that equal opportunities are available on the basis of individual merit, and to encourage advancement on this basis.

The following Affirmative Action compliance policy for contractors and vendors is hereby established as the policy and practice of our company:

1. Our company will recruit, employ and treat applicants and employees without regard to race, age, color, sex, religion, ancestry, national origin, marital status or handicap, including, but not limited to, the areas of compensation and opportunities for advancement, including upgrading and promotion.

2. Our company will actively use recruitment sources such as employment agencies, unions and schools which have a policy of referring applicants on a nondiscriminatory basis.

3. Our company will disseminate its affirmative action policy externally by informing and discussing it with all recruitment sources, by advertising in news media, specifically including minority news media, and by notifying and discussing the policy with minority groups, handicapped and women's organizations and subcontractors, as appropriate. In addition, we shall maintain records of each organization's response. The policy will also be posted in all places available and accessible to employees and applicants for employment.

4. Our company will maintain a file of the names and addresses of each minority, handicapped and female applicant referred to the company for hiring and if the applicant is not considered for employment or was not employed, the company's file shall fully document the reasons.

5. Our company will insure that all employee specifications, selection requirements, tests, and other employee recruitment or evaluation procedures do not discriminate against any applicant or employee on the basis of race, age, color, sex, religion, ancestry, national origin, marital status or handicap.

6. Our company will make sure that seniority practices, job classifications, rates of pay, and other forms of compensation, and other employee practices and classifications do not have an unlawfully discriminatory effect on any applicant or employee on the basis of race, age, color, sex, religion, ancestry, national origin, marital status or handicap.

7. Our company will make certain that all subcontractors are in compliance with the Ventura County Affirmative Action Compliance Policy for Contractors and vendors, and that all project subcontractors have an approved plan or policy statement.

8. Our company will solicit bids for subcontracts from qualified minority, handicapped and female subcontractors subject to availability.

9. Our company will continually monitor all personnel activities to insure that the Ventura County Affirmative Action Policy for Contractors and Vendors is carried out.

10. Our company will make good faith efforts to meet this policy and acknowledges that violators will be reported to the Board of Supervisors for appropriate action.

Our company hereby agrees to provide to the Ventura County Affirmative Action Office any access and information that they may request to assist in determining compliance with this policy.

Date Executed at (city/state)

I declare under penalty of perjury, pursuant to the laws of the State of California, that the foregoing is true and correct to the best of my knowledge.

Signature/Title (Company Representative)

RELEASE ON CONTRACT

CONTRACT NAME: _____

SPEC. NO. _____, PROJECT NO. _____

WHEREAS, by the terms of the contract dated _____, 20____ entered into by

_____ and the undersigned CONTRACTOR,

undersigned CONTRACTOR agreed to perform certain work for the compensation specified in said contract; and

WHEREAS, the CONTRACTOR represents that said work is fully completed and that final payment is due to the CONTRACTOR under terms of said contract,

NOW, THEREFORE, in consideration of the promises and the payment by [AGENCY NAME] to the CONTRACTOR of the amount due under the contract, to wit, the sum of \$_____ and the additional consideration of \$1.00, receipt of which is hereby acknowledged by the CONTRACTOR, the CONTRACTOR hereby releases and forever discharges _____ of and from all manner of debts, dues, demands, sum or sums of money, accounts, claims and causes of action, in law and in equity, under or by virtue of said contract except the claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, any amounts retained as required by Stop Notices or Labor Code Provisions, and any unsettled claims or disputes as follows: (If none, leave blank)

Description of Claim or Dispute	Amount	Date of Claim	Date of Notice of Potential Claim
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The CONTRACTOR certifies that each unsettled claim or dispute listed hereon has been processed in compliance with the requirements for making claims under the contract, including giving notice pursuant to the applicable provisions of the contract, and following the procedures for resolution of disputes or claims set forth in subsection 6-12 of the contract. Acceptance of this Release on Contract by the [Agency Name] shall not be deemed as a waiver or release of its right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

IN WITNESS WHEREOF, the hand and seal of the CONTRACTOR have been
hereunto set this ____ day of _____, 20____.

THIS FORM MUST BE ACCOMPANIED
by a proper acknowledgement form
(See Civil Code Section 1189)

Contractor

By

Title

PERFORMANCE AND PAYMENT BOND FORM **SURETY BONDS** **PERFORMANCE AND PAYMENT**

Bond No. _____

Whereas, the Board of Supervisors of the «Agency», State of California, hereinafter called "Agency", and «Contr», hereinafter called "Principal", have entered into a contract whereby principal agrees to install and complete certain designated work, which said contract dated «ContrDate», and identified as project «ProjName» (Spec. No.«SpecNo») is hereby referred to and made a part hereof; and

Whereas, said principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract.

Now, therefore, we the principal and the undersigned, as corporate surety, are held and firmly bound unto Agency in the

penal sum of «CostText» (\$«OrigCost») lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors and administrators, jointly and severally, firmly by these presents.

The condition of this obligation is such that if the above bounded principal, the principal's heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and provisions in the said contract and any alteration thereof made as therein provided, on principal's part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless Agency, its officers, agents and employees, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

And, whereas, under the terms of said contract, principal is required before entering upon the performance of the work, to file a good and sufficient payment bond with the Agency to secure the claims to which reference is made in Title 15 (commencing with Section 3082) of Part 4 of Division 3 of the Civil Code of the State of California.

Now, therefore, said principal and the undersigned, as corporate surety, are held firmly bound unto the Agency and all contractors, subcontractors, laborers, materialmen and other persons employed in the performance of the aforesaid contract and referred to in the aforesaid Civil Code in the like sum of «CostText» (\$«OrigCost») for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts required to be deducted, withheld and paid over to the Franchise Tax Board from the wages of employees of the contractor and the contractor's subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, that said surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees including reasonable attorney's fees, to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment herein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Title 15 (commencing with Section 3082) of Part 4 of Division 3 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should this condition of this bond be fully performed, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

The surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said contract or the plans and specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

In witness whereof, this instrument has been duly executed by the principal and surety above named

on _____, 20__.

«Contr» _____
 Name of Principal)

By _____

Title _____

 (Name of Surety)

By _____
 Attorney-in-Fact

Address _____

City _____ State _____ Zip _____

SAMPLE BOND FORM

Agency will prepare the Bond in this format and transmit it to the Contractor along with the Contract and the Notice of Award letter.

Surety shall fill in the Bond No., date and identification of surety in place provided.

Contractor shall sign and indicate title in place provided.

INDICATE COMPLETE ADDRESS OF SURETY TO WHICH CORRESPONDENCE CONCERNING THIS BOND SHOULD BE DIRECTED.

Telephone No. _____

A-467/9

SECTION 01000: GENERAL REQUIREMENTS

PART 1 – GENERAL CONDITIONS

1.01 WORK DESCRIPTION

The Contractor shall furnish all materials, equipment, tools and labor for the construction of an operational facility to provide increased water pressure and fire flow to properties along and nearby Roseland Avenue.

In accordance with the Plans and Specifications, the work shall include but not be limited to construction of a booster pumping station and appurtenance work including but not limited to, pumps and motors, piping, valving, electrical, instrumentation, telemetry, site rough and finish grading, masonry retaining wall, and concrete slabs/foundations.

1.02 LINES AND GRADES

Survey services shall be provided by the Contractor at the Contractor's expense. Survey services shall be in accordance with Section 2-9 of the standard Specifications. The Contractor shall notify the Engineer 48 hours in advance of the times and places at which he intends to do work, in order that lines and grades may be checked, and that necessary measurements for record and payment may be made with minimum inconvenience to the Agency or delay to the Contractor. The Contractor's surveyor shall provide grade sheets for review by the Engineer a minimum of seven (7) days prior to start of construction.

1.03 PROJECT LOCATION

This project is located in the unincorporated area of Ventura County, CA, north of the City of Moorpark on Roseland Avenue. More detail location maps are shown on the Plans. **Thomas Guide P476 E-2**

1.04 PRE-BID MEETING

Prospective bidders are encouraged to attend a pre-bidding conference to be held on **May 12, 2009** at 10:00 a.m. at the Ventura County Waterworks District Office, 6767 Spring Road, Moorpark, California. (805 378-3000). The meeting will be held for the purpose of answering any questions concerning the project. None of the information transmitted at this meeting is to be construed to in any way modify the Plans and Specifications. Any modifications will be forwarded to all plan holders as an addendum.

1.05 PRE-CONSTRUCTION MEETING

The Contractor shall attend a preconstruction meeting scheduled by the Engineer at the Ventura County Waterworks District Office. The meeting shall be attended by the Contractor's project superintendent, foremen, subcontractors, suppliers, and representatives from other agencies appropriate to the agenda.

1.06 SITE ACCESS

Access to the project site is directly from Roseland Avenue, and within District's existing Fairview Reservoir site.

1.07 WORKING HOURS

Weekdays (Mon. thru Fri.): 7:30 a.m. – 5:00 p.m. No work shall commence and no equipment shall be started prior to 7:30 a.m.

No work on weekends (Sat. & Sun.) and Holidays, without prior request in writing to the Engineer, 48 hours in advance of the work.

1.08 COORDINATION

Contractor shall coordinate with the Engineer in advance for assistance by District Operations to operate valves or related equipment within the existing water district system.

1.09 SUBMITTALS

A. Prior to Agency issuing the NTP, the following submittals shall be approved by the Engineer:

1. SWPCP
2. Construction schedule

B. Upon receiving Notification of Award, the Contractor is advised to consider the submittals required for long-lead time equipment. The following submittals are critical to the project schedule and shall be submitted to the Engineer within fourteen (14) calendar days after issuance of the NTP:

1. MCC / Switchgear
2. Pumps

The Contractor shall submit shop drawings in accordance with Section 2-5.3 of the Standard Specifications, except as herein noted. The Contractor shall review, stamp with his approval, and submit for review by the Engineer shop

drawings for all material and equipment to be incorporated into the work. Shop drawings shall be submitted with promptness and in orderly sequence so as to cause no delay in the prosecution of the work.

Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any Subcontractor, Manufacturer, Supplier or Distributor, and which illustrate some portion of the work.

1.10 STORM WATER POLLUTION CONTROL PLAN

Contractor shall prepare a Storm Water Pollution Control Plan in accordance with VCSS 7-8.6. Requirements can be found at the Ventura County Storm Water Quality Management Program web site www.vcstormwater.org under programs/construction. Contractor shall pay all fees associated with SWPCP and for compliance. Contractor shall comply with Plan conditions and shall pay any fines imposed on owner for conditions related to this project. Contractor shall retain a copy of the approved SWPCP on site until final acceptance of project.

1.11 CONSTRUCTION SCHEDULE

In accordance with Section 6-1 of the Standard Specification, the Contractor shall complete and submit a construction schedule. In lieu of Appendix B-1, the Contractor shall provide a computer generated, graphic construction schedule prepared by the critical path method of analysis. A general guide for preparing such a schedule is contained in, "The Use of CPM in Construction, A Manual for Contractors" published by the Associated General Contractors of America.

The critical path schedule shall be prepared from estimates of the required duration and sequence for each item of work and function to be performed, and shall represent in detail all planned procurement and on-site construction activities. The schedule shall be prepared with CPM scheduling software, such as Primavera P3. Contractor shall submit 2 hardcopies of the baseline schedule and 1 copy of the CPM file on CD.

Activities making up the critical path shall be identified. No activity on the schedule shall have duration longer than 21 days or assigned value greater than \$100,000, except activities comprising only fabrication, and delivery may then extend for more than 21 days. Activities which exceed these limits shall be divided into more detailed components. The schedule duration of each activity shall be based on the work being performed during the normal 40-hour workweek with allowances made for legal holidays and normal weather conditions.

Within 7 days after receipt of the submittal, the Engineer shall review the schedule for approval. If the submitted schedule does not comply with specified requirement, review comments will be returned to the Contractor for corrections and to be resubmitted. The approved schedule is the baseline construction schedule.

Revisions to the baseline construction schedule may be made only with written approval of the Contractor and Engineer. Changes in timing for activities, which are not on the critical path, may be modified with written agreement of the Contractor and Engineer. A change affecting the timing of any activity on the critical path may be made only in accordance with applicable provisions of Section 6 of the Standard Specifications.

In addition to the construction schedule submitted with the signed contract, Contract Bonds, and Certificate of Insurance, a revised schedule may be required monthly prior to each progress payment closure date (VCSS 6-1).

1.12 SECURE WORK AREAS

It is the responsibility of the Contractor to maintain safe and secure work areas at all times. Safe work areas will include the use of barricades, guards, lights, signs, and any other devices necessary to protect the public.

1.13 WATER FOR CONSTRUCTION

The Contractor may contact and make arrangements with the County Water and Sanitation Department for the use of water for the purpose of construction. The Contractor will be provided construction water at no cost, from a fire hydrant at a location to be determined by the Engineer. The Contractor shall pay an installation charge of \$45.00 and refundable deposit of \$650.00, and coordinate the acquisition of the required fire hydrant meter through the Engineer. Contractor shall install a backflow preventer at water connection location.

1.14 EQUIPMENT AND MATERIALS STORAGE

The Contractor shall maintain a secure storage site for all equipment and materials. All deliveries of materials to the job site shall be planned and executed so that traffic is not obstructed or interfered with in any fashion.

1.15 NUISANCE WATER

It is possible that nuisance water, such as rainfall, or surface runoff may occur within the construction site during the period of construction under this contract. The Contractor, by signing the contract, will be held to have

investigated the risks arising from such waters and shall take all measures to prevent delays in progress to the work caused by such waters.

1.16 TRENCH AND SAFETY METHODS

Trench and pit excavation shall conform to Section 7-10.4.1 of the Standard Specifications and these Special Provisions. The walls and faces of all excavations over five (5) feet in depth shall be effectively protected by a shoring system, sloping of the ground, or other equivalent means. Trenches less than five (5) feet in depth shall also be protected when examination indicates hazardous ground movement may be expected. The Contractor shall obtain a permit to perform excavation or trench work from the Division of Industrial Safety, State of California, prior to any construction.

1.17 WEEKLY PROGRESS MEETINGS

A weekly progress meeting shall be conducted at an agreed time and day by the Agency and contractor. The contractor shall provide the Agency with a two-week "Look Ahead" Schedule and minutes from the previous meeting one day prior to the weekly meetings.

1.18 DESIGNATED PERSON OF CONTACT

Contractor shall designate a project superintendent on the job at all times, with the authority to receive direction from the inspector. Should multiple crews be utilized, a foreman shall be assigned per crew with the authority to receive direction and provide information requested by the inspector.

1.19 CONSTRUCTION SITE MAINTENANCE

In accordance with Section 7-8 of the Standard Specifications, the Contractor shall provide the means to maintain a construction site free from dust and excessive noise. The Contractor is required to control dust during the entire Contract period, including holidays and weekends.

Throughout all phases of construction, including suspension of work, and until project acceptance, the Contractor shall keep the work site clean and free from rubbish, debris, and graffiti (including the Contractor's equipment). The Contractor shall also abate dust nuisance by cleaning, sweeping, and sprinkling with water, or other means as necessary.

The Contractor shall furnish and operate a self-loading motor sweeper with spray nozzles as necessary to keep paved areas of Roseland Avenue acceptable and clean wherever construction, including restoration, is

incomplete. Materials and equipment shall be removed from the site as soon as they are no longer necessary.

Provide temporary sanitation facilities.

1.20 TRANSPORTATION REQUIREMENTS

The contractor shall inspect the project-impacted immediate road area near the District reservoir site (and videotape) with representatives from the District prior to construction. Immediately after construction is complete, the Contractor shall inspect the road area jointly with a representative from the District to make repairs to a section or sections determined to be damaged by the Contractor's operations (as determined by the District) within 30 days of completion of the project.

At no time during the project construction shall access to Roseland Avenue or to the residences be blocked by heavy equipment. Adequate space shall be maintained to traffic on Roseland Avenue so that vehicles, including emergency response vehicles, are able to pass.

Signage and/or other appropriate mechanisms (e.g., temporary construction fencing, monitoring, etc.) designed to ensure bicyclist and pedestrian safety in the project area during construction activities shall be implemented.

1.21 OPERATION AND MAINTENANCE MANUALS

Submit six (6) copies of operation and maintenance manuals for all operating apparatus and equipment furnished under this contract to the Engineer 30 days prior to acceptance. Manuals shall be bound in durable covers, clearly indexed or provided with thumb tabs for each item or product, and a directory of related subcontractors, service representatives and parts sources shall be included.

Manuals shall contain full information for each item of equipment, including instructions for installation, start-up, operation, inspection and maintenance, lubrication schedules, parts lists, control or power circuitry, and other pertinent data as applicable. If literature covers more than one model, neatly identify appropriate provisions.

Manuals shall include detailed narrative of intended operation of the completed booster pump station as a whole system, and the process operation of each sub-system, including but not limited to:

- Booster pumps & Fire flow pump
- Electrical & instrumentation controls
- Stand by generator

The detailed narrative shall also describe the intended system control logic and all alarms.

A. Manuals shall include:

1. List of all equipment furnished for project including name, address, and telephone number of vendor.
2. List of serial numbers of equipment furnished.
3. A copy of all approved shop drawings in final form.
4. All electrical record drawings showing conduit locations dimensioned from the walls and/or other monuments.
5. All piping record drawings showing locations dimensioned from walls and/or other monuments.
6. Manufacturer's operation and maintenance instructions and parts lists.
7. List of all fuses, lamps, seals, and other expendable equipment and devices. Size, type, and ordering description shall be specified. Name, address, and telephone number of vendor shall be listed.

B. Supplemental pump data required. (Certified Lab Pump Tests)

C. Provide electronic copy in searchable pdf format on CD.

1.22 RECORD DRAWINGS

The Contractor shall maintain at the jobsite one set of full size contract drawings marked with red lines to show any deviations which have been made from the contract documents including buried or concealed construction and utility features which are revealed during the course of construction.

Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate fully the work as actually constructed.

Record drawings shall be accessible to the Engineer at all times during the construction period and shall be delivered to the Engineer upon completion and prior to acceptance of the work.

Field Estimates for Progress payments may not be processed if the record drawings are not kept current. Request for final payment shall not be

approved until completed, legible record drawings showing all variations between the "work as constructed" and as originally shown on the contract documents has been delivered to the Engineer.

1.23 DIMENSIONS AND VERIFICATIONS

The dimensions shown were established by formal survey methods. The locations of existing facilities are assumed to be complete. No warranty is made, expressed or implied, as to the accuracy of these dimensions, and it is the Contractor's responsibility to verify all dimensions before construction in accordance with these Specifications.

Prior to ordering any materials or beginning any construction, the Contractor shall expose the existing system at the intended points of connection with new facilities, and shall verify the location, elevation and types and sizes of materials and fittings required to make the connection. The Contractor shall verify the exact location of any obstructions prior to construction in order that revised grades or alignment may be established if required. When existing conditions are encountered which, in the opinion of the Engineer, require temporary suspension of work for design modifications or for other determinations, the Contractor shall move to other areas of work until such determinations are made. No additional compensation to the Contractor shall be made, except that an appropriate time extension for completion may be allowed when it affects the overall construction schedule.

1.24 DIVERSION AND CONTROL OF WATER

Disinfection and pump testing by their nature require the discharge of large amounts of water. The Contractor shall arrange for the disposal of water from the site. Discharged water shall be carried away from the site and legally discharged in such a manner as to minimize erosion.

1.25 INSTRUCTION

The Contractor shall instruct Agency's personnel in operation of all systems, mechanical, electrical and other equipment, as required by the individual product specifications. The Contractor will include a minimum of two (2) 8-hour days for field representatives(s) of all the different project equipment and material to instruct Agency's personnel in operation and maintenance of that equipment and material unless specified otherwise.

1.26 UTILITY CROSSINGS

Changes in alignment and grade of the water main connection or changes in the fittings at connections due to utility crossings shall be approved by the Engineer. The cost incurred in making utility crossings, shall be included in the price bid for other items of work.

1.27 FINAL ACCEPTANCE

After all work is completed, the Contractor shall request a final inspection to satisfy contract obligation in accordance with Ventura County Standard Section 6-8.

1.28 REQUIREMENT FOR DISTRICT APPROVED TELEMETRY CONTRACTOR

Contractor shall sub-contract with Systems Integrated, the District Approved Telemetry Contractor, for the portion of the work described in Section 1007 as RTU, and Bid Item No. 7B. The District has received a proposal in advance from Systems Integrated for the subject work, which is included as Exhibit "A".

1.29 MEASUREMENT AND PAYMENT

Payment for compliance of this section, except for Trench Safety Methods, shall be considered as included in the various work items shown on the bid form. Additional work items the Contractor believes are required for the work, but are not included in the bid form shall be considered as included in the various items of work and no additional payment shall be made therefore.

Payment for Trench Safety Methods shall be made at the Contract Lump Sum Price shown on the bid form. Said payment shall include, but not be limited to, furnishing, installing and removing all sheeting, shoring or bracing, providing shoring diagrams, and for performing all the work for Trench Safety Methods in accordance with this section. Measurement and Payment for Trench Safety Methods shall conform to Section 7-10.4.1 of the SSPWC.

SECTION 1001 SITE WORK

1001-1 GENERAL

1.1 Scope of Work

- A. The work includes site survey and staking, site rough and finish grading, trenching and backfilling for underground piping, installation of concrete slabs and equipment foundations, construction of a masonry retaining wall, repair of asphalt paving, placement of 6" PMB material, and appurtenant work.

1001-2 CONSTRUCTION MATERIALS

2.1 Concrete

- A. Concrete for slabs and equipment foundation shall be class 560-C-3250 in accordance with SSPWC 201-1.
- B. Concrete for guard posts shall be class 500-C-2500 in accordance with SSPWC 201-1.
- C. Concrete for pipe bedding and encasement shall be class 265-C-14.
- D. Steel reinforcement for concrete shall be in accordance with SSPWC 201-2.

2.2 Processed Miscellaneous Base

Processed miscellaneous base shall be in accordance with SSPWC 200-2.5.

2.3 Asphaltic Concrete Pavement

AC pavement for patching shall be type III-B3-AR 4000/8000 in accordance with SSPWC 400-4.

2.4 Soil Sterilant

Soil Sterilant material requirements are identified in SSPWC 2-2.4

2.5 Masonry

- A. Concrete block masonry units shall be in accordance with SSPWC 202-2.1.
- B. Grout and mortar for masonry work shall be in accordance with SSPWC 202-2.
- C. Reinforcing steel in masonry construction shall be in accordance with SSPWC 201.

1001-3 CONSTRUCTION METHODS

3.1 Grading

The booster pump station pad area, the electrical pad area, and those areas to receive PMB will be graded. Remedial grading operations after construction shall bring the area back to design contours and shall conform to SSPWC 300-2, 300-3, and 300-4.

3.2 Soil Sterilant requirements are identified in SSPWC 2-3.4.

3.3 Reinforced Concrete Slabs And Equipment Foundations

- A. Subgrade for the entire site to be covered with concrete slabs and base material shall be prepared in conformity with SSPWC 301-1.
- B. Slabs and equipment foundation pads shall be constructed in accordance with SSPWC 303-1.
- C. Installation of reinforcing steel shall be in accordance with SSPWC 303-1.7.

3.4 Asphaltic Pavement

AC pavement patching shall be 3" thick on a 6" deep PMB compacted to 95% relative density placed in conformity with SSPWC 302-5.

3.5 Concrete Block Masonry Wall

- A. Construction of masonry block wall units shall be in accordance with SSPWC 303-4 and per SPPWC Standard Plan 618-2 Type B.
- B. Installation of grout and mortar shall be in accordance to SSPWC 303-4
- C. Installation of reinforcing steel shall be in accordance with SSPWC 303-1.7 and per SPPWC Standard Plan 618-2 Type B.

1001-4 MEASUREMENT AND PAYMENT

Payment for the site work shall be at the lump sum price bid for Bid Item No. 1. Such payment shall include full compensation for all labor, materials, tools and equipment including all appurtenant materials, work and support in accordance with the plans and specifications.

END OF SECTION

**SECTION 1002
PUMPS, MOTORS AND APPURTENANCES**

1002-1 GENERAL

1.1 Scope of Work

- A. Provide and install three (3) 7 ½ HP multi-stage vertical pumps and one (1) 40 HP, vertical-turbine, water lubricated, shaft driven type pump complete with a vertical, hollow shaft, inverter duty, standard efficient induction type electric motor and all appurtenant devices.

The service of factory representatives to check installation and operation of the pumps and motors assembly and appurtenances after installation shall be furnished at no additional cost.

- B. Provide and install one (1) 16" diameter pump can, Sch 30 steel epoxy lined and coated per AWWA C-213.

1.2 Submittals

In addition to other requirements, the following shall be provided:

- A. Factory Certified Performance Curves: Factory certified performance curves showing operating head, capacity, efficiency, and horsepower shall be included in the submittals, certified by pump manufacturer to meet the project requirements, per Section 1000.

The factory certified performance curves for each pump must be under the actual test conditions and for the anticipated pump performance under field conditions (ref. ANSI/AWWA E101, Section 6.2.2). These curves shall show the make and model of the pump, size of impeller, capacity, head, NPSH required, brake horsepower and efficiency when operating through and at least up to 150 percent of the design operating range of the pump.

- B. Shop Drawings: Shop drawings of pump assembly showing conformance with specific characteristics shall be submitted per Section 1000-3.

1.3 Quality Assurance

The Contractor shall obtain written certification from the equipment manufacturer stating that all equipment will efficiently and thoroughly meet the requirements of the Specifications and that they will conform to the standards and requirements of applicable codes. The certification shall be included in the submittals per Section 1000-3.

1.4 Source Of Quality Control

The pump and appurtenant components shall not be shipped from the factory until the Agency has approved performance curves.

1.5 Supplemental Pump Data Required

Spare Parts

The manufacturer shall supply to the Agency a list of recommended spare parts and special tools required to assemble or disassemble the pump and motor units along with prices. The Agency may opt to purchase, at their discretion, the above recommended spare parts and special tools. The Agency will issue a separate purchase order, or change order, for such special tools and/or spare parts they purchase.

1.6 Operating Conditions

The Contractor shall furnish and install three (3) multi-stage vertical (Duty) booster pumps and one vertical turbine (high-flow) booster pump as describe herein.

A. Operational and Dimensional Requirements

The booster pumps will be used to pump domestic water. All materials furnished and installed by the Contractor shall be compatible with these purposes.

The pump operations shall conform to the following design characteristics with no excessive vibration, cavitation and no continuous upward thrust forces that could cause excessive noise or harmful operation to the pump, motor and piping and meeting current Hydraulic Institute Standards. The pumps shall be capable of operating along the pump curves to meet the design conditions as identified herein.

The design operation points on the curves shall be capable of meeting minimum efficiencies, design flows, horsepower and other criteria established herein, at each design head listed in the conditions summary. The required pump Net Positive Suction Head (NPSH) shall be less than the available minimum listed.

B. Pumps

Pumps shall meet the following operations and dimensional requirements:

1. Multi-Stage Vertical Centrifugal (Duty) Pumps

Minimum capacity at design head	75 gpm
Design Head, TDH	198 ft
Minimum efficiency @ design head	78 %
Diameter of discharge	2 inches
Maximum required horsepower	7.5 horsepower ^(See note 1)
Maximum pump operating speed	1770 rpm
NPSH available	38.97 ft ^(See note 2)
NPSH Required at design	7 ft
Maximum pump shut-off head	222 ft

Notes:

1. At no point on the pump curve shall the required motor horsepower exceed 7.5 horsepower.
 2. NPSH available using tank bottom.
- The pumps shall be Model 4SV-3 by Goulds Company or approved equal.

2. Vertical Turbine, (High-Flow) Pump

Minimum capacity at design head	1,000 gpm
Design Head, TDH	130 ft
Minimum efficiency @ design head	84.5%
Pump can diameter (O.D.)	16 inches
Maximum outside diameter of bowls	11.75 inches
Diameter of discharge	6 inches
Maximum required horsepower	40 horsepower ^(See note 1)
Maximum pump operating speed	1770 rpm
NPSH available	38.97 ft ^(See note 2)
NPSH Required at design	18.766 ft
Maximum pump shut-off head	168.3 ft

Notes:

1. At no point on the pump curve shall the required motor horsepower exceed 40 horsepower.
2. NPSH available using tank bottom.

The pump shall be Model 12MB, 3 Stages by Peerless Pump Company (Gary Holt, 909-860-4190 ext. 224) or approved alternate.

1002-2 CONSTRUCTION MATERIALS

2.1 Multi Stage Vertical Centrifugal (Duty)-Pump and Motor

A. General Requirements

The contractor shall provide 3 (three) multi-stage vertical centrifugal pump units. All pump units shall be from one manufacturer and provided complete, including electric motor drive.

B. Pump Construction

Each pump shall include the following design features:

1. Pump End Components

a) Casing

The pump casing shall be of deep drawn, laser welded AISI 304L or 316L stainless steel and shall be capable of withstanding maximum working pressures of 360 psi. Piping connections shall be in-line and shall be compatible with ANSI raised face flanges.

b) Wear Rings

Wear rings shall be provided within each stage. Wear rings must be self centering and easily replaceable.

c) Impeller

Impellers shall be of enclosed design and constructed of AISI 316L stainless steel. Impellers shall provide internal thrust balance in each stage.

d) Diffuser Bowl

Each stage shall have a bowl with attached diffuser and be constructed of AISI 304L or 316L stainless steel.

e. Seal Housing

The seal housing shall be of concave design and shall hold the seal faces below the topmost part of the pump casing.

f. Mechanical Seal

The pump shaft seal shall be one of the following configurations as indicated.

g. Shaft Sleeve and Bearing

The pump shall have shaft sleeves made of Tungsten Carbide and ceramic bearings. Shaft height shall be set with a standard space.

B. Electric Motor

The pump drive motor shall be NEMA standard design TC frame suitable for vertical mounting and close coupled to the pump unit. Motors shall be of standard manufacturers catalog design and must not use special bearings as a thrust handling device. The motor rating shall be:

7.5 HP	3600 RPM	230/460 volts
3 Phase	60 Hz	
ODP Enclosure		
High Efficiency, 1.15 Service Factor		

2.2 Vertical Turbine Pump and Motor

A. General Requirements:

The pump shall be a vertical-turbine type, automatic, water lubricated, close-coupled unit, complete with motor, combination motor support/discharge head, pump discharge column pipes, and line shafting. The pump shall be constructed in accordance with AWWA E101 specifications, except as herein modified.

Two brass or stainless steel plates shall be attached or integrally cast to each pump discharge head in a conspicuous place. The following information shall be plainly marked on the plates: Plate No. 1 - name and address of the manufacturer, capacity and head of the pump, serial number, model number, date of manufacture, and any other information necessary for complete identification; Plate No. 2 -direction of pump rotation.

The Contractor shall provide a 16-inch diameter pump can as shown and per manufacturer's recommendations. The can shall be Schedule 30 welded steel with an 8-inch welded, flanged inlet and adapter flange for pump mounting as recommended by the pump manufacturer. The pump can assembly shall be fusion bonded epoxy lined and coated per AWWA C213.

B. Strainer

The bottom bowl of the pump shall be fitted with a stainless steel strainer, suction case bearing (ASTM B145, bronze) and suction case (cast iron, A48-Class 30).

C. Bowl Assembly, Shaft, and Bearing

Each bowl assembly shall be cast from high-strength, close-grained, cast iron, ASTM A-48, Class 60 or better, free from blow holes, sand holes, and all other faults, accurately machined to close tolerances and a registered fit. The impellers shall be of the enclosed type and of solid cast bronze, ASTM B-584, or better, machined, polished and statically and dynamically balanced. The interior of the pump bowls shall be vitreous enamel lined. The bottom bearing shall be grease packed. The pump bowls shall have bronze, ASTM B-505, or combination bronze, ASTM B-505, and fluted cutlass rubber bearings. Rubber only bearings will not be permitted. ASTM B-505 bronze replaceable seal or wear rings shall be installed in each bowl.

Each bowl shall provide a side and bottom seal at the impeller skirt to prevent slippage of water between the bowl and impeller. Pump manufacturers shall certify that both the impellers and the bowl assemblies offered can be machined and fitted with wear rings when pump wear dictates their installation. The bottom or suction manifold bearing shall be packed with a waterproof grease and protected by an ASTM A-48 or better sand collar fitted on and secured to the impeller shaft immediately above the bearing. The pump top bowl shall contain by-pass ports to allow water entering the shaft enclosing tube to drain and a means to connect the shaft enclosing tube to the bowl assembly. Each bowl assembly shall have enough lateral clearance to allow for proper impeller adjustment and shaft stretch encountered in the application and at shut-off conditions. Adjustment of the impellers setting shall be accomplished by use of an adjusting nut fitted on the top drive coupling of the motor.

The impeller shaft shall be ASTM A276-416 or better stainless steel machined to exact limits with lathe cut threads and machine faced ends. There shall be two bearings of ample size in the housing of the impeller and an internal bearing between each impeller.

The line shafting shall be turned, ground and polished ASTM A108, Gr 1045, carbon steel precision shafting of ample size to operate the pump without distortion or vibration, but not less than 1.5" diameter. The shaft shall be designed so that the first critical speed is at least 50 percent above the operation speed. The shafts shall be furnished in interchangeable sections and shall be coupled with extra-strong threaded

ASTM A108 steel couplings machined from bar steel. Threads shall be lathe cut and ends of the shaft sections shall be machine faced and be such that normal pump rotation tightens the threads.

The line shafting shall be enclosed in a tube. The shaft enclosing tube shall be in interchangeable sections not over five feet in length. The tube sections shall be manufactured from Schedule-80 ASTM A53 welded steel pipe. Shaft enclosing tube sections shall be threaded internally on both ends to accept ASTM B584 couplings which also act as the lineshaft bearings. These combination coupling/bearings shall have an internal spiral groove to facilitate proper lineshafting lubrication that will readily allow water to flow through and lubricate the bearings below. Bearings shall be spaced not more than five feet apart. Hard rubber stabilizing spiders shall be provided. The tube tension nuts or tube nut assemblies shall be of the packed design to prevent water from spraying the bottom of the motor when high water pumping levels are encountered.

D. Column Pipe

The column pipe shall be a minimum of ten inches in diameter and be welded steel pipe of standard wall thickness, minimum ASTM A53 grade. Sections shall be connected with an ASTM A53 minimum sleeve type column pipe coupling. The joints shall butt in the column pipe couplings to ensure perfect column alignment after assembly.

E. Motor Support/Discharge Head

The discharge head motor mounting flange shall be the same diameter as the base of the motor supplied. The discharge head shall be grey cast iron, ASTM A48, Class 30 or better, of sufficient strength to support the motor, column assembly, pump, and the maximum downthrust of the pump with maximum vibration as established by the HIS. The discharge flange shall be 150-pound rating and drilled to receive 150-pound standard ANSI B16.1 bolting, flat faced, and six-inch nominal pipe size. The discharge head will be fitted with packed type tension nuts for provisions for water lubricating the lineshaft bearings.

F. Pump Motor Requirements

1. Motor for 40-HP turbine pump shall be manufactured by U.S. Electrical Motors.
2. Motor shall be NEMA Design B. Motor shall be NEMA Starting Code F or G.

3. Motor shall be vertical weather-protected Type 1, NEMA WP-1, solid shaft.
4. Stator windings shall be copper.
5. Torque and slip characteristics shall be as recommended by the manufacturer of the driven equipment and as specified.
6. Motor shall be sized to start and accelerate the design load of the driven equipment without exceeding any of the specified design requirements. The contractor shall replace or repair any motor failing these requirements with a motor that will meet the specifications and requirements at no additional cost to the District.
7. Connection box shall be cast metal with gaskets between the box and housing and between the box and cover. Provide a grounding terminal in the connection box.
8. Motors shall be rated for continuous duty at a service factor of 1.15, an ambient temperature of 50°C, and at an altitude of 3,300 feet.
9. Open drip-proof and weather-protected motors 7.5 horsepower and larger shall have stainless-steel screens over openings.
10. Motor shall have cast-iron frames. Aluminum frames are not acceptable.
11. Motor shall U.S. Motor "Premium Efficient" type "S" The efficiency shall be determined by IEEE 112 Method B using sine wave power for motors up to 300 horsepower. Efficiency shall be listed on the nameplate in accordance with NEMA MG 1-12.58.2.
12. Motor shall have 120-volt heating elements.
13. Provide motor with a guaranteed maximum sound power level of 72 dBA, measured per IEEE 85, when running at no-load connected to sine wave power.
14. In addition to nameplate information required by NEMA MG 1-10.37 through 39, show on the nameplate the bearing numbers for both bearings, efficiency, power factor at full load, and the maximum recommended kVAR of power capacitors to result in a 90% power factor. Nameplates and fasteners shall be stainless steel.

15. Equip motor with thermal protection in accordance with NEMA MG 1. Control leads shall be color-coded, brought out to the motor conduit box or a separate terminal box for connection. Motor Thermal protection shall be comprised at least (6) thermistors set within the motor's windings and on the bearings by the motor manufacturer. Thermistor set shall come complete with corresponding thermistor controller that contains an with output relay contact for high temperature alarm. Provide motor with US Motors Therma Sentry motor thermal detection system or approved equal.
16. Motor shall be dynamically balanced and measured per NEMA Method MG1-12.06.
17. Motor connected to Variable Frequency Drives shall be rated for Inverter Duty.
18. Vertical motor shall be designed for vertical operation and shall have thrust bearings with a rated L-10 life of 40,000 hours as defined by Anti-Friction Bearing Manufacturers Association (AFBMA). Bearings shall be designed for 30% momentary up-thrust capacity.
19. Equip grease-lubricated bearings with fittings in each bearing housing. Fittings shall be accessible without removal of any covers or guards. Provide drains to prevent over lubrication.
20. Provide Class F nonhygroscopic insulation system with two dips and bakes of insulating varnish. Size motor to limit temperature rise to a Class B rise at unity service factor.
21. Provide Class H insulation system consisting of vacuum pressure impregnation of 100% solid epoxy resins.
22. Motor electrical requirements shall be 230/460 volts, 3 phase, 60 Hz.
23. The castings shall be coated with a red-oxide zinc-chromate primer and finished with a corrosion-resistant epoxy coating. All fabricated steel enclosures shall be coated on all inside and outside surfaces except shafts and register fits.
24. Protect motors from exposure of elements for which they are not designed. Install and energize temporary electrical service to motors with electrical heaters.
25. Store motors in an air-conditioned, ventilated, or protected environment similar to or better than the environment in their final location.

2.3 Submittals

- A. Submit shop drawings in accordance with Section 1000-3.
- B. Submit motor housing material, winding material, NEMA design letter, NEMA code letter, ambient temperatures and maximum elevations in which motor is designed to operate continuously, service factor, NEMA insulation class, temperature rise, type of enclosure, voltage, locked rotor current, full load current, bearing life, and dynamic balance.
- C. Submit nameplate data.
- D. Submit dimensions and weights of motors.
- E. Submit percent efficiency and power factor data at full, 75%, and 50% load.

2.4 Factory Tests

- A. For each motor provide routine (short commercial) test data. Tests shall comply with NEMA MG 1-12.51 and MG 1-23.46.
- B. Perform noise tests by measurement in accordance with the latest revision of IEEE-85, Test Procedure for Air Borne Noise Measurements and Rotating Electrical Machinery. The motor shall be operating during test on rubber at no load with rated voltage and frequency.
- C. Perform vibration tests per NEMA MG 1-12.06 or MG 1-20.53. Delete the following paragraph if thermally protected motors are not specified.
- D. Test thermally protected motors in accordance with NEMA MG 1 winding temperature and trip current tests.
- E. Each pump and motor unit shall be hydrostatically tested by the manufacturer in accordance with Hydraulic Institute Standards at a minimum of 350 psi.
- F. Production performance testing will be conducted by the manufacturer on each pump unit. Head at three operating points (70% of BEP, BEP and 120% of BEP) will be measured to verify performance.

2.7 Field Operating Tests

- A. Run each motor with its control as nearly as possible under operating

conditions to demonstrate correct rotation direction, alignment, wiring size, proper overload relay sizing, speed, and satisfactory operation. Test interlocks and control features to verify correct wiring and operation.

- C. Record current in each phase of each motor and include in the maintenance manual. Repair or replace motor or driven equipment if current exceeds motor nameplate value.

2.8 Coating

Touch up field-damaged factory finish with paint that is equal in quality and color to the original factory finish.

1002-3 **CONSTRUCTION METHODS**

3.1 Installation

No pump shall be installed without written authorization from the Agency.

Instructions of the manufacturer of all items covered in this Section shall be followed unless they conflict with the plans. If such conflict exists, the Agency shall be notified in writing and his instructions shall be obtained prior to proceeding.

Equipment shall be field tested to verify proper alignment, and operation as specified, including freedom from binding, scraping, vibration, shaft runout or other defects. Pumps shall be field tested under operating conditions and shall have pressure, capacity, vibration and power input measured. Equipment shall be secure in position and neat in appearance.

The installation work shall include furnishing the necessary materials for initial operation.

3.2 Adjust and Clean

After installation of equipment is complete, all necessary adjustments, lubrication and maintenance shall be performed in accordance with the manufacturer's instructions. Prior to final inspection, all surfaces shall be cleaned of grease, construction dirt, concrete, other foreign matter and painted in accordance with Section 1006.

3.3 Equipment Startup

An experienced, competent factory representative of the manufacturer shall, unless otherwise approved by the Agency, visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. The

representative shall be present when the equipment is placed in operation and thereafter as often as necessary until the equipment installation and operation is satisfactory to the Agency. The representative shall furnish to the Agency, a written report certifying that the equipment: (1) has been properly installed and lubricated; (2) is free from undue stress imposed by connecting anchor bolts; (3) is in accurate alignment; (4) has been operated under full load conditions and that it operates satisfactorily. Include one (1) day additional to provide factory representative for instruction of operating and maintenance personnel.

1002-4 ACCEPTANCE TESTS

A. Equipment Testing and Documentation

1. The pumps shall be acceptance tested by Contractor to verify conformance with the Contract Documents.
2. The following data shall be tabulated for each pump and submitted to the Engineer prior to acceptance of the equipment:
 - a. Equipment or motor name
 - b. Nameplate full-load and locked rotor ampere rating. Motor service factor.
 - c. Motor ambient temperature rating
 - d. Overload relay rating
 - e. Measured starting and full load current, each phase Megger reading
 - f. Measured flow rate
3. No equipment item for which acceptance test data has not been submitted shall be deemed as meeting Contract Documents.
4. Equipment testing schedules shall be submitted to the City seven days prior to the scheduled date of testing.

1002-5 MEASUREMENT AND PAYMENT

Payment for the multi-stage vertical centrifugal (Duty) booster pumps and vertical turbine (high flow) booster pump, motors and appurtenances shall be included in the lump sum price bid for Bid Item No. 2.

Such payments shall include full compensation for all labor, materials, tools and equipment to install the low-flow duty and high flow booster pumps and motors including all appurtenant materials, work and support, in accordance with the plans and specifications.

END OF SECTION

**SECTION 1003
PIPING, VALVES AND APPURTENANCES**

1003-1 GENERAL

The work consists of supplying and installing piping and valves, and other appurtenances including pump control valves, gate valves, relief valves, check valves, air and vacuum valves, pipe and special fittings and pieces for the pumps, yard piping including all pipes, valves and fittings not covered by other sections.

1003-2 CONSTRUCTION MATERIALS

2.1 General Valve Requirements

All valves and accessories shall be new with all manufacturers' warranties fully effective, and shall be supplied from established and reputable manufacturers. Vendor data on all valves shall be submitted to the Engineer for approval as to materials, design, manufacturing standards and suitability for the application intended.

2.2 Pump Control Valve (Supplied by Owner)

The pump control valve supplied by owner installed in the 40 HP turbine well pump discharge line shall be a 6-inch diaphragm actuated, hydraulically operated, globe pattern valve, CLA-VAL 60-11.

2.3 Combination Pressure Relief/Surge Anticipator Valve (Supplied by Owner)

A 4-inch diaphragm-actuated globe pattern type pressure relief/surge anticipator valve supplied by owner shall be installed off the discharge line as shown on the plans.

The high pressure pilot shall be set to open at any pressure above the normal operating pressure. The low pressure pilot shall be set to open the main valve at any pressure below its normal operating pressure. The low pressure pilot shall allow the main valve to open to preset amount as controlled by a hydraulic limiter.

2.4 Resilient Wedge Gate Valves

Gate valves sizes 4"-12" shall conform to AWWA Standard C509. The valve body shall be constructed of cast iron, ASTM 126 Class B, with flanges conforming to AWWA C207, Class D, and shall be internally coated in accordance with AWWA C550. All gate valves shall have resilient seats.

All below ground gate valves shall be provided in a non-rising stem style and configured for buried service. The valve shall have an exterior coating of 20 mils of Epoxy applied in accordance with the provisions of AWWA C550. All exposed nuts and bolts shall be coated or if uncoated shall be 316 stainless steel. A cast iron valve box shall be provided. The box shall be extension style with slide type adjustment and flared base. The valve box cover shall be cast iron designed for traffic service and shall have a cast iron ring. If the valve is installed more than 4 feet below grade, a valve stem extension shall be provided. The valve operating nut shall be 2-inch square conforming to AWWA C500.

Above ground gate valves shall include both rising stem "outside stem and yoke" and non-rising stem type. See plans for location.

2.5 Air Release Valve

The air release valve body and cover shall be cast iron, ASTM A48, design for 150 PSIG, with 1/2-inch or 2-inch NPT female threaded inlet (per plans), Buna-N seat, Delrin baffle and stainless steel trim and float. The discharge orifice shall be equal to the inlet diameter and shall be fitted with an adjustable throttling device to regulate the flow of air escaping. Air valves shall be ARI, APCO, Crispen, or approved alternate.

2.6 Pipe

A. Above Ground Pipe

Pipe for pipe risers and above ground use shall be Ductile Iron Pipe conforming to AWWA C104, C115, C116, and C150 or Schedule 40 steel conforming to AWWA C200, C206, C207, C210 and C213. Welded steel pipe spools and assemblies shall conform to the provisions of SSPWC 207-10, for Class 150 or 300 PSI service as shown on the plans. Above ground steel pipe shall be epoxy lined and coated per AWWA C213.

B. Below Ground Pipe

1. Pipe for penetrations through and under concrete pad and under footings shall be ductile iron (DI), lined and coated pursuant to AWWA C104 and C105.
2. Below ground Domestic mainline pipe excluding risers shall be either DI minimum Class 150 or PVC Class 150 AWWA C900 conforming to SSPWC 207-17. Pipe sizes shall be provided as shown in the plans.
3. All metallic fittings, valves, couplings and other ferrous materials shall

be coated with "NO-OX" and encased in polyethylene per AWWA C105.

4. Pipe for French drain behind retaining wall to be corrugated polyethelene (PE) tubing, perforated conforming to ASTM F-405, enclosed in geotextile "sock" similar in all respects to ADS Drainguard, or approved equal.

2.7 Flanges

Flanges shall conform to the requirements of AWWA C207, Class D, and shall be provided as shown in the plans, class 125/150 drilling or class 300 drilling as specified.

2.8 Fittings and Special Pieces

All commercial fittings shall conform to the provisions of AWWA C104 and C110 and SSPWC 207-9 or 207-10, Class 150. All special pieces, including curves, tees, outlets, reducers and enlargers shall be fabricated as shown on the plans and shall conform to the provisions of SSPWC 207-9 or 207-10, Class 150. All special pieces shall be lined and coated in accordance with the provisions of SSPW 207-9 and 207-10 or AWWA C213 (for epoxy lining and coating).

Bolted couplings shall have a minimum sleeve thickness of 1/4 inch and include the minimum of required 5/8 inch mounting bolts as shown in the plans. The couplings shall be internally coated in accordance with AWWA C213 and be similar in all respects to Dresser Style 253.

Couplings for grooved end pipe shall be similar in all respects to Victaulic Style 77.

Fittings shall be Class 150 ANSI flanged, flanged by mechanical joint or mechanical joint as shown on the project plans.

2.9 Manifolds

Manifolds shall be constructed from welded steel pipe and furnished as detailed on the plans. They shall be fusion bonded epoxy lined and coated per AWWA C213.

2.10 Welded Steel Pipe

Welded steel pipe spools and assemblies conforming to the provisions of SSPWC 207-10, Class 150 or service shall be provided as shown on the plans.

Above ground pipe shall be cement-mortar lined conforming to the provisions of Section 207-10.4.2 with the exterior surface coated in accordance with the exterior surface coated in accordance with the provisions of Section 502-6., or epoxy lined and coated per AWWA C123. Below ground pipe shall be cement-mortar lined and coated conforming to the provisions of SSPWC 207-10.4.2 field welded joints are not allowed. The pipe shall be manufactured in a minimum number of flanged sections that can reasonably be transported to the field and installed in the pipe trench.

2.11 Testing and Certification

The Contractor shall submit a certification signed by an authorized agent of the pipe fabricator that all ductile, cast iron, and welded steel pipe including special pieces have been sampled, tested and inspected in accordance with the provisions of SSPWC Sections 207-9 and 207-10. If requested by the Engineer, all test and inspection report shall be submitted to the Engineer in duplicate.

2.12 Piping Shop Drawings

The contractor shall submit for approval detailed shop drawings for all types of joints, special fittings, connections, and straight pipe; together with direction profile drawings, "Laying Diagrams," showing the following:

Length, designation by number for special sections, and position in the pipeline of each section of pipe, joint, special fitting, and connection (including type).

The station (if any), pipe axis elevation, angular deflection of each joint and type of joint where curvature is to be accommodated for vertical or horizontal alignment.

A schematic drawing of the pipeline sections.

No pipe shall be manufactured until the drawings have been approved by the Agency. The Agency requires six sets of drawings for approval.

2.13 Concrete

Concrete for thrust blocks and pipe support posts etc. shall be Class C2500.

2.14 Joint Restraints

A joint restraint system may be used in lieu of thrust blocks in congested locations of yard piping. The restraint mechanism shall consist of a plurality of individually-actuated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile iron conforming to ASTM A536-80.

The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53 of latest revisions. Twist off insure proper actuating of restraining devices.

The restraining glands shall have a pressure rating equal to that of the pipe on which it is used. The restraining glands shall have been tested to UNI-B-13-92, be listed by Underwriters Laboratories, and be approved by Factory Mutual. The restraint shall be the EBAA Iron Series 2000PV or approved equal.

2.15 Flexible Couplings

Flexible couplings shall be non-metallic, single arch, expansion joints. The flexible couplings shall be provided with steel retainer rings having flange dimensions in accordance with 125/150 pound standards: ANSI B16.1 AWWA C-207 Tables 1 and 2 Class D; AWWA C-207. The flexible couplings shall be installed with factory supplied control rod assemblies.

2.16 Pipe Supports

Pipe supports shall be provided and installed in the saddle type, U-bolt type, and flange type as shown on the project plans. Flange type supports shall be provided with Class 125 bolting pattern.

2.17 Pressure Gauges

Unless otherwise shown, pressure gauges shall have a stainless steel case, a minimum 3 ½ inch dial, ¼ inch threaded connection and ½" ball or gate valve for isolation. Gauges shall be fluid filled and calibrated to read to 150 percent of the working pressure of the pipe or vessel to which they are connected. For the well pump, 0-200 psi range is required. All gauges shall be Grade A as manufactured by McDaniel Controls, Reotemp, U.S. Gauge, or approved equal.

2.18 Pressure Transmitter

A high accuracy pressure transmitter shall be provided to indicate the booster pump discharge pressure. The pressure transmitter shall be constructed of 316 stainless steel and have a full-scale accuracy of $\pm 0.1\%$, a range of 0-200 psi, a 4-20 mA output and temperature compensation. The pressure transmitter shall be Rosemount model Smart 3051S Ultra, or an approved equal.

2.19 Diaphragm Tanks

Contractor shall provide and install two (2) 86-Gallon pre-charged diaphragm type tanks. The tanks shall be constructed with steel shells, heavy-duty Butyl diaphragm, Polypropylene liner shall be coated in accordance to Section 1006. The tanks shall be pre-charged to 68 psig and have a maximum working pressure of 125 psig. Tanks shall be provided with a factory-installed connection.

Tanks shall be ANSI/NSF 61 approved, and be similar in all respects to Amtrol WX-302 or approved alternate.

1003-3 **CONSTRUCTION METHODS**

Installation shall conform to the manufacturer's recommendations, the plans, SSPWC 306-1.2 and these Special Provisions. Once all underground piping has been placed in the trench and bolted together and thrust blocked, it shall be hydrostatically tested to 150% of the maximum working pressure in the presence of the Engineer.

All above ground piping, fittings and valves shall be installed and supported in their respective positions, free for all distortions and strain. Valves shall be carefully aligned and positioned as indicated on the plans.

1003-4 **MEASUREMENT AND PAYMENT**

Payment for the piping, valves and appurtenances including yard piping and valves, shall be at the lump sum price bid for Bid Item No. 3. Such payment shall include full compensation for all labor, materials, tools and equipment including all appurtenant materials, work and support in accordance with the plans and specifications.

END OF SECTION

**SECTION 1004
PAINTING AND COATING**

1004-1 GENERAL

A two step protective coating system shall be furnished and applied to all exposed ferrous surfaces (except galvanized or stainless steel and non-ferrous metals) on all equipment, piping, or fabricated steel associated with the pumping station in accordance with SSPWC 310, the plans and these Special Provisions.

1004-2 CONSTRUCTION MATERIALS

2.1 Protective Coating System

A standard industrial grade two-step paint system shall be utilized that consists of an epoxy primer base coat and an aliphatic urethane top coat.

The Contractor shall select a paint system that meets the Ventura County, Air Pollution Control District regulation requiring that volatile organic compounds (VOC) be below 250 gram per liter.

The Contractor shall submit to the Engineer a written plan of the paint system to be utilized. The plan is to outline the specific products to be utilized including vendor data sheets and the method of application to be employed.

The paint system utilized shall be one of the following or an approved equal.

CARBOLINE

Carbomastic 15 (Base Coat)
Carboline 133HB (Top Coat)
Bamboo - 0855

DEVOE

Chenfast 547 (Base Coat)
Prufthane 369 (Top Coat)
Palamino Tan - 1200

PORTER

Magna-Prime 7501 (Base Coat)
Hythane Super 8610 (Top Coat)
Light Tan

2.2 Color Samples

Two 12-inch square color samples on cardboard or hardboard shall be submitted to the District for approval prior to delivery of the paint system materials to the field.

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1004-3 CONSTRUCTION METHODS

3.1 Inspection

Contractor shall make available for District's use a suitable gage for measuring thickness of applied paint.

3.2 Application and Workmanship

Field painting is not required on brass, bronze, other nonferrous metal and galvanized or stainless steel, unless otherwise required. Factory finished items shall be repainted in the field in order to create a uniform appearance and weather protection for all installed piping, valve, and equipment.

- A. Surface Preparation - All surfaces shall be free of dirt, rust, grease, or other foreign matter before coating. Unprimed, bare metal surfaces shall be cleaned in accordance with the Steel Structures Painting Council Specification SSPC-SP-10 (Near White Blast Cleaning). Weld surfaces rough edges, and coatings splatter or defects shall be ground smooth and weld splatter removed.
- B. Application - Application shall be in strict conformance with the manufacturer's recommendations. All sharp edges, nuts, bolts or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- C. Coverage - The base coat shall be applied to a minimum dry film thickness of 4 mils and the top coat shall be applied to a minimum dry film thickness of 3 mils. The top coat shall be applied to produce a uniform appearance as to color and sheen with no primer show through. The paint shall be free of all drip, sags, runs and "holidays."

3.3 Job Conditions

Environmental Requirement - Do not apply coatings when surface temperature is below 50⁰ F (10⁰ C) unless otherwise specified. Do not coat exterior

surfaces during damp, frosty, or rainy weather, or until surface has thoroughly dried from effects of such weather. Avoid coating surfaces exposed to hot sun.

3.4 Protection of Surrounding Materials - During painting operations, take all precautions to protect floors, masonry, concrete, aluminum, glass, and other prefinished surfaces from paint spatter, spillage and other soiling. Upon

completion of the work, remove all paint spots from floors, glass and other surfaces.

- 3.5 A one gallon kit of each selected base and top coat material along with the corresponding thinner shall be provided to the Agency to be used for touch-up maintenance of the protective coating.
- 3.6 Comply with all recommended safety precautions for application of coatings. Use with adequate ventilation and observe all cautions as to flammable and toxic properties of material.

1004-4 MEASUREMENT AND PAYMENT

Payment for the protective coating system shall be at the lump sum price bid for Bid Item No. 4. Such payment shall include full compensation for all labor, materials, tools and equipment including all appurtenant materials, work and support in accordance with the plans and specifications.

END OF SECTION

SECTION 1005 DISINFECTION & TESTING

1005-1 GENERAL

The work includes the disinfection and testing of the pump station, including all pipeline, valves, meter, connections, fittings and appurtenances, and shall be performed in accordance with the plans and specifications.

1005-2 CONSTRUCTION MATERIALS

Chlorine or other compounds approved by state or local regulatory agencies shall be used as disinfectants. The disinfectant shall be delivered to the site of the work in closed containers bearing the original label indicating the percentage of available chlorine. The disinfectant shall have been recently purchased. Chlorine compounds in dry form shall not have been stored for more than one year and storage of liquid compounds shall not exceed 60 days. During storage, disinfectants shall not have been exposed to the atmosphere or to direct sunlight. Unless superseded by governmental regulations, the quality of chlorine compounds used for disinfection shall be sufficient to produce a minimum concentration of 25 ml/L of the available chlorine in solution when mixed with the total volume of water in the line. Materials shall conform to AWWA B 300 and B 303.

1005-3 CONSTRUCTION METHODS

3.1 Pipelines And Appurtenances Cleaning and Flushing

The interior of all pipelines shall be cleaned and flushed prior to connection to the main line.

3.2 Disinfection

- A. Disinfection Preparation: The Contractor shall provide for disinfection as soon as construction and cleaning procedures have been completed. All oil, grease, soil, and other materials, which could harbor and protect bacteria from disinfectants, shall be removed from the piping.
- B. Disinfection: After cleaning, disinfection shall be performed in accordance with AWWA C651. After cleaning, calcium hypochlorite in solution or sodium hypochlorite solution shall be water-mixed and

introduced into mains to form a chlorine concentration, which will provide a minimal residual of 20 ml/L in all parts of the line after 24 hours have elapsed. During the sterilization process, all valves, hydrants, and other accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. The placing of HTH capsules or powder in pipe sections during the laying process will not be considered adequate sterilization. The contractor shall keep adequate chlorine residual testing and indication apparatus available on the site during the entire sterilization period. After final flushing, the flushing fittings shall be plugged with devices intended for this purpose at the pressure class of the pipe. Where water main is coated, plugs and outlets shall be similarly coated.

C. Agency will perform sampling and testing of bacteriologic samples.

3.3 System Test

A complete integrated operational test of the booster pump station and emergency generator under normal operation conditions shall be performed in the presence of the Engineer and a representative of Waterworks District No. 1. The Contractor shall submit a proposed test plan to the Agency for approval prior to scheduling the system test

1005-4 MEASUREMENT AND PAYMENT

Payment for disinfection and system test shall be at the lump sum price bid for Bid Item No. 5 Such payment shall include full compensation for all labor, materials, tools and equipment including all appurtenant materials, work and support in accordance with the plans and specifications.

END OF SECTION

**SECTION 1006
PACKAGE ENGINE GENERATOR SYSTEM**

1006-1 GENERAL

1.1 Standards

Construct equipment in accordance with the applicable requirements of the following standards:

- A. National Electrical Code (NEC).
- B. American National Standards Institute (ANSI).
- C. National Electrical Manufacturers Association (NEMA).
- D. Institute of Electrical and Electronic Engineers (IEEE).
- E. Insulated Cable Engineers Association (ICEA).
- F. American Society for Testing and Materials (ASTM).
- G. Underwriters' Laboratories, Inc. (UL).
- H. Applicable Documents
 - 1. The following documents shall apply to the specified equipment.
 - a. IEEE 587 Surge Testing
 - b. NEMA MG1 Motors and Generators
 - c. NFPA 37 Installation and Use
 - d. UL 142 Fuel Tanks

1.2 Work Included

- A. The manufacturer shall have available prototype test results for the assembled engine-generator set. Individual component tests for the major components are not acceptable as a substitute for prototype testing of the complete and assembled engine generator set. All the equipment shall be new, and of current design and shall be constructed in accordance with the applicable requirements of the IEEE, NEMA, UL, ISO, NEC and ANSI standards.

- B. Equipment and materials shall be new and delivered to the job site factory-tested and ready for installation. The work includes the following:
 - 1. Furnish and install engine-generator set with mounted and loose accessories as described herein and shown on the drawings. Transfer switch equipment shall be furnished and warranted by the generator supplier.
 - 2. Furnish tests, documents, spare parts source list and services as specified.
 - 3. Furnish fuel, oil and antifreeze for testing and final fill.
- C. The engine generator shall be equipped with the necessary devices to meet current Ventura County Air Pollution Control District (VCAPCD) regulations for the operation of a standby diesel generator. Contractor shall obtain a general permit registration number to submit application, pay for, and obtain a VCAPCD permit to construct and operate the standby generator. Isolated dry contacts for SCADA shall include low fuel, fail, run, and switch in "auto".
- D. On behalf of the District, the Contractor shall, prepare and submit application forms to obtain a permit from the VCAPCD required to operate proposed standby emergency generator. The completed forms shall be submitted to the District for review.

1.3 Submittal

- A. Submit shop drawings in accordance with the General Requirements.
- B. Equipment as described herein is that as manufactured by Caterpillar. Equipment shall be equivalent to that specified herein for ratings, operation, and function.
- C. Submit shop and installation drawings and catalog data for the following equipment. Show applicable ratings, sizes, materials, manufacturers and part numbers, and overall dimensions and weights. Provide the following submittal and shop drawing information for review. Any deviation from the specifications shall be noted on the transmittal letters indicating reasons for them.
 - 1. Itemized bill of material.

2. Engine-generator base with anchor bolt sizes and layout. Submit anchor bolt material listing. Submit catalog data for vibration isolators and calculations for size and number of anchor bolts.
 3. Engine.
 4. Generator.
 5. Enclosure.
 6. Silencer.
 7. Base fuel tank and spill basin. (day tank assembly.)
 8. Control panel.
 9. Battery charger.
 10. Batteries.
 11. Jacket water heater.
- C. Submit system schematic diagram showing all piping and wiring interconnections with sizes and quantities. Submit ladder-type schematic electrical diagrams with legend identifying all devices on diagrams. Provide drawings for engine generator showing overall dimensions, power and control wiring entrance locations, fuel connections, anchor points, weight, breaker location and control panel.
- D. Submit installation fact sheet giving fuel, coolant, lubricating oil, and exhaust and ventilation requirements.
- E. Submit torsional vibration analysis with vibration isolation calculations certified for Zone 4 installations.
- F. Submit factory test report and warranty documents.
- G. Submit a start-up inspection report signed by the engine manufacturer's authorized field service representative.
- H. Obtain construction and operating permits from the VCAPCD on behalf of the District. Submit copy of application and original general Permit Registration for "pre-permitting" engine generator with VCAPCD to District.

1. Provide an information copy of the standard engine inspection and maintenance service contract. The contract shall be for the complete system including all auxiliary support systems.

1.4 Manufacturer's Services

- A. Provide equipment manufacturer's services at the jobsite for the minimum man-days listed below, travel time excluded:
 1. Two man-days to check the installation and advise during start-up, testing, and adjustment of the equipment and to instruct the District's personnel in the operation and maintenance of the equipment. Submit operation and maintenance manuals prior to this instruction.
 2. Written certification, in a form approved by the District, shall be provided by the equipment manufacturer or his authorized representative. This certification shall verify:
 - a. That the equipment and its installation has been inspected on the job by the manufacturer and that the equipment is in first-class condition throughout, has been installed in accordance with manufacturer's requirements and recommendations, and that the installation is approved by the manufacturer.
 - b. That the equipment is operating in a safe and satisfactory manner and is delivering capacities and performance not less than the capacities and performance specified and/or indicated on the drawings.

1.5 Tools and Accessories

Furnish and deliver all special tools, instruments, accessories, and special lifting and handling devices shown in the approved instruction manuals. Unless otherwise specified or directed by the District, the items shall be delivered to the District, with the Contractor's written transmittal accompanying each shipment, in the manufacturers' original containers labeled to describe the contents and the equipment for which it is furnished. The Contractor shall deliver a copy of each transmittal to the District for record purposes.

1.6 Warranty

Equipment furnished under this section shall be guaranteed against defective parts or workmanship for a period of 24 months from date of field testing and acceptance by the District.

1.7 Acceptable Manufacturers

- A. Subject to compliance with requirements, provide diesel generator, automatic transfer switch, documents, tests, and services by Caterpillar and the authorized distributor or approved equivalent.
- B. The engine, generator, generator control panel, and fuel tank unit shall be manufactured in the U.S. by manufacturers currently engaged in the production of such equipment. An authorized manufacturer's distributor shall be capable of providing equipment as specified, maintaining parts inventory; performing initial start-up, warranty and 24 hour emergency service, and have a Service Facility located within a 75 mile radius of the District.
- C. Warranty for all products against defects in material and workmanship for a period of 2 years from the date of start up. Warranty coverage shall include parts, labor, travel expenses, and labor to remove/re-install equipment. Engage supplier capable of administering the warranty service on all components of the emergency system specified herein.

1.8 Ratings

The rating of the standby engine-generator shall be as listed below and based on operation of the set when equipped with all operating accessories, such as air cleaners, lubricating oil pump, fuel injection pump, radiator fan, and jacket water pump. The specified standby kw shall be for continuous electrical service during interruption of the normal utility source.

- A. Standby kw: 100 kw (Site rated for 100KW/125KVA) minimum.
- B. Engine Speed: 1,800 rpm (maximum).
- C. Voltage: 480/277 volts, 3 phase, 4 wire.
- D. Frequency: 60 hertz.
- E. Power Factor: 0.8.
- F. Altitude: 1,200 feet above sea level.
- G. Temperature: 120°F maximum, 30°F minimum.

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- H. Humidity at Maximum Temperature: 95%.
- I. The momentary rms voltage dip shall not be greater than 35% of rated voltage when full load at rated power factor is applied to the generator.
- J. The engine-generator shall be capable of starting and running the following loads in the sequence listed. Maximum voltage dip shall be 25%. Provide oversized generator and/or engine-generator unit to comply with this requirement. Assume solid-state starters are set at 400% current limit and motor is fully loaded during starting.

Pump "P-1"	7.5 hp	Starting VFD	Code NEMA "G"
Pump "P-2"	7.5 hp	VFD	NEMA "G"
Pump "P-3"	7.5 hp	VFD	NEMA "G"
Pump "P-3"	40 hp	Soft Start	NEMA "G"
15 kva XFMR & Panel	13 kw	Full Load	

1.9 Engine and Equipment

- A. General: The engine shall be the standard product of the manufacturer, a current production model, and have the following features:
 - 1. Full compression ignition diesel.
 - 2. Two- or four-stroke cycle.
 - 3. Water cooled.
 - 4. Replaceable cylinder liners.
 - 5. Replaceable valve seat inserts.
 - 6. Turbocharged, aftercooled, retarded four degrees.
 - 7. With or without aftercooler.
 - 8. Capable of the rated output when operating on a commercially available No. 1-D or 2-D diesel fuel (ASTM D 975).

B. Provide the engine with the following accessories:

1. Fuel, lube oil, and intake air filters.
2. Intake air silencer, high frequency type or combination intake filter/silencer.
3. Lube oil cooler.
4. Fuel transfer pump
5. Flexible fuel lines.
6. Engine-mounted water pump.
7. Coolant and oil drain valves.

C. Starting System:

1. Provide a d-c electric starting system with positive engagement drive. Minimum voltage shall be 24 volts.
2. Provide lead-acid storage batteries of the heavy-duty diesel-starting type. The batteries shall have sufficient capacity to provide for one-and-one-half-minute total cranking time without recharging and shall be 20-hour rated no less than 200 amp-hours at 24 volts. Provide a free-standing corrosion-resistant fiberglass battery box. Provide battery cables and replaceable connectors.
3. Provide a UL-listed, two rate, current-limiting battery charger to automatically recharge batteries. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, d-c ammeter, and fused a-c input. A-C input voltage shall be 120 volts. Amperage output shall be no less than 5 amperes. Charger output shall be at least 25% greater than the auxiliary equipment power demand.

D. Governing System:

1. Provide an adjustable isochronous governor of the electrical-hydraulic or all electric type with electrical speed sensing. Governor shall provide adjustable speed setting from 58- to 62-

hertz adjustable speed regulation, adjustable load limit from 100% to 110% of unit rating, and shall also control the engine at recommended idle speed. The governor shall be capable of maintaining the frequency constant within $\pm 0.25\%$ for any constant load from no load to full generator rating. After a sudden load change of 25% of rated load, the governor shall reestablish stable operating conditions in not less than one and one-half seconds. Stable operation is defined as operation at a frequency that is constant within $\pm 0.25\%$ of rated frequency. The maximum change of frequency during the one and one-half second surging period shall not exceed 1.5 hertz.

2. Install the electronic control portion of the governor in the generator control panel. Governor shall be Woodward 2301, Barber Colman DYN1-10004, or equal.

E. Lubrication System:

1. Fix a pressure-type lubricating system with gear-type oil pump and full flow oil filter to the engine. Filters shall be threaded spin-on type, conveniently located for servicing. Provide filters with a spring-loaded bypass valve to ensure oil circulation if filters are clogged.
2. Provide an oil drain with readily accessible manual valve with piping extended for easy access and proper capture of waste oil.

F. Engine-Mounted Fuel System:

1. Provide an engine-mounted fuel filter with spin-on type replaceable elements, fuel pressure gauge, accessible manual shutoff valve, and engine-driven positive displacement fuel pump.
2. Provide a water separator on the engine just ahead of the fuel filters to prevent condensation, or other water, present in the fuel from reaching the engine filters, pumps, or injectors. Construct of heat-resistant Lexan, with an aluminum-perforated baffle, for easy viewing of the amount of water contained.

- G. Jacket Water Heater: Provide a UL-listed, unit-mounted thermal circulation-type water heater incorporating a self-contained thermostatic switch, controlled by the exit coolant temperature from the heater to maintain engine jacket coolant to 90°F in an ambient

temperature of 30°F. The heater shall be single phase, 60 hertz, 120volt, 2000w. Heater shall be Chromalox or equal. Provide hand valves in the heater hoses to facilitate changing heating elements without draining the entire cooling system.

H. Safety Switches: Provide devices for indication and control of the following conditions at the generator control panel.

1. Low oil pressure (pre-alarm).
2. Low oil pressure with press to test feature (shutdown).
3. High water temperature (pre-alarm).
4. High water temperature (shutdown).
5. Overspeed (shutdown).

Overspeed trip and cranking termination shall be by a dual element electronic-type speed switch that operates on magnetic impulses from the flywheel ring gear or other engine-timed gear. Overspeed trip setting shall be 118% of synchronous speed. The low setting shall be used to automatically ensure continued engine cranking until the engine has reached 600 rpm, even if the oil pressure is up to an acceptable level at a lower speed.

6. Overcrank (shutdown).
7. Emissions: Provide the engine with emission control equipment to ensure that gaseous exhaust emissions (for NOx, HC, and CO) do not exceed the maximum levels established by the South Coast Air Quality Management District. These maximum levels shall be at manufacturer's rated speed and load as measured by SAE-J177 and SAE-J215 recommended practices. Verification of the ability to meet these emission specifications shall be submitted.

1.10 Generator

A. General:

1. The generator shall be a 3-phase, 60-hertz, single-bearing, dripproof, rotating field, synchronous type, with 3-phase rotating armature brushless exciter. Provide Class F insulation on the stator and rotor. Further protect both with 100% epoxy varnish

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impregnation and an overcoat of resilient epoxy asphalt insulating material to increase resistance to abrasive dust or sand, high humidity, and light acidic, oil, or salt-laden atmospheres, as well as prevent fungus growth.

2. The wave form deviation factor of the line-to-line voltage at no load and balanced rated load at 0.80 power factor shall not exceed 5%. The rms of all harmonics shall be less than 3% and that of any one harmonic less than 2% at full rated load.
 3. Conform to the applicable NEMA standards for motors and generators, MG-1. Base rating of generator on continuous operation at 0.80 power factor.
- B. Regulator: The voltage regulator shall be a solid-state, volts per hertz type with 3-phase sensing and shall maintain a constant and stable generator output voltage within $\pm 1\%$ of nominal for all steady-state loads from no load to full load with isochronous speed control and $\pm 2\%$ with speed droop operation. A 5% variation in frequency and the effects of field heating shall not affect the unit's regulation performance. Provide stability and voltage range adjustments.

1.11 Structural Steel Base

- A. Mount the engine-generator on a heavy-duty structural steel base. Provide holes for mounting bolts. Provide the structural steel base with means for lifting the unit for shipment and installation. Clearly identify lift points and total weight and permanently mark on the base.
- B. Anchor the steel base to the foundation with an anchorage system designed to withstand seismic forces per the California Code of Regulations, Title 24, Part 2, Section 2312, Seismic Zone 4, with $Z = 0.4$, $C_p = 0.67$, and $I_p = 1.5$. Submit calculations.
- C. Isolate the engine-generator from the structural steel base with rubber-in-shear isolators for units 225 kw and smaller.
- D. If the manufacturer recommends the use of vibration isolators between the unit base and the concrete foundation, provide spring-type isolators with neoprene-jacketed pre-compressed molded fiberglass noise isolation pads, steel load plate, built-in leveling bolt, welded steel or cast housing, and high deflection steel springs. Isolators shall be Peabody Noise Control, Inc.; Kinetics brand, Type SM; or equal.

1.12 Cooling System

- A. Provide an engine-mounted radiator with blower-type fan sized to maintain full load operation continuously at the specified maximum ambient temperature. Equip the radiator with a 1-inch-wide duct adapter flange and low coolant level switch gauge. Airflow restriction from the radiator shall not exceed 0.5 inch water. Provide ductwork with flexible connection section between radiator duct flange and exhaust louver. Provide fan guard for protection of maintenance personnel as required by CAL/OSHA.
- B. Ductwork shall be galvanized iron or steel sheets or aluminum sheets. Anchor ducts securely to the building and install so as to be completely free from vibration during engine operation. Brace and reinforce ducts with angles or other structural members. Internal ends of slip joints shall be installed in the direction of flow.
- C. Flexible connection shall be wire-reinforced glass fabric. The connection shall be rendered practically airtight.
- D. Fill the engine-cooling system with distilled water and a solution of 30% by volume ethylene glycol for freeze protection and 5% by volume of a borate-nitrite solution (NALCO 2000 or equal) to prevent rust and corrosion.
- E. Provide a coolant drain with readily accessible manual valve with piping extended for easy access and proper capture of waste coolant.

1.13 Exhaust System

- A. Exhaust system shall consist of a critical grade silencer, flexible exhaust fitting, exhaust piping, insulation, and mounting hardware.
- B. Provide a chamber-type supercritical grade silencer constructed of Type 304 stainless steel with a baked on silicon-based coating rated for 1100°F minimum. Silencer shall provide an average noise attenuation of 33 to 40 dBA. Provide brackets, companion flanges, gaskets, and fasteners for mounting silencer. Silencer shall be as manufactured by Universal, Nelson, Riley-Beaird, or equal.
- C. Silencer and exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitations specified by the generator set manufacturer.
- D. Provide a seamless Type 316 stainless-steel bellows-type flexible exhaust fitting at least 18 inches long.

- E. Exhaust piping shall be carbon steel. Provide flanged or welded type fittings. Provide sufficient flanged fittings to permit the system to be entirely dismantled in sections. Use sweep elbows with a radius at least three times the pipe diameter.
- F. Provide vertical discharge tailpipe. Cap with a counterbalanced raincap.
- G. Cover the exhaust manifolds with an expanded metal guard for personnel protection.
- H. Cover the silencer and interior exhaust piping with lagging to maintain a surface temperature not to exceed 150°F. Lagging shall be calcium silicate insulation with banded aluminum jacket.

1.14 Fuel Storage System

Consists of a Day tank with analog fuel levels and fuel leak status dry contacts.

Provide a double wall UL listed subbase or integrated fuel storage tank with capacity to provide a minimum full connected load running time of 24 hours. Tank shall include level gauge, low level contacts wired to control panel, rupture basin alarm contacts wired to control panel, basin drain, all fuel lines, fill cap, drain valve, vents, UL label and other necessary items. Fuel capacity shall be based on actual load or 200 gallon minimum. The fuel storage shall not exceed Uniform Fire Code or local fire department limitations for maximum fuel storage on site. The tank shall be made of corrosion-resistant steel. Provide an automatic leak detection system in the rupture basin with audible and visible alarms.

1.15 Generator Control Panel

- A. Provide a NEMA 1, vibration isolated, dead front, 16-gauge steel control panel with lockable hinged cover. Mount and wire the control panel to the engine-generator set. The panel shall include the following equipment:
 - 1. Voltmeter, 3-1/2 inches, 2% accuracy with 3-phase fuse protection.
 - 2. Ammeter, 3-1/2 inches, 2% accuracy.
 - 3. Ammeter-voltmeter phase selector switch.

4. Frequency meter, 3-1/2 inches, dial type.
5. Kilowatt meter.
6. Oil pressure gauge.
7. Water temperature gauge.
8. Oil temperature gauge.
9. Running time meter.
10. Instrument transformers.
11. Automatic starting controls.
12. Voltage level adjustment rheostat.
13. Dry contacts for remote alarms wired to terminal strips from the following status and alarms:
 - a. Low oil pressure.
 - b. High coolant temperature.
 - c. Low coolant level.
 - d. Breaker Position
 - e. In Auto.
 - f. Low battery voltage.
 - g. Run
 - h. Common fail.
14. Visual alarm indicators for impending shutdown from low oil pressure and high coolant temperature.
15. 80-dB alarm horn with silence switch.
16. Three-position function switch marked "manual," "off/reset," and "auto."

17. Panel illumination lights and switch.
 18. Electric governor control unit.
 19. Generator voltage regulator as previously specified.
 20. Low battery voltage alarm light.
 21. 4- to 20-ma signal outputs for the following: oil pressure, coolant temperature, and battery voltage.
 22. Emergency stop button on control panel and an additional emergency stop button on the side of the engine-generator mounted approximately 48 inches above finished floor.
- B. Meters, circuit breakers, control switches, and current transformers shall be General Electric, Westinghouse, or equal. Pilot lights and push buttons shall be oiltight type. An annunciator panel may be provided in lieu of oiltight pilot lights. Digital instrumentation is acceptable in lieu of meters and lamps.
- C. Provide relays and timing devices with clear polycarbonate dust covers. Devices shall be plug-in type with holddown spring retainers. Output contacts shall be rated 10 amperes at 24-volt d-c.
- D. Provide engraved or etched nameplates to show position of switches and function of pilot lights, push buttons, and meters. Do not provide embossed tape.
- E. Provide fully automatic generator set start-stop controls in the generator panel. Controls shall operate as follows:
1. When the function switch is in automatic position and upon closure of a set of external contacts or when the switch is in manual position, the engine shall automatically crank. An adjustable cranking limiter shall allow from 2 to 5 cycles of 10 seconds' crank followed by 10 seconds' rest. If the engine fails to start after this time, the starting circuit shall be locked out and the overcrank shutdown light initiated.
 2. When operating in the automatic mode and the remote engine run contact opens, the engine shall shut down.
 3. Initiation of any safety shutdown shall immediately stop the engine and light the appropriate light. Upon correction of the

fault, the shutoff system shall be made operable by moving the function switch to off/reset and then back to the "auto" position.

1.16 Main Line Circuit Breaker

Provide a main line molded case circuit breaker sized in accordance with the NEC. Install on the generator in a NEMA 1 enclosure or in the generator control panel to function as a load circuit interrupting and protection device. It shall operate both manually for normal switching function and automatically during overload and short-circuit conditions. Circuit breaker shall trip free of the handle. The handle position, or a luminescent flag, shall indicate "off," "on," or "tripped" breaker positions. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short-circuit protection. Insulated neutral terminals and a ground terminal shall be provided and marked. The circuit breaker shall meet standards established by UL, NEMA, and NEC. Do not use generator exciter field circuit breakers in lieu of a main line circuit breaker.

1.17 Enclosure

House generator in a factory fit outdoor, weatherproof, sound attenuated enclosure, with 14 gauge, and hinged control panel door. All doors shall be lockable. The Generator enclosure shall be of the required dimension to house furnished generator and indicated optional equipment and shall specifically listed for use and installation with the furnished generator model. The generator's enclosure sound level cannot exceed an average of 74 dBA at 23ft. distance in free field testing. Provide shield to prevent water from entering through exhaust penetration. The enclosure s paint shall be electro deposition type enamel. Provide restrained spring isolators for mounting enclosure.

1.18 Torsional Vibration Analysis

Submit a torsional vibration analysis of the engine-generator combination, showing it free of harmful torsional vibration stresses within $\pm 10\%$ of its normal operating speed range, the natural frequency, critical speeds, relative amplitudes of angular displacement, and approximate nodal locations of the complete elastic system of the engine and driven equipment.

1.19 Fuel Leak Detection System

A. Monitoring Panel

The Monitoring Panel shall be modular in design and accept up to 64 input signals from the sensors. The Panel shall have an audible alarm mounted on the front door and a membrane keypad. An LCD shall be visible with the front door closed. Enclosure shall be NEMA 4X.

B. Remote Probe Modules

The panel shall consist of 1 probe module and provisions for connecting to 7 additional modules. Each module shall be capable of monitoring 8 probes or other contact input devices (i.e. float switch). Each probe module shall be mounted in a NEMA 4X enclosure.

C. Relays

One relay shall be mounted inside the panel. Up to 16 programmable relays shall be available for individual probe alarm. They shall be normally energized SPDT, Form C Type rated for 10 A continuous use at 250 VAC.

D. Audible Alarm

An Audible Alarm shall provide a signal of not less than 75 dB.

E. Sensors

The standard sensors shall be probes. The probes shall detect the presence of liquids while ignoring gases and vapors in the atmosphere. The probe shall be less than $\frac{3}{4}$ " in diameter and less than 2" long. The probe housing shall be corrosion resistant. The probe shall be solid state with no moving parts and shall typically reset after all volatile liquid is removed from the Probe. Lead wires shall consist of a minimum 22 AWG shielded conductors. The wire insulation shall be resistant to hydrocarbons and water and be appropriate for the application.

F. Resetability

The probes shall be resettable in most cases after removal of the volatile liquid sensed. The number of resets is dependent upon length of exposure and type of liquid sensed.

1.20 Preparation

- A. Make arrangements with District and Engineer 48 hours in advance to witness start-up test.
- B. Coordinate location of Contractor's facilities to ensure proper access is available.
- C. Obtain the SCE's transformer voltage readings and phase rotation and coordinate with genset.
- D. Verify that genset equipment is ready to be connected and energized.

1.21 Factory Testing

- A. Perform factory tests in the presence of the District's Representative prior to shipment. Provide seven days' advance notice of test date. Include the following tests.
- B. Demonstrate proper operation of all safety devices, shutdown features, and alarms. Conduct load tests utilizing resistive load banks as follows:

Load	Hours
1/2	1
3/4	1
Full	4

- C. Record current, voltage, frequency, water temperature, and lube oil pressure every 15 minutes.
- D. Verify fuel consumption rate at 1/2, 3/4, and full loads. Note fuel consumption rates on a label located at fueling point.

1.22 Installation

- A. The Contractor shall coordinate the construction of engine-generator set foundations and piping systems with the generator set manufacturer's written requirements. Foundation blocks, anchor bolt layouts, and piping may have to be modified from those shown on the plans. Such work shall be at the Contractor's expense.
- B. Anchor bolts for the engine-generator set bases shall be cast-in-place. Engine manufacturer shall provide anchor bolts and select anchor bolt material.
- C. Fill the tanks with No. 2-D diesel fuel meeting ASTM D 975-60T. After field testing is complete, refill the tanks.

- D. Installation of fuel detection system equipment shall be installed per the manufacturer's recommended installation procedures. All local, state and federal codes and requirements shall be followed. The system shall be installed by properly trained personnel.

1.23 Piping

- A. Pitch horizontal runs of exhaust pipe away from the engine. Provide condensate traps with petcocks or valves at low spots in the exhaust system.
- B. Extend the crankcase ventilator pipe from the engine to discharge crankcase fumes outside the equipment enclosure. Pipe size shall be as recommended by the generator set manufacturer to prevent excessive crankcase pressure. Provide condensate traps with petcocks at all low places in the pipe to collect oil condensate without blocking fumes passage.

1.24 Painting and Coating

Coat noninsulated exhaust pipes and silencers with a baked silicon-based coating rated for 1100°F minimum.

1.25 Start-Up

- A. On completion of the installation, the initial start-up shall be performed by a factory-trained service representative of the engine supplier, who shall thoroughly inspect, operate, test, and adjust the equipment. The inspection shall include the soundness of all parts, the completeness of all details, the proper operation of all components with special emphasis on safety devices, the correctness of settings, proper alignments, and correct phase rotation to match other sources.
- B. The generator manufacturer's authorized representative shall provide an installation inspection and testing verification compliance sheet at time of start-up. The generator manufacturer's authorized representative shall assist Contractor during start-up and perform all requested operational test as directed by the District to ensure that generator is fully operational as described in this specification.
- C. Field tests shall include the following:

1. Simulate power failure by tripping the main breaker and demonstrate complete manual and automatic start, load, unload, and stop sequence of the engine-generator.
2. Conduct a two-hour run, utilizing maximum available load. If available load is less than 75% of the generators' rating, then add loads to obtain 75% generator loading (minimum).
3. Retest all alarms and shutdown features.

1.26 Scheduled Oil Sampling

- A. In order to forecast and minimize engine failure, the supplier of the equipment shall provide a quarterly (every three months) oil sampling analysis for a period of two years from date of acceptance. This scheduled oil sampling shall be of the atomic absorption spectrophotometry method as opposed to the spectographic analysis method and shall be accurate to within ± 1 ppm for the following elements: lead, iron, chromium, copper, aluminum, and silicon. In addition, test the sample for the presence of water, fuel, dilution, and antifreeze.
- B. Provide equipment needed to take oil samples in a kit at the time of acceptance. Include a sample gun kit, bottles, mailers, and written instructions.
- C. Provide immediate notification by telephone or fax to the District when analysis results show any critical reading. If readings are normal, provide a report by mail showing that the oil quality is within established requirements.
- D. This scheduled oil sampling program shall be available to the District at the supplier's normal rate, after the mandatory two years, and shall be continued thereafter at the District's option.

1006-2 MEASUREMENT AND PAYMENT

Payment for the Package Engine Generator System shall be included in the lump sum price bid for Bid Item No. 6.

Such payments shall include full compensation for all labor, materials, tools and equipment to install the package engine generator system including all appurtenant materials, work and support, in accordance with the plans and specifications.

END OF SECTION

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SECTION 1007 INSTRUMENTATION

1007-1 GENERAL

1.1 Description

- A. This section includes general requirements for the project instrumentation system.
- B. Equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards:
 - 1. Instrumentation: Instrument Society of America (ISA).
 - 2. Wiring: National Electrical Code (NEC), ISA S5.3 and S5.4.
 - 3. Control Panels and Equipment: NEMA, UL, and ANSI.
 - 4. Control Logic: NFPA 79.

1.2 Related Work Specified Elsewhere

- A. Section 18-16 – RTU Enclosure.

1.3 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Submit data sheets for each component, together with a technical product brochure or bulletin. The data sheets shall show:
 - 1. Component name.
 - 2. Manufacturer's model number.
 - 3. Project tag number.
 - 4. Project location.
 - 5. Input and output characteristics.
 - 6. Scale range and units (if any) and multiplier (if any).
 - 7. Requirements for electric supply.

- C. Submit certified dimensional drawings and catalog data for each size and type of instrument specified herein. Catalog data are to be highlighted to define specific materials of construction and features specified herein. Show tag number for each applicable instrument.
- D. Submit installation, mounting, and anchoring details for all components or entry details.

1.4 Calibration and Final Checkout

The District's Representative will witness calibration and final checkout of the instrumentation and control system to determine if the system complies with the contract documents.

1.5 Manufacturers and Model Numbers

Manufacturers and model or type numbers are provided as part of the instrument narrative descriptions. The proposed manufacturers are those on which the instrument system design has been based.

1.6 Instrument Tagging

Attach a stainless-steel tag to the instrument at the factory. Permanently mark the stainless-steel tag with the instrument tag number. As a minimum, the manufacturer's standard metal nameplate shall denote model number, serial number, operating electrical voltage and amperage (when applicable), and date of manufacture.

1.7 Instrument System Power

- A. Power for the instrument system shall be 120-volt a-c, single phase, 60 Hz.
- B. Where d-c power supplies are not furnished integral with any one instrument system loop, then provide two separate solid-state power supplies with bumpless transfer.

1.8 Uniformity of Components

Components which perform the same or similar functions shall, to the greatest degree possible, be of the same or similar type, the same manufacture, the same grade of construction, the same size, and have the same appearance.

1.9 Mounting of Equipment and Accessories

- A. Mount equipment in accordance with the installation detail drawings as prepared by the Contractor and reviewed by the District's Representative. Mount equipment so that they are rigidly supported, level and plumb, and in such a manner as to provide accessibility; protection from damage; isolation from heat, shock, and vibration; and free from interference with other equipment, piping, and electrical work.
- B. Locate devices, including accessories, where they shall be accessible from grade, except as shown otherwise.

1.10 Coordination and Testing of Electrical Service

- A. Coordinate the installation of the electrical service to components related to the system to assure a compatible and functionally correct system. All accessories shall be coordinated and installation supervised by the Contractor.
- B. Test the completed system after installation to assure that all components are operating with the specified range and all interlocks are functioning properly.

1.11 Calibration

- A. Each instrument requiring factory calibration shall be furnished with calibration data. The calibration data shall be factory certified.
- B. Calibrate systems after installation in conformance with the component manufacturer's instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation and that the components and/or systems are within the specified limits of accuracy. Defective elements which cannot achieve proper calibration or accuracy, either individually or within a system shall be replaced or repaired. Accomplish this calibration work by a technical field representative of the instrumentation system supplier. He shall certify in writing to the District's Representative that all calibrations have been made and that all systems are ready to operate.

1.12 Field Testing

- A. Exercise systems through operational tests in the presence of the District's Representative in order to demonstrate achievement of the specified performance.

- B. Coordinate operational tests dependent upon completion of work specified elsewhere. Schedule tests among all parties involved so that the tests may proceed without delays or disruption by uncompleted work.

1.13 Start-Up

- A. When systems are assessed to have been successfully carried through a complete operational test and the District concurs in this assessment, a date for system start-up involving the District's operating personnel will be agreed upon.
- B. Recheck the systems at this time to verify proper operation, and final adjustments shall be made.

1.14 Operator Training

- A. Provide the District's operating personnel and/or the District's Representative with two eight-hour days of formal instruction in the functions and operations of each system provided under this contract. The training shall cover overall system theory, hardware architecture, the operating system, programming instruction in the applicable languages, utility, programs, system generation, and diagnostics. The programming instruction shall include program development, coding, sample programs, and debugging at every programming level. Actual programming exercises and hands-on experience shall be emphasized. Emphasis shall also be placed on safety features and features which may require readjustment, resetting or checking and recalibration by them from time to time.
- B. Provide the training sessions at the District's facilities and on the equipment furnished under this contract. The education and instruction of operating personnel shall be by a qualified instructor familiar with the requirements for this project. Session dates shall be directed by the District.

1007-2 **FIELD-MOUNTED INSTRUMENTS**

2.1 Description

This section includes materials and installation of the following calibrated field-mounted instruments:

- A. Pressure transmitters.

- B. Tubing, valves, fittings, and manifolds.
- C. Valve position limit switches.

2.2 Related Work Specified Elsewhere

- A. Section 1007-1 - General Instrumentation Requirements
- B. Section 1007-3 - Remote Terminal Unit (RTU)

2.3 Pressure Transducers

- A. The pressure transducer shall be of the microprocessor-based type 2-wire system. The transducer shall operate from a 12-40 VDC source. The output signal shall be 4 mA to 20 mA dc. The transducer shall be housed in a NEMA 4 enclosure and shall be FM approved explosion-proof, intrinsically safe, 316 stainless steel housing.
- B. Configuration data shall be stored in RTU's nonvolatile EEPROM memory. This data shall be retained when power is interrupted, so the transducer shall be functional immediately upon power up or if the transducer electronics module should be changed for upgrade or repair.
- C. The pressure transducer shall provide an electronic signal proportional to the calibrated pressure range. The pressure-sensing element shall be silicone oil filled with a process media operating temperature range of -40 °F to 140 °F.
- D. An integral stainless steel bleed manifold (pre-assembled to the transducer and leak checked) shall be provided for each transducer. The manifold shall have a block and a vent/test valves.
- E. Provide the pressure transducer with the following features:
 - 1. Zero and span adjustments.
 - 2. Over-range protection.
 - 3. Vent/drain valve.
 - 4. Full 5:1 range turndown.
 - 5. 1/2 inch NPT male process connection (water pipe)
 - 6. Two electrical conduit connections, 1/2-inch NPT female.
 - 7. Independent pushbutton zero and span adjustments.
 - 8. Integral digital indicator, calibrated in engineering units.
 - 9. Panel mounting bracket

- F. Accuracy of the pressure transmitter shall be $\pm 0.2\%$ of calibrated span.
- G. The pressure transmitter shall be manufactured by Invensys Systems Inc., Foxboro Model IGP10-A22D1F for discharge and suction pressure transmitters, and IGP10-A22C1F for level transmitter, or equal.

GENERAL

1. Tag No.	PT1	PT2
2. Service	Discharge Pressure	Suction Pressure

TRANSDUCER

3. Diaphragm Mate.	316 SS	316SS
4. Output Signal	4-20 ma d-c	4-20 ma d-c
5. Output Signal To	Pumping Station RTU	Pumping Station RTU
6. Static Press. Rating	2,000 psig	2,000 psig
7. Press. Element Range	0-150 psig	0-60 psig
8. Press. Element Calibrated Range	0 to 150 psig	0 to 60 psig
9. Elect. Class	NEMA 4	NEMA 4

SERVICE CONDITIONS

10. Process Media	Potable Water	Potable Water
11. Specific Gravity	1.0	1.0
12. Oper. Press. psig (min./max.)	0 to 300	0 to 300

2.4 Tubing, Valves, Fittings, and Manifolds

- A. Instrument tubing connections between process lines and instruments shall be 1/2 inch in diameter with 0.035-inch seamless wall, annealed ASTM A 269, Type 316 stainless steel.
- B. Fittings shall be 316 stainless-steel double ferrule design. Fittings shall be Swagelok, Parker CPI, or equal.
- C. Valves shall be full port ball valves with 316 stainless-steel body and Teflon seats and packing. Valves shall be Parker CPI, Whitey, or equal.

2.5 Pressure Switches

Pressure switches shall be Type 403 stainless steel bourdon tube actuating an enclosed, metal contact snap-action switch. Switch shall have separate set point and reset point adjustments. Contact shall be connectable as normally open or normally closed. Adjustment of the switch set points shall be accomplished without having to gain access to the interior of the unit. Pressure switch range shall be as directed in the field. Enclosure shall be NEMA 4. Provide Square D 9012 GAW1-K1-Z16, GAW5-K1-Z16, GAW25-K1-Z16 as applicable.

2.6 Position Limit Switches for Valves

Provide water and dust tight NEMA 4 or IP65/66 position limit switches for indication of open or closed positions of valves as shown in the drawings. Provide single-pole double-throw contacts rated for 3 amperes break, minimum, at 120-volt a-c, 35% power factor. Provide an adjustable mounting bracket to permit the actuation point to be field adjustable at any point of the valves travel. Switch to be Square D, Allen-Bradley, or equal.

2.7 Execution

Pressure Switches: Set pressure switches as directed in the field. Simulate pressure and verify that the equipment controlled operates per the plans and other sections of these specifications.

1007-3 **REMOTE TERMINAL UNIT (RTU)**

3.1 Description

This document describes an INTELLIGENT Remote Terminal Unit (RTU) that may be used in a sophisticated distributed Supervisory Control and Data acquisition (SCADA) system involving water, wastewater, drainage, power, and other utility applications.

The system is to be used for transmitting alarm, status, telemetry, calculated data, diagnostics, and error logging information from RTUs to the Central facility computer(s), and directly between RTUs. The RTU shall also be able to upload any portion of their database to the Central computer(s) upon request or event operation. This shall allow the system to operate in a degraded mode (i.e., RTUs keep on working and storing information according to the last received instructions from the central station) in the event of a system communication failure.

The RTU shall permit the Central computer to upload commands, interrogation requests, the full database definition, and application software and parameters via the communication channel.

The Central computer shall provide to the operators full visibility and control of the RTU's operation including database changes, parameter changes, and remote diagnostics. There shall be source-level application monitoring as well.

The RTUs will communicate and exchange data with each other and/or with other hierarchies in the system to inform them, plus the Central computer of their activity.

The RTU shall support NETWORK communication. i.e., each RTU is able to act as a communication node while performing its other assigned tasks, and shall be designed to meet the Ethernet TCIP protocol which is in compliance with the Open System Interface (OSI) model as recommended by the International Standards Organization (ISO).

The RTU shall also be provided so that it shall integrally monitor the charging state of the batteries, the AC power source, the charging rate and/or discharge rate of the charging current to the batteries without the use of any I/O points that are provided by I/O modules.

3.2 The Requirement

- A. The CONTRACTOR, through the use of a District approved Telemetry Contractor and qualified electrical installers, shall furnish, install, and place into service the operating process instrumentation, control systems, and all appurtenant work, in accordance with the requirements of the Contract Documents. The District approved Telemetry Contractor shall supply the RTU material, work, and programming specified in this section. This Contractor shall assist with District approved Telemetry Contractor in RTU testing procedures. This Contractor shall furnish and install all material not identified as being furnished or installed by the District approved Telemetry Contractor.
- B. The District approved Telemetry Contractor shall be procured by this Contractor to act as a Sub Contractor on this project whose scope is as outlined below and as on the Contract Documents. The Telemetry Contractor shall assume full responsibility for the functional operation of all new and modified instrumentation systems and furnish equipment and programming that meets District standards. The Telemetry Contractor shall perform all engineering necessary in order to install

and connect, to calibrate, and to place into operation all sensors, instruments, PLC, radio, accessories, and all other equipment as specified herein. Furthermore, said Telemetry Contractor shall calibrate and demonstrate the operability of said systems in accordance with the Contract Documents. The Telemetry Contractor shall furnish all local and remote programming as directed and required by the District to implement remote monitoring and control of station equipment, and as outlined on the Contract Documents and per District standards. The Telemetry Contractor shall review District standards and direct procurement, assembly, and installation of all components within the Telemetry / RTU cabinet. It is not a requirement that the Telemetry Contractor furnish and install or supervise installation of the Telemetry / RTU cabinet.

- C. Work required under this section includes, but is not limited to the following:
1. Prepare complete, detailed shop drawing submittals of the Telemetry System equipment for submittal and approval by the District. It shall include shop drawings for equipment, including PLC assemblies, human machine interfaces, radio transceiver equipment, power supplies, and other equipment to be installed with Telemetry RTU cabinet section.
 2. Supply, install, calibrate, and start up all required instruments and assemblies not otherwise specified and supplied as part of a mechanical equipment package.
 3. Supply, assemble, install, program, and test new local PLC and radio communications equipment.
 4. The CONTRACTOR shall install all conduit and wire as detailed in the contract documents for the installation of PLC control system. The CONTRACTOR shall coordinate with Telemetry Contractor to insure work is completed in a satisfactory manner. The CONTRACTOR shall be required land all signal circuits on terminal strips located within the Telemetry RTU cabinet. The terminals shall be labeled to show corresponding signal. The Telemetry Contractor shall furnish all signal wiring from terminal strip to respective PLC input / output terminals as determined by programming.

3.3 RTU Hardware, Software and Programming

- A. This section includes requirements for materials, testing, and installation of the RTU. The RTU is provided as a kit that is to be installed by the Contractor. The Telemetry Contractor's scope of work is identified in this specification.
- B. The District approved Telemetry Contractor shall complete RTU panel used to allow connection of various field sites to a central computer system. The telemetry package shall be provided with installation support, commissioning, modifications of the communications backbone and master station screen and database development. This document describes the contents of a standalone four pump Booster station with VFD pressure-speed control. The RTU shall operate on 120 VAC power with and furnished with 24VDC power supplies with battery backup system. This Contractor shall furnish antenna cable and connection to existing telemetry antenna. The existing antenna is mounted on the top of the existing reservoir tank as identified on drawings.
- C. The Contractor shall subcontract the telemetry work to the District's approved Telemetry Contractor – no exceptions taken.

Contact:

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Systems Integrated
2200 N. Glassell St.
Orange, CA 92865
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- D. The telemetry Contractor's scope includes the following services:
 - 1. Start up testing and commissioning
 - 2. Radio survey and programming
 - 3. Master station database and screen development and radio network programming
 - 4. Programming of remote site equipment to perform data collection and control of pump station.
 - 5. Installation of batteries and termination of battery cables in telemetry enclosure.
 - 6. Documentation consisting of the following:

- a. Wiring diagrams of the telemetry system.
- b. Submittals required by District for the enclosure and associated telemetry equipment.
- c. O&M manuals for the telemetry enclosure, including program listing of the ladder logic used to control the pumps.
- d. Written test plan for acceptance to the telemetry subsystem (provided that a PI&D is provided).

3.4 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Submit manufacturer's data for all materials and equipment.
- C. Submit a copy of the programming software to develop the application plus a copy of the complete configuration and application shall be delivered to the District prior to acceptance of the work (provided by the Telemetry Contractor).

3.5 Extra Materials

- A. Provide the following spare parts delivered to the District in the manufacturer's original containers labeled to describe the contents and the equipment for which it is furnished.
 1. DC Power Supply: One.
 2. PLC Input/Output Modules: One of each type provided.

3.6 General Description

The RTU shall consist of integrated radio telemetry and local processing and control electronics, operator interface, radio equipment, power supply, and enclosure. The District approved Telemetry Contractor shall provide all RTU equipment as identified.

3.7 Materials

Provide instruments, equipment and materials suitable for service conditions and meeting standard specifications such as ANSI, ASTM, ISA and SAMA. The intent of this Specification is to secure instruments and equipment of a uniform quality and manufacture throughout the SCADA system. Where ever possible the existing equipment shall be matched to minimize maintenance and repair parts.

3.8 PLC Description

The PLC shall be configured in its enclosure as specified herein, with snap-in DIN rail mounted terminal blocks, and all I/O wiring from the PLC modules shall be run by the manufacturer/supplier to the required number and type of terminal blocks. These terminal blocks shall be two (2) tier and fused for 50 ma for analog inputs and outputs and fused for 4 amps for digital outputs. Unfused terminal blocks shall be provided for digital inputs. Besides fuses utilized in the power supply itself, separate terminal blocks with 4 amp fuses shall be provided for AC power and isolating the DC power source. An PLC which has wiring coming directly from the I/O to the RTU module wiring block(s) shall be deemed to be unacceptable.

A. Modular System

The PLC modules are to be constructed from non-metallic materials. No screws are to be used to construct the modules. Connection of the modules to the mother-board shall be via a simple "snap-in" action with a single Phillips screw to assure module stability.

All modules shall feature a color coded terminal cover which shall identify the types of voltages which may be present to prevent unintentional contact with high voltages.

A interconnection between the modules shall be used to minimize cabling.

Front access to all controls, indicators, and connectors shall be provided.

The modules shall have the following provisions:

- Latch or screw release for the module.
- Labels mounted on the module for connections, definitions and identification.
- Concealing of all connection I / O cables.

Any plug-in I/O Module may be plugged into any empty slot on the I/O Bus.

The I/O bus shall support a minimum of 10 modules, in multiple chassis assemblies, and shall fully support dual-CPU and dual power supply operation.

The RTU shall automatically run a self-ID feature to determine what module is plugged into which slot.

Modules shall be color coded for ease of identification.

B. CPU Description

The RTU shall use a high performance 16 bit microprocessor, operating at a 16 MHz clock rate and 32K memory. . Allen Bradley SLC 5/05 (#1769-L32C) It shall have the capacity to have up to 30 fixed I/O points. And be complete with a 7 slot I/O module chassis (#1769-A7) minimum. The CPU module shall be provided as standard with the capability of handling two communications protocols as a minimum. The RS-232 port shall be configured for DH-485 / DF-1 which is designed specifically for the radio communications environment, and furnish a #1761-NT-ENI module with Ethernet port. Ethernet port shall be a configured protocol which is designed specifically for the communications system PLC. Communications shall be via the built-in 10Base-T Ethernet channel using a TCP/IP protocol . Furnish a (4) four port Ethernet communications hub mounted on backplane for network connections. The on-board operating system or firmware shall consist be stored on a EE PROM and shall be programmable without the changing of any hardware/firmware items. Additionally, upgrade capability shall be available either directly or over the communications channel/network.

FLASH memory: 32K available for data programming.

RAM (for data and parameters): Electrically-erasable non-volatile memory. Expandable to 64K when required.

C. I/O Module Description

PLC shall be comprised of various types of signal input modules and signal out modules. Provide all I/O modules as identified on plans or as required by the Systems Integrator to complete the SCADA system

Modules shall be complete with all fasteners, connectors, data cables, and accessories as required to furnish a complete SCADA System.

D. Digital Input Module Description

1. AC Input Module Allen Bradley #1769-IA16

- a. Capacity: Sixteen dry/wet contact isolated inputs
- b. Voltage: 85-132 volts AC.

2. DC Input Module Allen Bradley #1769-IQ16

- a. Capacity: Sixteen source contact isolated inputs
- b. Voltage: 5-30 volts DC.

E. Analog Input Module Description

1. Analog Input Module Allen Bradley #1769-IF4

- a. Capacity: Eight source inputs
- b. Voltage: 5-30 volts DC at 4-20mA signal input

2. Provide 24 VDC power for all analog current loops through AI module. User shall optionally decide whether or not to use the internal source or an external source.

F. Digital Output Module Description

1. AC Output Module Allen Bradley #1769-OB16

- a. Capacity: Sixteen dry/wet contact isolated inputs
- b. Voltage: 85-265 volts AC (0.2A per contact / 4A. per module)

2. DC Output Module Allen Bradley #1769-OB6EI

- a. Capacity: Six contacts, individually isolated inputs, fused, resettable
- b. Voltage: 10-30 volts DC.

G. Analog Output Module Description

1. Analog Output Module Allen Bradley #1769-OF2

- a. Capacity: Two source outputs – current varying
- b. Voltage: 5-30 volts DC at 4-20mA signal output.

H. PLC Chassis

Provide a PLC chassis as required to install all required modules as indicated on plans, or identified by the Telemetry Contractor. Chassis should have enough space to mount all required modules and have enough space to install three spare modules. PLC chassis shall be as manufactured from Allen Bradley #1769-A

I. Operator Interface

1. Provide, program, test, fully configure, and place into operation OI as indicated herein.
 - a. The OI shall be a panel-mounted PC that allows bi-directional communication with the RTU. Mount on door of RTU Control Panel.
 - b. The OI shall have a minimum of 12-inch diagonal, color LCD display with 800 x 600 pixel resolution, and touch screen capability. Each touch area shall provide audible feedback to the operator. The unit shall have a continuous resistive touch-screen.
 - c. Screens shall be configured using a PC-based software package that operates in the Windows environment. Software shall be Wonderware InTouch HMI. Runtime license shall be provided by the Contractor.
 - d. The unit shall communicate with the PLC in a serial fashion, as determined by the Telemetry Contractor. A communication driver shall be provided with the editing software by the equipment manufacturer.
 - e. All cables for communication between the HMI and the PLC shall be provided along with a cable for serially interfacing the device with a personal computer.

J. PLC Mounting

1. The PLC shall be provided in a standard housing, capable of being backboard mounted or DIN rail mounted in control enclosure.
2. All components are to be modular and installed or removed easily and provided with quick disconnects.

K. Environmental

The PLC shall operate, as specified, over an ambient temperature range of -30 to +60°C, with a relative humidity of up to 95%, according to EIA standards RS-204B and RS-152B, intermittent duty specifications.

L. PLC I/O Isolation

1. Analog inputs and outputs shall be isolated using Phoenix Contact MCR type Analog Interface Modules or approved equal.
2. Digital outputs driving resistive loads in excess of 0.5 amperes or inductive loads shall have interposing relays as required in Section 18-16.

M. Signal Transmission

1. Analog: Signal transmission between electric or electronic instruments shall be 4-20 mA and shall operate at 24 VDC. A 24VDC power supply shall be provided, to power the 4-20mA loop for all looped powered instruments. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. Where practical, milliampere signals from the field shall be converted to a voltage signal at the external terminals of each panel, and all instruments within a panel shall be parallel wired.
2. Discrete: Self powered status and alarm signals shall be isolated by optical isolator or relay from PLC.

3.9 Radio Transceiver

The radio transceiver shall be a solid-state, FM radio transceiver operating in any of the following frequency ranges: VHF 5-20 watts, UHF 2-25 watts, 800-900 MHz 1-15 watts power output. The formats shall include simplex and repeater communications, DF1 and GE EDACS trunking systems and spread-spectrum technologies. Radio operational characteristics are to comply with all applicable FCC rules for secondary signalling on a shared channel, operation on a splinter channel, trunking system, Multiple Address System and spread spectrum.

To facilitate operations in the UHF band, the typical radio modem shall feature a minimum data speed of 9600 bps @ 12.5 KHz UHF frequencies operating a power output level of 2.0 watts, with a maximum being 19.2 kbps. Additionally, the radio transceiver shall be synthesized with a minimum number of channel assignments being 15.

The operating frequency may be on a channel designated by the FCC for 15K0G2D or 16K0F3E emissions. It is to be frequency-synthesized to +0.0005% or better of the assigned carrier frequency over a temperature range of -30 to +60°C. This shall be accomplished without the use of heaters

or temperature compensated oscillators, to maintain a low current drain. There shall be no approval given to non-synthesized radio equipment.

Spurious transmissions and harmonics are to be more than 50 dB below carrier.

The receiver shall meet the following specifications:

Sensitivity: less than 1.0 uV for 20 dB quieting.

Spurious and image rejection: greater than -60 dB.

Provide a squelch output, for use as a channel monitor.

The transceiver shall use high-quality, long-life transistors and diodes throughout, and is to be completely solid-state.

3.10 AC Power Supply for Logic and Radio

The RTU shall operate from continuous 115 to 230 VAC (+10%, -15%) 50/60 Hz primary power, without the need for changing power supplies. The power supply shall provide either 12 or 24 VDC for powering digital input circuits as well as analog input current loops and shall feature automatic recharging of the standby DC power source.

Battery voltage, battery charge/discharge with rate, module temperature, etc. shall be provided to the backplane bus and made available to the application ladder logic, HMI display. This function shall not require any of the I/O being used in the system.

All RTUs shall contain sealed lead-acid batteries to provide continued operations of all systems should there be a loss of AC power. Nicad batteries will not be acceptable. The battery shall provide a minimum of 8-hour standby operation at 25°C for a minimum-configuration RTU with standard radio. The battery shall have an operating temperature range of -30 to +60°C.

As an option, a larger-capacity battery shall be made available to provide 20-hour standby operation at 25°C for a minimum-configuration RTU with standard radio. Recharging time shall not be more than 12 hours (fully-depleted battery at 25°C).

In the event of a primary power failure of at least a three-minute duration, an AC power fail message is to be sent to the central station.

The power supply, battery, and charger shall all be contained in the RTU housing. The RTU shall automatically switched to battery power if AC power is lost.

The power supply shall have the capability to provide outputs to monitor AC supply, DC battery voltage, current charging or discharging.

3.11 DC Power Supply for Logic and Radio

The RTU may operate from an external voltage source of 11.5-13.5 VDC.

During transmissions, the RTU shall require no more than 6 Amps for no more than 2 seconds per transmission.

3.12 Lightning Protection

1. Lightning Protection: In the control panel there shall be a lightning arrester mounted and electrically grounded. The arrester shall be Polyphaser Model IS-B50LNC1 or equal.
2. Power Circuits: Telemetry, radio, and computing equipment must be supplied power from a completely separate circuit from the panelboard. No additional outlets are to be permitted on this circuit. Lightning arresting equipment shall be installed on this circuit in accordance with the manufacturer's recommendations. Arresters shall be Model 512 as manufactured by MGG Electronics, Inc., 12 Burt Drive, Deer Park, New York 11729 or equal.

3.13 Nameplates

1. For each piece of equipment, provide a manufacturer's nameplate identifying the model number, serial number, operating electrical voltage and amperage (where applicable), and date of manufacture.
2. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate, white letters on black background. Engrave nameplates with the inscriptions indicated on the Drawings. Lettering shall be not less than ¼ inch high. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the Engineer, with epoxy cement. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer as approved by the City.
3. Each control device, including push buttons, control switches, and indicating lights, shall have an integral legend plate or nameplate indicating the device function. These shall be inscribed as indicated on the Drawings or as favorably reviewed by the Engineer.

4. Provide red CAUTION or SAFETY nameplates, with white lettering ¼ inch high, to alert operators of special conditions that may result in faulty equipment operations. Devices containing batteries that must be replaced periodically must be clearly identified. Nameplates are not required if the device senses and displays a low battery warning.

3.14 RTU Enclosure

1. Enclosure: The enclosure shall be NEMA 12 for indoor installations unless otherwise identified in the Contract Documents. The enclosure shall be a single 36" high X 30" wide X 12" deep gray painted, all-steel, as shown unless specifically approved by Engineer. The cabinet shall be drilled on the back, and fastened to the backpanel of the RTU enclosure. The enclosure shall be manufactured of 14-gage steel so formed as to provide structural strength in excess of standard cabinets employing 1/8-inch steel of standard construction. Cabinet shall have fully gasketed front swinging doors, equipped with a vault-type handle and tumbler lock. The doors shall be rigidly formed with stiffeners as required to eliminate diagonal twist. The enclosure shall have a removable interior mounting panel for mounting of components. PLC enclosure section shall be furnished with a fluorescent interior work light with an on/off switch. The enclosure shall be sized to contain the equipment required to make the installation complete and suitable for the intended purpose. Electrical wiring shall be in plastic wireways and/or spot tied to present an orderly appearance. The components within the control board(s) shall be mounted on fixed panels or swinging racks accessible through the door(s). All control components shall be UL labeled. Wiring and terminations shall be in accordance with the NEC. Cabinet enclosures shall be set off with trim strips, top, sides, and bottom, and shall be equipped with a dust screen and associated grill. Where cutouts are shown for mounting future front panel-mount instruments, the cutouts shall be covered with a cover plate finished to match the surrounding panel.
2. Instruments: All meters, instruments, and other components shall be the most recent field proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise specified to match existing equipment. Instruments performing similar functions shall be of the same type, model, or class and shall be of one manufacturer. All panel mounted instruments shall have matching style and general appearance.

3. Control Enclosure Wiring:

- a. Wire Type and Sizes: Conductors shall be flexible stranded copper machine tool wire; these shall be UL listed rated 600 volts. Wires for instrument signal circuits and alarm input circuits shall be No. 12 or 14 AWG. All other wires, including shielded cables, shall be No.18 AWG minimum.
- b. Wiring Installation: All wires inside Telemetry enclosure, including field wires adjacent to terminal strips shall be run in plastic wireways except (1) wiring run between mating blocks in adjacent sections, (2) wiring run from components on a swing-out panel to components on a part of the fixed structure, and (3) wiring run to door-mounted components. Wiring run from components on a swing-out panel to other components on the fixed structure shall be made up in tied bundles. These bundles shall be tied with nylon wire ties, and shall be permanently secured to panels at both sides of the "hinge loop" so that conductors are not strained at terminals. Wiring run to control devices on the front of the control board shall be tied together at short intervals with nylon wire ties and secured to the inside face of the control board using spot welded mounts. Wiring to rear terminals on control board mounted instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.
- 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 be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using black numbered wire markers which shall be plastic-coated cloth, Brady Type B-500, Thomas and Betts "E-Z Code," or equal or shall be permanently marked heat-shrink plastic.

4. Terminal Blocks: Sufficient terminals shall be installed in each control board for all field wires (including spare wire) routed to that control board as shown on the electrical drawings. Terminal blocks shall be molded plastic or nylon with barriers and box lug terminals, and shall be rated 15-amperes at 600-volts. White marking strips, fastened securely to the molded sections, shall be provided and wire numbers or circuit identification shall be marked thereon with permanent marking fluid. Terminals shall be large enough to accommodate a 3/16-inch screwdriver blade.

3.15 PLC I/O List

Description	Type	Range
RTU AC Power Available	DI	
RTU Battery OK	DI	
RTU Power Supply OK	DI	
RTU door Open	DI	
RTU Door Bypassed	DI	
Main utility breaker closed	DI	
Ground Fault	DI	
Photocell input	DI	
MCC section 1A & 1B door switch	DI	
MCC section 2 door switch	DI	
MCC section 3 door switch	DI	
MCC section 4 door switch	DI	
MCC section 5 door switch	DI	
MCC section 6 door switch	DI	
MCC section 7 door switch	DI	
MCC section 8 door switch	DI	
MCC section 9 door switch	DI	
MCC section 10 door switch	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Pump 1 in bypass only	DI	
Pump 1 in VFD only	DI	
Pump 1 in hand	DI	
Pump 1 in auto	DI	
Pump 1 not in Emergency stop	DI	
Pump 1 motor high temperature	DI	
Pump 1 discharge valve open	DI	
Pump 1 discharge valve closed	DI	
Pump 1 control power available	DI	
Pump 1 running	DI	

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Description	Type	Range
Pump 1 VFD failed	DI	
Pump 1 high discharge pressure	DI	
Pump 1 motor protection module	DI	
Pump 1 bypass contactor closed	DI	
Spare	DI	
Spare	DI	
Pump 2 in VFD only	DI	
Pump 2 in bypass only	DI	
Pump 2 in hand	DI	
Pump 2 in auto	DI	
Pump 2 not in Emergency stop	DI	
Pump 1 motor high temperature	DI	
Pump 2 discharge valve open	DI	
Pump 2 discharge valve closed	DI	
Pump 2 control power available	DI	
Pump 2 running	DI	
Pump 2 VFD failed	DI	
Pump 2 high discharge pressure	DI	
Pump 1 motor protection module	DI	
Pump 2 bypass contactor closed	DI	
Spare	DI	
Spare	DI	
Pump 3 in bypass only	DI	
Pump 3 in VFD only	DI	
Pump 3 in hand	DI	
Pump 3 in auto	DI	
Pump 3 not in Emergency stop	DI	
Pump 3 motor high temperature	DI	
Pump 3 low suction pressure	DI	
Pump 3 discharge valve closed	DI	
Pump 3 control power available	DI	
Pump 3 running	DI	
Pump 3 VFD failed	DI	
Pump 3 high discharge pressure	DI	

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Description	Type	Range
Pump 3 motor protection module	DI	
Pump 3 bypass contactor closed	DI	
Spare	DI	
Spare	DI	
Pump 4 in bypass only	DI	
Pump 4 in Soft Start only	DI	
Pump 4 in hand	DI	
Pump 4 in auto	DI	
Pump 4 not in Emergency stop	DI	
Pump 4 Motor High Temperature	DI	
Pump 4 low suction pressure	DI	
Pump 4 discharge valve closed	DI	
Pump 4 control power available	DI	
Pump 4 running	DI	
Pump 4 soft start failed	DI	
Pump 4 high discharge pressure	DI	
Pump 4 motor protection module	DI	
Pump 4 bypass contactor closed	DI	
Pump 4 in bypass only	DI	
Pump 4 in Soft Start only	DI	
Spare	DI	
Spare	DI	
Utility power failed (from ATS)	DI	
ATS in normal	DI	
ATS in Emergency	DI	
ATS Pre-transfer	DI	
Generator Start	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Generator in auto	DI	
Generator running	DI	
Generator failure	DI	
Generator low coolant level	DI	
Generator breaker not closed	DI	
Generator fuel tank overflow	DI	
Generator fuel low fuel level	DI	

Description	Type	Range
Generator fuel tank high level	DI	
Generator - fuel leak alarm	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Spare	DI	
Pump 1 Call	DO	
Pump 2 Call	DO	
Pump 3 Call	DO	
Pump 4 Call	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
ATS test	DO	
Generator remote start	DO	
Generator remote stop	DO	
Outdoor Yard Lights On	DO	
Outdoor Yard Lights Off	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	

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Description	Type	Range
Spare	DO	
Spare	DO	
Spare	DO	
Spare	DO	
Generator Fuel Level	AI	TBD
Generator Water Temp	AI	TBD
Discharge Pressure	AI	TBD
Spare	AI	
Spare	AI	
Spare	AI	
Spare	AI	
Spare	AI	

3.16 Antenna Connection

- A. Antenna Transmission Line: The transmission line shall be provided, and connected by this Contractor. This Contractor shall provide new antenna conduit and transmission cable.
- B. A new conduit is required to be installed between the new booster station Telemetry enclosure and the existing antenna located on the existing reservoir tank located at site. The new conduit shall be routed from the existing antenna mast to the Telemetry enclosure in a manner to insure that any water that may get into the conduit will not flow into the Telemetry enclosure. The radio cable shall be pulled through the conduit, up conduit riser on reservoir tank wall, and through the weather head. Leave three feet of radio cable shall be left available for termination at antenna. The radio cable will be terminated to RJ45 weather tight connectors. The radio cable will be terminated and tested by the Telemetry contractor.

3.17 Lightning Protection

- A. Within the booster station's telemetry enclosure, this Contractor shall furnish grounding system conductors and isolated grounding lug terminal as identified. This Contractor shall bond grounding conductors to isolated grounding terminal.
- B. Lightning Protection: In the booster station's telemetry enclosure there shall be a lightning surge arrester mounted and electrically grounded with a #4 insulated ground conductor. The arrester shall be Polyphaser Model IS-B50LNC1 or equal.

- C. Power Circuits: Telemetry, radio, and computing equipment must be supplied power from a completely separate circuit from the panelboard. No additional outlets are to be permitted on this circuit. Lightning arresting equipment shall be installed on this circuit in accordance with the manufacturer's recommendations. Arresters shall be Model 512 as manufactured by MGG Electronics, Inc., 12 Burt Drive, Deer Park, New York 11729 or equal.

3.18 Programming

All local and remote station programming shall be provided by District approved Telemetry Contractor.

3.19 Input and Output Signal Mapping

Refer drawings for all RTU digital and analog inputs and outputs circuits. See approved shop drawings for exact location of terminals to land all field mounted signals, circuit designations, signal circuit conductor color coding, typical for all signals circuit and terminal designations.

3.20 RTU Installation

- A. All conduit penetrations shall be from the bottom. No penetrations shall be made into the top, sides or back of the enclosure. Penetrations shall be made not less than 3 inches and not more than 4 inches from the rear of the enclosure.
- B. A 1-inch rigid conduit shall be installed from the RTU to an isolated grounding rod located within 10 feet. A # 4 green THHN wire shall be installed in the conduit and bonded to the grounding rod.
- C. A 1-inch rigid conduit shall be installed from the battery box to the telemetry enclosure. 2 #6 cables – Red / Black TEW type cables shall be installed in the conduit from the battery box to the telemetry enclosure. The cables shall have 3 feet at each end for termination. The battery box is floor mounted and is approximately 24-inches x 24-inches.

3.21 Test, Inspection, and Training

- A. General: After installation has been completed, the Contractor shall conduct an operating test to demonstrate that equipment operates in accordance with specification requirements. The Contractor shall also assist the District approved Telemetry Contractor in performing RTU

programming and monitoring tests to demonstrate that equipment operates in accordance with specification and District requirements.

- B. Inspection: The Contractor shall verify that all signal and control circuits are properly labeled, and interconnecting wires and terminals identified. The District Inspector and/or Operations Engineer shall observe operational features as specified. This Contractor shall rectify any deficiencies in any furnished field mounted signals, equipment, or controls as indicated by tests and/or direct District approved Telemetry Contractor or District operations personnel. After deficiencies have been corrected, the District approved Telemetry Contractor shall completely retest work affected by such deficiencies until deemed as acceptable by District operations personnel. Any deficiencies within RTU equipment or programming shall be the responsibility of the District approved Telemetry Contractor to correct, but may require this Contractor to be present to assist with further testing of RTU control and monitoring of equipment.

1007-4

MEASUREMENT AND PAYMENT

Payment for all instrumentation as described in Sections 1007-1 and 1007-2 shall be included in the lump sum price bid for Bid Item No. 7A.

Payment for Section 1007-3, Remote Terminal Unit (RTU), in the amount of \$53,453.85 shall be included in the lump sum price bid for Bid Item No. 7B.

Such payments shall include full compensation for all labor, materials, tools and equipment to install all instrumentation including all appurtenant materials, work and support, in accordance with the plans and specifications.

END OF SECTION

SECTION 1008 ELECTRICAL

1008-1 GENERAL

1.1 Description

A. Scope: CONTRACTOR shall provide all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this division, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all divisions for related work required to be included as work under this division.
2. General provisions for electrical work.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the formwork, and panels.
2. CONTRACTOR shall review all Sections of the specifications and coordinate power and control requirements.

C. General:

1. Interpretation of Drawings:
 - a. Dimensions shown on the Drawings that are related to equipment are based on one manufacturer's equipment. Coordinate the dimensions of the equipment furnished with the space allocated for that equipment.

D. Definitions

1. For the purposes of Section 1008, the following definitions apply:
 - a. Provide: Furnish and install.
 - b. Indicated: As shown on the drawings or specified herein.

- c. Circuit Designation: Panel designation and circuit number, in example A-13.

1.2 Related Work Specified Elsewhere

- A. One-Year Guarantee: General Requirements.
- B. Permits and Licenses: General Requirements.

1.3 Quality Assurance

A. Requirements of Regulatory Agencies:

1. Permits: Obtain all permits required to commence work.
2. Codes: Material and equipment shall be installed in accordance with the current standards and recommendations of the National Electrical Code, the National Electrical Safety Code, the Uniform Building Code for Seismic Zone 4, and with local codes that apply. Where discrepancies arise between codes, the most restrictive regulation shall apply.
3. Tests by Independent Regulatory Agencies: All electrical material and equipment shall be new and shall bear the label of the Underwriter's Laboratories, Inc., or other nationally recognized independent testing laboratory, wherever standards have been established and label service regularly applies.
4. Materials, appliances, equipment, and devices shall conform to the applicable Underwriters' Laboratories, Inc. (UL) standards. The label of, or listing by, UL is required for all electrical equipment.
5. Utilities:
 - a. Electric Utility: Southern California Edison Company (SCE).
 - b. Work in connection with the electric service and metering shall be done in strict conformance with the requirements of SCE.
6. Inspection Requirements: All equipment shall be inspected and tested at site as specified in these Contract Documents.

- B. Reference Standards: Provide electrical equipment and materials, including installation, conforming to the following codes and standards, as applicable. The equipment and materials shall bear labels to indicate

manufacturing conformance to the specified standards or equal. Where two codes or standards are at variance, conform to the more restrictive requirement

1. National Electrical Manufacturers Association (NEMA).
2. The American National Standards Institute (ANSI).
3. The Institute of Electrical and Electronic Engineers (IEEE).
4. Insulated Power Cable Engineers Association (IPCEA).
5. National Electrical Code (NEC).
6. National Electrical Safety Code (NESC).
7. National Electrical Contractors Association Standards (NECA).
8. Underwriters' Laboratories, Inc. (UL)
9. National Fire Protection Association (NFPA)
10. Illuminating Engineering Society. (IES)
11. American Society for Testing Materials. (ASTM)
12. Occupational Safety and Health Act (OSHA).
13. Ventura County Waterworks District No. 1(DISTRICT / OWNER).
14. Basic Electrical Regulations, Title 24, State Building Standards, California Administrative Code.
15. Low Voltage Electrical Safety Orders, Title 8, Division of Industrial Safety, State of California.
16. National Electrical Code (NEC).
17. County and City Electrical Codes.
18. Certified Ballast Manufacturers.
19. Public Utilities Service Requirements.

- C. Assembled Products: The major components of any assembly such as motor control centers, switchboards and panels shall be manufactured by the assembly manufacturer.

1008-2 PRODUCT DELIVERY

A. Operation and Maintenance Data:

Conform to requirements of General Requirements and the Specifications.

B. Record Documents:

Record drawings shall include the following:

1. Actual in place conduit and cable layouts with schedule of conduit sizes and number and sizes of conductors
2. Layouts of the grounding system and lighting arrangement.
3. Control wiring diagrams with terminal numbers and all control devices identified.

2.1 Product Delivery, Storage and Handling

- A. Delivery of Materials: CONTRACTOR shall instruct the manufacturers and vendors as to the maximum shipping sizes of equipment that can be accommodated at the site.

- B. Storage and Handling of Materials: Conform to General Requirements.

1008-3 JOB CONDITIONS

- A. CONTRACTOR shall examine the site and existing facilities in order to compare them with the Drawings and Specifications with respect to the conditions of the premises, location of and connection to existing facilities and any obstructions, which may be encountered.

1008-4 AREA CLASSIFICATIONS

The following lists of locations are not all inclusive. Contractor shall refer to the Contract drawings for determination of actual requirements.

- A. General: Use equipment, materials, and wiring methods suitable for the types of locations in which they are located as defined below.
- B. Definitions of Types of Locations:
 - 1. Dry Locations: Within Motor Control Center enclosure sections only.
 - 2. Damp Locations: None
 - 3. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated in the drawings. All locations below grade.
 - 4. All materials, equipment and incidentals in areas identified as wet locations shall meet NEC and NEMA requirements for wet locations. Enclosures installed in wet locations shall be NEMA 4X non-metallic or 316 stainless steel. Conduits shall be PVC jacketed and terminated at enclosures with watertight, threaded hubs. All fittings shall be PVC jacketed.

1008-5

ACCEPTANCE TESTS

- A. The electrical work shall be free from improper grounds, short circuits, and overloads. The correctness of the wiring shall be verified first by visual comparison of the conductor connections with connection diagrams. Individual circuit continuity checks shall be made, by using electrical circuit testers. Then, the correctness of the wiring shall be verified by the actual electrical operation of the electrical and mechanical devices in both automatic and manual modes of operation. Any deviation from the wiring indicated on the Drawings or accepted shop drawings shall be corrected and indicated on the Drawings and accepted shop drawings. Testing shall be performed by the Contractor at no change in contract price and shall be subject to witnessing by the District.
 - 1. The tests shall be performed to assure that all the electrical equipment specified to be tested will operate within the industry and manufacturer's published tolerances, will perform safely, and to record test result data, to be used as a baseline for future tests.

1008-6

UTILITY COMPANY REQUIREMENTS

- A. Install all electric service entrance equipment in accordance with the SCE's requirements. Coordinate with SCE to ensure timely connection

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by the utility. Obtain SCE's approval of metering equipment shop drawings prior to starting fabrication.

1008-7

MATERIALS

- A. Similar materials and equipment shall be the product of a single manufacturer.
- B. Provide only products which are new, undamaged, and in the original cartons or containers.
- C. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current design.
- D. Materials and equipment shall be suitable for storage, installation, and operation at an ambient temperature of 0°C to 40°C except where more stringent conditions are stated in individual equipment specifications.
- E. Electrical equipment and panels shall be factory finished with manufacturer's standard primer and enamel topcoats, unless stated otherwise in the individual equipment specifications. Provide 1 pint of the switchboard and motor control center manufacturer's touchup paint for repair of damaged enamel topcoats.

1008-8

PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver electrical materials and equipment in manufacturer's original cartons or containers with seals intact, as applicable. Unless otherwise specified, deliver conductors in sealed cartons or on sealed reels, ends of reeled conductors factory sealed. Deliver large multi-component assemblies in sections that facilitate field handling and installation.
- B. Storage: Unless designed for outdoor exposure, store electrical materials off the ground and under cover. Prevent corrosion, contamination, or deterioration.
- C. Handling: Handle materials and equipment in accordance with manufacturer's recommendations. Lift large or heavy items only at the points designated by the manufacturer. Use padded slings and hooks for lifting as necessary to prevent damage.

1008-9**INSTALLATION**

- A. The drawings indicate connections for typical equipment only. If the equipment furnished is different from what is shown, provide the modifications necessary for a safe and properly operating installation in accordance with the equipment manufacturer's recommendations.
- B. The drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Field determine exact location based on physical size and arrangement of equipment, finished elevations, and obstructions.
- C. Work or equipment not indicated or specified which is necessary for the complete and proper operation of the electrical systems shall be accomplished without additional cost to the District.
- D. Review demolition methods with District's Representative prior to cutting or removing existing facilities or equipment. Repair damage to match existing.
- E. Accomplish work required to pierce any waterproofing after the part piercing the waterproofing has been set in place. Seal and make watertight the openings made for this purpose.
- F. Seal weather-tight equipment or components exposed to the weather.
- G. Protect equipment outlets and conduit openings with factory-made plugs or caps whenever work is not in progress at that point.
- H. Protection: Protect electrical materials and equipment until final acceptance. Protect factory painted surfaces from impact, abrasion, discoloration, and other damage. Keep electrical equipment, materials, and insulation dry at all times. Maintain heaters in equipment connected and operating until equipment is placed in operation. If partial dismantling of equipment is required for installation, box or wrap the removed parts until reinstalled. Repair or replace damaged work as directed, at no additional cost to District.

1008-10**NAMEPLATES**

- A. Mark each individual panelboard, motor controller, disconnect switch, timer, relay, and contactor to identify each item with its respective service or function.

- B. Provide nameplates with engraved lettering not less than 1/4 inch high. Use black-on-white laminated plastic (so letters will be white with black background), attached with rivets or sheet metal screws. Do not use embossed plastic adhesive tape.
- C. Provide a nameplate inside the door of each panelboard listing its designation, voltage, feeder number, and load served.
- D. Provide a nameplate on each transformer listing its designation, voltage, feeder number and load served.
- E. Provide a wire marker on all control and signal listing its designation as shown in approved shop drawings.

1008-11 **SEISMIC RESTRAINT FOR ELECTRICAL EQUIPMENT**

11.1 Description

- A. This section describes the requirements for furnishing and installing seismic restraint devices for electrical equipment.

11.2 Related Work Specified Elsewhere

When it applies, this section is referenced in other sections of the specifications.

11.3 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Submit seismic anchoring calculations with equipment submittals. Calculations shall be performed by a licensed structural engineer and registered in the state of California.
- C. Submit equipment anchoring methods. Include anchoring locations, anchor types, and minimum anchor embedment depths.

11.4 Seismic Design Of Equipment

- A. Prefabricated equipment shall be designed and constructed in such a manner that all portions, elements, subassemblies, and/or parts of said equipment and the equipment as a whole, including their attachments, shall resist a horizontal load equal to the operating weights of those parts multiplied times the following factors:

<u>Type of Equipment</u>	<u>Factor Cp</u>
Rigidly supported equipment such as fuel tanks, transformers, and control panels	0.50
Flexible or flexibly supported equipment such as communication equipment and standby generators	1.00

- B. Load is to be applied at the center of gravity of the part and to be in any direction horizontally. Design stresses shall be in accordance with the specifications for design of the American Institute of Steel equipment.

11.5 Seismic Anchoring and Restraints

Equipment Anchors: All electrical equipment shall be securely anchored. Anchoring shall have the capability of withstanding seismic forces per the 1989 California Code of Regulations, Title 24, Part 2, Section 2312, Seismic Zone 4, with $Z = 0.4$, $C_p = 1.0$, and $I_p = 1.5$. C_p may be two-thirds of the value specified for components mounted on foundations at grade or on floor slabs on earth grade.

11.6 Equipment

Install equipment anchors in accordance with the final shop drawing and manufacturer's recommendations. Properly torque all bolts to the required values.

1008-12 MISCELLANEOUS ELECTRICAL DEVICES

12.1 Description

This section includes materials and installation of miscellaneous electrical devices and equipment, termination box cabinet, time switches, and associated instrumentation equipment.

12.2 Related Work Specified Elsewhere

12.3 Submittals

- A. Submit shop drawings in accordance with the General Requirements.

- B. Submit ratings and characteristics including voltage ratings, continuous current ratings, conduit entry restrictions, and enclosure type and dimensions.

12.4 Lighting and/or Relay Control Cabinet

- A. Provide the lighting controls in separate individual metal enclosure rated NEMA 12 to be mounted within NEMA 3R RTU enclosure or as indicated, specified and/or required.
 - 1. Construction: Enclosures shall be all-steel rated NEMA 12. Enclosures shall be of the height and width as shown on the drawings unless specifically approved by Engineer. Each of the enclosure shall have front hinged swinging door with inner door for relays, switches. The doors shall be rigidly formed with stiffeners as required to eliminate diagonal twist. Enclosures shall have a hinged front door and a removable interior mounting panel for components. Wall mounted enclosures shall have a lockable hasp and mounting flanges. Enclosures shall be by Hoffman, Keystone, or equal.
- B. Contactors shall be provided as shown on the Drawings.
- C. Time Switches shall be adjustable and powered by self-starting synchronous motors, with spring driven reserve, which shall be sufficient contacts at least 36 hours after power failure. On restoration of normal power, the time switch shall transfer to synchronous motor drive and automatically rewind the reserve. The switch shall have an astronomic dial, day-omitting device and a 3-way manual control for each circuit. "On" operation shall occur automatically at sunset. "Off" operation shall be adjustable in one-half hour increments to sunrise. Both "on" and "off" shall have a range of adjustability of 20 to 40 minutes before or after sunset and sunrise. The time switch contacts shall be capable of carrying a minimum of 40 amperes per pole continuously at 240 volts. The switches shall be single pole, double throw and equipped with three-position controls (ON-OFF-AUTOMATIC) and terminals. The synchronous motor shall operate on a 120 volt and 60 hertz control circuit. The time switches shall be Tork, Paragon, General Electric or equal.
- D. Relays: Provide the control and time delay relays as shown on the drawings and as required. Adjust the time delay relays so that logic is properly sequence. Identify each relay with marking tape in accordance with the relay numbers shown on the Drawings.

1. General Purpose Relays: General purpose relays shall be industrial plug-in style relays with a 120 VAC coil. Bases shall have clamp screw terminal connections. Contacts shall be rated 10 amps. Sufficient contacts shall be provided to accommodate all requirements. Relays shall be Potter & Brumfield, Square D or equal.
 2. Time Delay Relays: Time delay relays shall be on delay or off delay as required, industrial plug-in style timers, with user selectable ranges, a 120 VAC coil, and dial adjustment. Bases shall have clamp screw terminal connections. Additional relays (slave relays) shall be provided and installed when the number or type of contacts required exceeds the contact capacity of the specified timers. Time delay relays shall be IDEC or equal.
- E. Push Buttons and Indicating Lights: Push buttons and indicating lights shall be round configuration. Indicating lights shall be 120 volts ac type. Details including engraving, contacts, and the like shall be as indicated. Push buttons and lights shall be rated NEMA 13 for indoor applications, and NEMA 4 for outdoor applications. Devices shall be Westinghouse, Allen-Bradley, Square D or equal.
- F. Selector Switches: Selector switches shall be of the rotary type with the number of positions, color, escutcheon engravings, contact configurations and the like as indicated. Section switches shall be rated NEMA 13 for indoor applications. Selector switches shall be Westinghouse, Allen-Bradley Bulletin 800, or equal.

12.5 Mounting

- A. Install the metal enclosed control equipment as indicated, specified and required. Equipment shall be installed level and securely attached to the RTU enclosure with machine bolts.
- B. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The ENGINEER reserves the right to require minor changes in location of equipment prior to roughing in without incurring any additional costs or charges.

12.6 Enclosure Wiring

- A. Wiring Installation: All wires inside control boards including field wires adjacent to terminal strips shall be run in plastic wireways except (1) wiring run between mating blocks in adjacent sections, (2) wiring run from components on a swing-out panel to components on a part of the

fixed structure, and (3) wiring run to door-mounted components. Wiring run from components on a swing-out panel to other components on the fixed structure shall be made up in tied bundles. These bundles shall be tied with nylon wire ties, and shall be permanently secured to panels at both sides of the "hinge loop" so that conductors are not strained at terminals.

- B. Wiring run to control devices on the front of the control board shall be tied together at short intervals with nylon wire ties and secured to the inside face of the control board using spot welded mounts. Wiring to rear terminals on control board mounted instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.
- 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 be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using black numbered wire markers which shall be plastic-coated cloth, Brady Type B-500, Thomas and Betts "E-Z Code," or equal or shall be permanently marked heat-shrink plastic.

1008-13 CONDUIT

13.1 Section Includes

- A. PVC Coated Rigid Galvanized Steel conduit.
- B. Metal Conduit
- C. Liquid tight flexible metal conduit.
- D. Fittings and conduit bodies.
- E. Nonmetal conduit.

13.2 References

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- C. ANSI/NFPA 70 - National Electrical Code - 1993.

- D. NECA "Standard of Installation."
- E. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit.
- F. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

13.3 Design Requirements

Conduit Size: ANSI/NFPA 70.

13.4 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Submit product data for the following:
 - 1. Conduit and fittings for each type specified.
 - 2. Boxes.
 - 3. Bodies, supports, and fasteners
- C. Product Data: Provide for PVC jacketed RGS conduit, RGS conduit, liquid tight flexible metal conduit, nonmetallic conduit, fittings, and cast ferroalloy conduit bodies.

13.5 Project Record Documents

- A. Accurately record actual conduits and routing of all underground conduits.

13.6 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

13.7 Project Conditions

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.

- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to best suit field conditions.

13.8 Quality Control

- A. NEMA Compliance: Comply with NEMA standards pertaining to conduits and components.
- B. UL Compliance and Labeling: Comply with requirements of UL standards pertaining to electrical conduits and components. Provide conduits and components listed and labeled by UL.

13.9 Conduit Requirements

- A. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations: Use PVC coated galvanized steel conduit (excluding utility service conduits).
 - 1. Minimum Size: 1 inch

13.10 Metal Conduit

- A. Rigid Steel Conduit: ANSI C80.1
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Steel or Malleable Iron

13.11 PVC Coated Rigid Galvanized Steel Metal Conduit

- A. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick. Robroy or approved equal.
- B. PVC-coated conduits shall be as manufactured by Robroy, Occidental (OCCAL), Perma Cote or approved equal.
- C. Conduit:
 - 1. All conduits, prior to coating, shall conform to ANSI C80.1 and UL 6. Conduits shall be hot-dipped galvanized after threading.
 - 2. The zinc surface shall be treated prior to coating to enhance the bond between metal and plastic.

3. Both interior and exterior of the conduit shall be coated with an epoxy acrylic primer of approximately 0.5-mil thickness.
 4. The exterior coating shall be applied by dipping in liquid plastisol or other equal method which will produce a finished product conforming to NEMA 5-19-1986.
 5. The thickness of the PVC coating shall be a minimum of 40 mil the full length of the conduit except the threads.
 6. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the plastic.
 7. A chemically cured urethane coating of a nominal thickness of 2 mils shall be applied to the interior of all conduit.
 8. The conduit shall be bendable without damage to the PVC or urethane coatings.
 9. All threads shall have an added protection of a 2-mil clear urethane coating.
- D. Fittings: Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating Robroy or approved equal.
1. Fittings and elbows shall be coated similar to the conduits.
 2. A loose coupling shall be furnished with each length of conduit. A PVC coating shall be bonded to the outer surface of the coupling, and a PVC sleeve equal to the outside diameter of the uncoated conduit shall extend beyond both ends of the coupling approximately one pipe diameter or 2 inches whichever is smaller. The wall thickness of the sleeve shall be the same as the plastic coating on the pipe.
 3. The PVC coating on the coupling shall be ribbed to enhance installation.
 4. All hubs shall have PVC sleeves equal to those on the couplings.
 5. All screws on Form 8 fittings shall be of stainless steel with encapsulated plastic heads.
 6. All U bolts and RA clamps shall be sized to fit conduit, and the nuts shall be encapsulated in plastic.

7. Fittings shall otherwise be same as specified for rigid steel.
 8. Elbows or bends exceeding 45 degrees shall be PVC coated and shall be of the same dimensions as specified for rigid steel long-radius elbows.
- E. Conduits and fittings shall conform to NEMA RN-1 and shall be manufactured by Robroy, Ocal Inc., or equal.

13.12 Rigid Steel Conduit

- A. Rigid Steel Conduit and Fittings: Conform to ANSI C80.1, NEMA RN2, and UL 6, hot-dipped galvanized after threading. The zinc coating shall be flexible and shall not crack during bending.
- B. Fittings:
1. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.
 2. Locknuts: Steel or malleable iron.
 3. Bushings: Threaded type, steel or malleable iron, with 105°C rated plastic insulated throat. Plastic bushings with a temperature rating of 105°C may be used for conduits 1 inch and smaller.
 4. Box Connectors for Damp and Wet Locations: Provide a watertight threaded hub on enclosure consisting of sealing fitting with tapered conduit thread, neoprene O-ring, and 105°C rated insulating throat with grounding and bonding lug.
 5. Couplings: Threaded, hot-dipped galvanized after fabrication.
- C. No running threads will be permitted. Provide union fittings for these locations.

13.13 Liquid tight Flexible Metal Conduit

- A. Conduit: Steel, UL-360 listed, PVC jacketed.
- B. Description: Interlocked steel. Construction with PVC Jacket. American Brass, Electroflex, or approved equal.
- C. Fittings:
1. Conform to ANSI C33.84, UL listed for use with the conduit.

2. In sizes 1-1/4 inches and less UL listed for grounding.
3. Made of steel or malleable iron, zinc plated, 105°C insulated throat, grounding and bonding lug.

13.14 Nonmetallic Conduit

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.
- C. Non-metallic conduits and fittings shall be manufactured by Carlon, Condux, or approved equal.

13.15 Conduit Fittings

- A. General: 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. Such 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 be closed with gaskets. Surface-mounted cast fittings, housing wiring devices in outdoor and damp locations, shall have mounting lugs. Fittings used with PVC coated conduit shall have PVC coating.
- B. Insulated bushings shall be molded plastic or malleable iron with insulating ring, similar to O-Z Type A and B, equivalent types by Thomas & Betts, Steel City, Appleton, Efcor, O-Z/Gedney, or approved equal.
- C. Insulated grounding bushings shall be malleable iron with insulating ring and with ground lug, such as O-Z Type BL, equivalent types by T & B, Steel City, Efcor, O-Z/Gedney, or approved equal.
- D. 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 such as Appleton Type EC, equivalent types such as manufactured by T & B, Steel City, Efcor, O-Z/Gedney, or approved equal.
- E. Liquid-tight fittings shall be PVC coated or non-metallic type manufactured by O- Z/Gedney, or approved equal.

- F. Hubs for threaded attachment of steel conduit to sheet metal enclosures, where required, shall be similar to Appleton Type HUB, equivalent types such as manufactured by T & B, Efcor, Myers Scrutite, or approved equal.
- G. 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.

13.16 Conduit Sealant

- A. Moisture Barrier Types: Sealant shall be a nontoxic, non-shrink, non-hardening, putty-type hand-applied material providing an effective barrier under submerged conditions.
- B. Fire-Retardant Types: fire stop material shall be a reusable, no toxic, asbestos-free, expanding, putty type material with a three-hour rating in accordance with UL 35L4.

13.17 Prohibited Materials

Do not provide aluminum conduits, fittings, supports, or boxes.

13.18 Corrosion Protective Coatings for Metal Conduit

- A. Koppers Company: Bitumastic 505.
- B. Porter Paint Company: Super Tar Set.
- C. Carboline: Carbo-mastic.

13.19 Conduit Usage Schedule

Install the following types of conduits and fittings in locations listed, unless otherwise noted in the drawings. Definitions and requirements of NEC apply unless specifically modified below. Installation of all buried or concealed conduit work shall be witnessed and approved by a District representative. Use of IMC conduit is not approved. Discuss use of IMC with District for each specific application. They must approve use before IMC is allowed in spec.

- A. Exterior, Exposed:
 - 1. Material: Rigid steel conduit larger than 3 inches.

2. Minimum Size: 3/4 inch.
- B. Exposed, Where Area is Indicated as Corrosive Area:
 1. Material: PVC-coated rigid steel conduit.
 2. Minimum Size: 3/4 inch.
- C. Interior, Exposed, Dry, Wet, and Damp Locations:
 1. Material: Rigid steel conduit over 6 feet above finished floor.
 2. Minimum Size: 3/4 inch.
- D. Embedded in Concrete Slabs or Walls and Masonry Walls:
 1. Material: Rigid steel conduit.
 2. Minimum Size: 1 inch.
- E. In Earth, Below Concrete Slabs or Underground:
 1. Material: Rigid nonmetallic conduit (PVC).
 2. Minimum Size: 1 inch.
 3. Conduit Stub-Ups: Provide PVC-coated rigid steel conduit elbows for stub-ups which connect to underground rigid PVC conduit. Stub-ups concealed below floor or pad-mounted equipment may be PVC Schedule 80. Stub-ups extending up to 6 inches above grade shall be PVC-coated rigid steel.
- F. Final Connections to Motors, Transformers, Vibrating Equipment, or Instruments:
 1. Material: Liquid-tight flexible conduit.
 2. Minimum Size: 1/2" inch.
 3. Length of liquid-tight flexible conduit shall be 3 feet or less, unless otherwise authorized by the District.

13.20 Conduit Fill

For runs that are not sized in drawings, compute the maximum conduit fill using NEC requirements for Type THW conductors (larger if applicable), although the actual wiring may be with types of conductors having smaller cross-sections.

13.21 Conduit Installation, General

- A. Install conduit concealed unless specifically noted otherwise.
- B. Run exposed conduits parallel and perpendicular to surface or exposed structural members and follow surface contours as much as practicable to provide a neat appearance.
- C. Make right-angle bends in conduit runs with standard or long-radius elbows or conduits bent to radii not less than those specified for standard or long-radius elbows.
- D. Buried conduits shall penetrate perpendicular to surface penetrated.
- E. Make bends and offsets so that the inside diameter of conduit is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- F. Cap all conduits immediately after installation to prevent entrance of foreign matter.
- G. Do not use diagonal runs except when specifically noted in the drawings.
- H. Route exposed conduit to preserve headroom, access space, and work space.
- I. Treat threaded joints of rigid steel conduit with T&B "Kopr-Shield" before installing fittings where conduit is in slabs and other damp or corrosive areas.
- J. For PVC-coated rigid conduits, use manufacturer's recommended threading and installation tools.
- K. Conduit Terminations:
 - 1. Terminate conduits with locknuts and bushings except where threaded hubs are specified.

2. Install conduits squarely to the box and provide one locknut outside the box and one locknut and bushing inside the box.
 3. Install locknuts with dished side against the box.
 4. When terminating in threaded hubs, screw the conduit or fitting tight into the hub.
 5. When chase nipples are used, install conduits and coupling square to the box and tighten the chase nipple leaving no exposed threads.
- L. Install exposed, parallel, or banked conduits together. Make bends in parallel or banked runs from the same centerline so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel.
- M. Conduit runs are shown schematically. Supports, pull boxes, junction boxes, and other ancillary equipment are not usually shown in drawings. If not shown, provide as required by NEC except that bends shall not exceed 360 degrees in total, between pull points. Provide additional boxes to permit pulling of wires without damage to the conductors or insulation.

13.22 Conduit Sealing

Seal conduit entries with silicone sealant when conduit leaves an area identified as corrosive.

13.23 Installation

A. Underground Ducts

1. Where PVC conduit is installed underground in locations other than under concrete slab, provide 24-inch minimum cover. Provide 3-inch minimum sand below and 3-inch minimum sand-cement slurry with red color additive on top and sides of conduits. Maintain a 12-inch minimum separation between conduit and other systems. Pitch conduit to drain away from buildings. Provide 6-inch-wide red magnetically detectable warning tape 12 inches above conduits.
2. Where an underground utility distribution system is required, it shall be comprised of multiple runs of single bore non-metallic ducts, concrete encased, with steel reinforcing bars. When non-

metallic ducts are required, they shall be rigid Schedule 40 PVC for concrete encasement. The concrete envelope shall have a compression strength of 3,000 psi.

B. Conduits embedded in concrete and bellows slabs

1. Install conduits and sleeves passing through slabs, walls, or beams so as not to impair the strength of construction. Secure conduit to prevent sagging or shifting during concrete pour.
2. Conduits larger than 1-1/2 inches in diameter may be embedded in structural concrete only after submittal and review of location and reinforcement details.
3. Conduits and sleeves may be installed without specific permission, provided they are 1-1/2 inches or less in diameter and are spaced not less than three diameters on centers.
4. Install conduits in slabs other than slabs-on-grade as close to the middle of the slabs as practical without disturbing the reinforcement. Outside diameter of the conduit shall not exceed one-third times the slab thickness. Do not space parallel runs of conduit closer than three diameters on centers, except at cabinet and outlet box locations. Conduit must be installed deep enough for elbows to penetrate perpendicular to slab.
5. Conduits shown in or under slab-on-grade construction shall be installed below the floor slab and under curing or damp-proofing membranes. An exception may be made for conduit with an outside diameter not larger than 25% of the slab thickness, in which case, standards applying to slabs other than slab-on-grade may be used. Conduit must be installed deep enough for elbows to penetrate perpendicular to slab.
6. Perform trenching and backfill in accordance with Section 2.

C. Requirements for rigid nonmetallic (PVC) conduit

1. Comply with the installation provisions of NEMA TC2, except as modified below.
2. Make cuts with a fine tooth handsaw. For sizes 2 inches and larger, use a miter box or similar saw guide to assure a square cut.

3. Use factory-made couplings for joining conduit.
4. Cementing and joining operation shall not exceed 20 seconds. Do not disturb joint for 5 minutes, longer (up to 10 minutes) at lower temperatures. Make joints watertight. Joining procedure shall conform with detailed procedures of ASTM D 2855.

13.24 Conduits and Raceways

- A. General: Raceways shall be installed as shown, however, conduit routings shown are diagrammatic. 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 conduit. Bends in larger sizes of metallic conduit shall be accomplished by the use of factory elbows as much as practical. Field bends are allowed but shall be minimized. All installations shall be in accordance with the latest edition of the National Electrical Code.
- B. Raceways shall be installed in accordance with the following schedule:
 1. Low Voltage Raceway (control, power, and communications):
 - a. Rigid Schedule 40 PVC shall be used for concrete encased duct in earth as used for installation of electrical service feeders.
 - b. Galvanized rigid steel raceways shall be used on outdoor exposed locations.
 2. Exposed Raceways:
 - a. Conduits shall be rigidly supported with clamps, hangers, and strut channels.
 - b. Intervals between supports shall be in accordance with the National Electric Code.
 3. Analog signals shall be run in separate conduit from control and power wiring.
- C. Conduit Terminations: Empty conduit terminations not in pullboxes shall be plugged. Exposed raceway shall be installed perpendicular or parallel to buildings except where otherwise shown. Conduit shall be

terminated with flush couplings at exposed concrete surfaces. Metallic raceways installed below-grade or in outdoor locations and in concrete shall be made up with a conductive waterproof compound applied to threaded joints. Compound shall be Zinc Clads Primer Coatings No. B69A45, HTL-4 by Crouse-Hinds, Kopr Shield by Thomas & Betts, or approved' equal. Rodent proof all open floor conduits with silicon.

D. Conduit Installations:

1. Where a run of concealed PVC conduit becomes exposed, a transition to rigid steel conduit is required. Such transition shall be accomplished by means of a or a minimum 3-foot length of PVC coated galvanized rigid steel conduit with sweep up, either terminating at 8" minimum above the exposed concrete surface with galvanized rigid steel conduit coupling or continued up to conduit body or junction box.
2. Flexible liquid tight conduit shall be used at locations for the connection of equipment such as motors, transformers, instruments, valves, or pressure switches subject to vibration or movement during normal operation or servicing. Flexible conduit may be used in lengths required for the connection of recessed lighting fixtures; otherwise the maximum length of flexible conduit shall be 18 inches. Connections made using flexible liquid-tight conduit shall be installed with a cast junction box for the make-up of connections. Flexible liquid tight conduits shall be as manufactured by American Brass, Cablec, Electroflex, or approved equal
4. Provide 3/16 inch nylon pull cord in each empty conduit for future use.
5. Use suitable caps to protect installed conduit against entrance of dirt and moisture during construction.

13.25 Grounding

- A. Provide grounding in accordance with Section 1008-17.
- B. Use grounding bushings for all conduits carrying a grounding conductor.
- C. Provide a grounding conductor in flexible conduit, size conforming to NEC Article 250.

13.26 Conduit Supports

- A. Support conduit at intervals and at locations as required by the NEC. Do not use perforated strap or plumbers tape for conduit supports.
- B. Conduit on Concrete or Masonry: Use one-hole malleable iron clamps with pipe spacers (clamp backs) or preformed galvanized steel channels. Anchor with metallic expansion anchors and screws. Stainless-steel expansion anchors shall be used where subject to moisture. Galvanized expansion anchors may be used indoors except where subject to moisture, mounted on floor, or where area is identified as "corrosive." Shot-in fasteners are not allowed.
- C. Suspended Conduit: Use malleable iron, factory-made, split-hinged pipe rings with threaded suspension rods sized for the weight to be carried (minimum 3/8 inch diameter); Kin-Line, Grinnell, Elcen, or equal. For grouped conduits, construct racks with threaded rods and tiered angle-iron or preformed channel cross members. Construct channel to limit deflection to 1/200 of span. Clamp each conduit individually to a cross member. Where rods are more than 2 feet long, provide rigid sway bracing.
- D. Supports at Structural Steel Members: Use Type 304 stainless-steel or malleable iron beam clamps. Drilling or welding may be used only where indicated on the drawings.
- E. Where area or room is identified as "Corrosive Location," supports, hangers, preformed channels, and clamps shall be Type 304 stainless steel, PVC coated steel, or fiberglass. Fiberglass support system shall be as manufactured by Omnistrut, Click, or equal. Bolts and nuts for stainless steel and PVC coated support systems shall be Type 304 stainless steel.

13.27 Damaged Conduit

- A. Repair or replace conduit damaged during or after installation.
- B. Replace crushed or clogged conduit or any conduit whose inner surface is damaged or not smooth.
- C. Repair cuts, nicks, or abrasions in the zinc coating of galvanized conduit with galvanizing repair stick, Enterprise Galvanizing "Galvabra" or equal.

- D. Repair cuts, nicks, or abrasions in the PVC coating of PVC-coated conduit with the manufacturer's recommended PVC material and build up surface thickness to match the factory coating thickness and color.

13.28 Empty Conduit

- A. Provide 200-pound strength pull cord in all empty conduits.
- B. Provide a waterproof label on each end of the pull cords to indicate the destination of the other end.
- C. Show coordinate dimensions of all stub-outs on as-constructed drawings. Place a 1-inch by 12-inch by 12-inch concrete marker over all stub-outs and engrave with the words "Electrical Conduit."

13.29 Adjusting and Cleaning

Upon completion of installation of conduits and boxes, inspect interiors of conduits and boxes; clear all blockages; and remove burrs, dirt, and construction debris.

1008-14 DUCTBANK

14.1 Section Includes

- A. Duct
- B. Hand holes

14.2 References

- A. AASHTO - Standard Specification for Highway Bridges.
- B. ANSI/ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- C. ANSI/ASTM A569 - Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled, Commercial Quality.
- D. ANSI/NEMA FB I - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. ANSI/NFPA 70 - National Electrical Code.

- F. NEMA TC 2 - Electrical Plastic Tubing (EFT) and Conduit (EPC-40 and EPC-80).
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- H. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.
- I. NEMA TC 8 - Extra-Strength PVC Plastic Utilities Duct for Underground Installation.
- J. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

14.3 Submittals

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide for nonmetallic conduit, hand hole and supports.

14.4 Project Record Documents

- A. Submit under provisions of the General Requirements.
- B. Accurately record actual locations of exact routing of duct bank.
- C. Accurately record actual locations of each hand hole.

14.5 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc as suitable for purpose specified and shown.

14.6 Delivery, Storage, and Handling

- A. Deliver, store, protect, and handle Products to site under provisions of the General Requirements.
- B. Accept conduit on site. Inspect for damage.

- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

14.7 Project Conditions

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Verify locations of hand holes prior to excavating for installation.
- D. Duct bank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.
- E. Hand hole locations are shown on Drawings in approximate locations unless dimensions are indicated. Locate as required to complete duct bank system.

14.8 Plastic Conduit

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3

14.9 Plastic Duct

- A. Plastic Utilities Duct: NEMA TC 6; PVC NEMA TC 8; PVC Type EB.
- B. Plastic Utility Duct Fittings: NEMA TC 9.

14.10 Precast Concrete Hand Holes

- A. Manufacturers:
 - 1. Brooks, Quickset or equal.
 - 2. Substitutions: Under provisions of the General Requirements.
 - 3. Material: Reinforced precast concrete.
- B. Construction: Modular sections with tongue-and-groove joints.
- C. Reinforcing: AASHTO Classification H-20 Traffic Rated.

- D. Shape: As indicated.
- E. Nominal Dimensions: As indicated.
- F. Wall Thickness: 4 inches
- G. Frames and Covers: Steel bolt-down traffic rated cover. Provide cover marked ELECTRIC, or COM.

14.11 Accessories

- A. Underground Warning Tape: 4-inch wide plastic tape, colored yellow with suitable warning legend describing buried electrical lines.

14.12 Examination

- A. Verify that excavation, base material installation, and compaction is completed.

14.13 Preparation

- A. Prepare excavation in accordance with hand hole manufacturer's instructions. 6-inches of compacted rock is minimum.

14.14 Duct Bank Installation

- A. Install duct in accordance with manufacturer's instructions.
- B. Install duct to locate top of duct bank at depths as indicated on drawings. Lesser depths are allowed at hand holes.
- C. Install serving utility duct banks per SCE Standards.
- D. Install no more than equivalent of three 90-degree bends between pull points.
- E. Provide suitable fittings to accommodate expansion and deflection where required.
- F. Stagger duct joints vertically in concrete encasement 6 inches minimum.
- G. Use suitable separators and chairs installed not greater than 4 feet on centers.

- H. Band ducts together before placing concrete.
- I. Securely anchor duct to prevent movement during concrete placement.
- J. Place concrete under provisions of Section 3.
- K. Provide minimum 3 inch concrete cover at bottom, top, and sides of duct bank.
- L. Connect to hand hole wall using dowels.
- M. Provide suitable pull string in each empty duct except sleeves and nipples.
- N. Backfill trenches under provisions of Section 2-3.
- O. Interface installation of underground warning tape with backfilling specified in Section 2-3. Install tape 12 inches below finished surface.

14.15 Precast Hand Hole and Pull Box Installation

- A. Install and seal precast sections in accordance with manufacturer's instructions.
- B. Install hand holes plumb.
- C. Use precast sections to bring hand hole cover to finished elevation.
- D. Damp-proof exterior surfaces, joints, and interruptions of hand holes after concrete has cured 28 days.

14.16 Wire and Cable

- A. Wire and cable.
- B. Instrumentation Cable
- C. Wiring connectors and connections

14.17 Related Sections

- A. Section 1008-1 – General Electrical Requirements.

- B. Section 1008-17 – Grounding
- C. Section 1008.13 – Conduit.
- D. Section 1008-10 – Identification.

14.18 References

- A. ANSI/NFPA 70 - National Electrical Code.

14.19 Submittals

- A. Submit in accordance with the General Requirements.
- B. Submit material list for each conductor type. Indicate insulation material, conductor material, voltage rating, manufacturer and other data pertinent to the specific cable, such as shielding, number of pairs, and applicable standards.

14.20 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

14.21 Project Conditions

- A. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to best suit field conditions.
- B. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

14.22 Wire and Cable

- A. Description: Single conductor insulated wire.
- B. Conductors: Stranded copper only, aluminum wire shall not be used. Solid wire shall not be used. All wire sizing shall be rated per NEC Table 310-16. Wires sizes up to #1 awg shall be rated the same as over current protection device and based on 60 degree C wiring. Wires sizes #1 awg and larger shall be rated the same as over current protection device and based on 75 degree C wiring.

- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type XHHW-2 insulation for feeders and branch circuits larger than 2/0. Type THHN/THWN insulation for feeders and branch circuits 1/0 AWG and smaller. Equal or equal. Provide Type XHHW-2 for below-grade runs and XHHW-2 or THWN for above-grade runs, and rated for continuous operation at 75°C.
- E. Contractor shall furnish, install, connect and test all cable and wire required for connection to all electrical equipment. All wire and cable shall be U.L. listed and approved for the purpose. Cable and wire shall be stranded copper and shall have 600V insulation.
- F. No. 12 AWG minimum conductor size for power circuits.
- G. No. 14 AWG minimum conductor size for control circuits.

14.23 Instrumentation Cable

- A. Single Pair or Triplex Shielded Instrument Cable:
 - 1. Single-pair cables shall be two No. 14 AWG and single-triad cables shall be three No. 16 AWG stranded tinned-copper conductors individually insulated with fully color-coded PVC rated at 600 volts; insulated conductors twisted together and shielded with a spiral-wound metal foil tape overlapped for 100% shielding. Outer jacket shall be PVC. Runs over 100 linear feet shall be No. 16 AWG.
 - 2. Manufacturer: Provide shielded cable of one of the following:
 - a. Okonite Company.
 - b. Belden Company.
 - c. Dekoron Wire and Cable Company.
 - d. Alpha Cable Company.
- B. Multi-pair Shielded Instrument Cable:
 - 1. Tinned copper, 7 strand XLPE insulated conductors, #16 AWG minimum, 600V, twisted in pairs with aluminum-mylar shield over each pair, silicone rubber fiberglass fire barrier tape, tinned copper drain wire, aluminum mylar overall shield, Hypalon outer jacket.

2. Manufacturer: Provide shielded cable of one of the following:

- a. Okonite Company.
- b. Dekoron Wire and Cable Company.
- c. Belden Company.
- d. Alpha Cable Company.

14.24 Grounding Conductors – Bare Copper

Refer to Section 18-6 for bare copper grounding conductors.

14.25 Conductor Tags

Provide individual or sleeved, nonmetallic, type. Grafoplast, Phoenix Contact, Thomas & Betts sleeve markers, or equal.

14.26 Prohibited Materials

Do not provide aluminum wire, cable, or connectors.

14.27 Preparation

- A. Completely clean and thoroughly swab all raceways before pulling conductors.

14.28 Wire Installation

- A. Install wiring and cable in conduit and terminate unless otherwise noted.
- B. The number of conductors indicated on the drawings for the various circuits are minimum requirements. The actual number of conductors installed for each circuit shall in no case be less than the number indicated, and the contractor shall increase quantities to suit the actual equipment selected for installation and shall do so at no additional cost to the owner.
- C. All wire and cable shall be installed in a neat and workmanlike manner and shall be neatly formed in all junction boxes, pullboxes and at the

terminal enclosures. Each conductor shall be identified by a permanent number at each end.

- D. Group conductors No. 1/0 and smaller in panelboards, cabinets, pull boxes, and switchboard wireways; tie with plastic ties; and fan out to terminals. Lace conductors No. 2/0 and larger with marline.
- E. No. 12 AWG minimum conductor size for power and lighting circuits.
- F. No. 14 AWG minimum conductor size for control circuits.
- G. Pull all conductors into raceways in one pull. To reduce pulling tension in long runs, coat cables with pulling compound recommended
- H. Use suitable wire pulling lubricants as required. Conductors No. 2 AWG and smaller shall be hand pulled. To reduce pulling tension in long runs, coat cables with pulling compound recommended by the cable manufacturer before being pulled into conduits.
- I. Protect all exposed conductors from damage, concrete and paint prior to use.
- J. Neatly train and lace wiring inside all enclosures and panelboards. Provide excess length where possible.
- K. Clean conductor surfaces before installing lugs and connectors. Treat with Thomas & Betts coppershield prior to installing lugs.
- L. Provide terminations capable of carrying full amperage of conductors at 75%%C with no perceptible temperature rise. All conductors shall be free from splices.
- M. Use split bolts for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor minimum. Tape shall be Scotch 33+ by 3M or approved equal.
- N. Use insulated spring wire nuts with plastic caps for copper conductor splices and taps, 10 AWG and smaller. Ideal wingnuts or approved equal. Scotchlock type wirenuts shall not be used.
- O. Remove debris and moisture from the conduits, boxes, and cabinets prior to cable installation.

- P. Group conductors No. 1/0 and smaller in panelboards, cabinets, pull boxes, and switchboard wireways; tie with plastic ties; and fan out to terminals. Lace conductors No. 2/0 and larger with marline.

14.29 Low-Voltage Wire Splices

- A. Stranded Conductors No. 8 and Larger: Use T & B "Locktite" connectors, Burndy Versitaps and heavy-duty connectors, O.Z. solderless connectors, or equal.
- B. Stranded Conductors No. 10 and Smaller: Use crimp connectors with tools by same manufacturer and/or UL listed for connectors of all stranded conductors.
- C. Retighten bolt-type connectors 24 to 48 hours after initial installation and before taping. Tape connections made with non-insulated-type connectors with rubber-type tape, one and one-half times the thickness of the conductor insulation, then cover with Scotch 33 tape.
- D. Do not splice wires in underground hand holes or pull boxes unless explicitly indicated in the drawings. Seal splices in underground hand holes and pull boxes and in light poles with individual sealing packs of Scotchcast Brand 400 Resin or equal.

14.30 Low-Voltage Wire Terminations

- A. Terminate wires and cables at each end.
- B. Provide ring tongue, nylon- or vinyl-insulated copper crimp terminals for termination on screw-type terminal strips (if so supplied as an integral part of a device) and ferrules with insulating sleeves for terminal blocks, except for light switches and receptacles. Utilize installation tools recommended by the crimp manufacturer.
- C. Terminal lugs shall be UL listed and of the copper compression type, electro-tin plated. Provide color-coded system on terminal and die sets to provide the correct number and location of crimps. Permanent die index number shall be embossed on completed crimp for inspection purposes.
- D. Tighten screws and bolts to the value recommended by the manufacturer.

14.31 Instrumentation Cable Installation

- A. Separate analog signals from power conductors and IIOV control signals unless otherwise noted.
- B. Ground shield on shielded cables at one end only and as recommended by instrument manufacturer.
- C. Terminate stranded conductors with pre-insulated crimp type spade or ring type terminals properly sized to fit fastening device and wire size.
- D. Install and terminate vendor furnished cable in accordance with vendor equipment requirements.

14.32 Interface With Other Products

- A. Identify wire and cable under provisions of Section 16195.
- B. Identify each conductor with its circuit number or other designation indicated on the Drawings.

14.33 Field Quality Control

- A. Perform field inspections and testing under provisions of the General Requirements.
- B. Inspect wire and cable for physical damage and proper connections.
- C. Measure tightness of bolted connections and compare' torque measurements with manufacturer's recommendations.
- D. Test shielded instrumentation cable shields with an ohmmeter for continuity along the full length of the cable and for shield continuity to ground.
- E. Connect shielded instrumentation cables to a calibrated 4-20 milliamp DC signal transmitter and receiver. Test at 4, 12, and 20 milliamp transmitter settings.
- F. All tests shall be reviewed and approved by the System Supplier.

14.34 Owners Conductor Color Code Requirements

- A. Contractor shall follow the following color code requirements for conductors. On 3-phase circuits, conductor insulation color shall be as shown. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. On

conductors larger than No. 8 AWG, color tape or colored plastic bands will be permitted.

- B. Color Coding of Low-Voltage Building Wire: Provide color coding throughout the entire network of feeders and circuits (600 volts and below) as follows:

	240/120	240	480/277
Phase	Volts	Volts	Volts
Phase A	Black	Black	Brown
Phase B	Red	Red	Orange
Phase C	---	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green

In addition to color-coding all conductors, each conductor shall be identified in each pull box, panel-board, or termination with circuit identification markers. This identification is applicable to all power, control, alarm, and instrumentation conductors and these markings shall be recorded on the Record Documents. Markers shall be slip-on PVC sleeve type as manufactured by Brady, Seaton, or equal.

- C. Phase conductors No. 10 AWG and smaller and neutral/ground conductors No. 6 and smaller shall have factory color coding with solid color insulation. Do not use onsite coloring of ends of conductors or apply colored plastic adhesives in lieu of factory color coding. Larger conductors may have onsite application of colored plastic adhesives at ends of conductors and at each splice.
- D. Control wires shall have colored insulation. Separate color codes for each wire shall be provided in each conduit that has up to seven wires. Conduits with more than seven wires shall have at least seven types of colored insulation.
- E. Tagging of Conductors: Tag control wires and instrument cables in panels, pull boxes, and at control device. Tag control wires and instrument cables with same wire numbers as on the shop drawing submittals. Tag power wires in pull boxes where there are more than one circuit. Tag power conductors with motor control center or panelboard number and circuit numbers.

14.35 Insulation Resistance Tests

Test each complete circuit prior to energizing. Insulation resistance between conductors and between each conductor and ground shall not be less than 25

mega ohms. Repair or replace wires or cables in circuits which do not pass this test and repeat the test.

1008-15 BOXES

15.1 Section Includes

- A. Electrical device boxes.
- B. Pull and junction boxes.

15.2 Related Sections

- A. Section 18-8 – Wiring Devices
- B. Section 18-12 – Equipment Wiring Systems.

15.3 References

- A ANSI/NEMA FB - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NFPA 70 - National Electrical Code.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

15.4 Project Record Documents

- A Submit under provisions of General Requirements
- B. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

15.5 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc.

15.6 Project Conditions

- A. Electrical boxes are shown on Drawings in approximate quantities and locations unless dimensioned. Furnish and install additional boxes as required to best suit actual field conditions.

15.7 Exposed Surface Mounted Boxes

- A. Cast Boxes: NEMA FB 1, Type FD cast ferroalloy with threaded hubs and mounting lugs. Provide gasketed cover by manufacturer. Crouse Hinds or approved equal. Boxes used with PVC coated conduit shall be PVC coated or non-metallic type.
 - 1. Cast iron with threaded hubs. Provide boxes with mounting flanges.
 - 2. Conduit bodies may be used instead of boxes except where boxes contain devices.
 - 3. Outlet boxes connecting to PVC-coated rigid conduit shall be of the same material and material coating as the conduit, with metal threaded hubs. Provide with gasketed covers secured with at least two corrosion-resistant capture screws.

15.8 Conduit Bodies

- A. Provide types, shapes, and sizes to suit individual applications. Provide like material matching gasketed covers, secured with at least two captive corrosion-resistant screws.
- B. Bodies connecting to rigid conduit shall be of the same material and material coating as the conduit, with metal threaded hubs. Provide with gasketed "clip on" covers secured with at least two corrosion-resistant stainless steel captive screws.

15.9 Junction and Pull Boxes

- A. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; unflanged, surface-mounted junction box. Crouse Hinds Type WEB.

1. Material: Galvanized cast iron.
 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- B. Provide factory-made standard sizes, and shop fabricate when nonstandard size boxes are shown. Comply with UL and NEMA standards.
 - C. NEMA 1: Sheet steel, hot-dipped galvanized after fabrication. Finish with one coat of metal primer and one coat of primer sealer.
 - D. NEMA Type 4X: Type 304 stainless steel or fiberglass, with gasketed covers and Type 304 stainless-steel bolts or screws.
 - E. NEMA 4: Code gauge steel, hot-dipped galvanized after fabrication. Provide cover with Type 303 stainless-steel bolts.
 - F. NEMA 3R: Sheet steel, hot-dipped galvanized after fabrication. Factory painted with corrosion-resistant coatings.
 - G. NEMA 12: Code gauge steel, hot-dipped galvanized after fabrication. Provide continuous hinged cover and three-point latch or Type 303 stainless-steel bolts and clamps.

15.10 Prohibited Materials

Do not provide aluminum fittings, supports, or boxes.

15.11 Installation

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements. All boxes shall be precisely located and solidly mounted.
- B. Install electrical boxes to maintain headroom and to present solid, neat and precise mechanical appearance.
- C. Use multigang boxes and device plates where several devices are located in the same general area. Sectional boxes shall not be used. Obtain back box requirements for systems provided under other sections and provide them per those requirements.

- D. Install outlets and boxes securely and support them substantially. Anchor boxes with one or more integral flanges.

15.12 Adjusting and Cleaning

Upon completion of installation of conduits and boxes, inspect interiors of conduits and boxes; clear all blockages; and remove burrs, dirt, and construction debris.

1008-16 WIRING DEVICES

16.1 Section Includes

- A. Receptacles.
- B. Device plates and box covers.

16.2 Related Sections

- A. Section 1008-1 – General Electrical Requirements

16.3 References

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.

16.4 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations. Submit material list for each type of switch, receptacle, and cover plate. Indicate type, ratings, material, color, and manufacturer.

16.5 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

16.6 Receptacles

- A. Description: NEMA WD 1; molded composition, brown, specification grade receptacles. Duplex receptacles for 120-volt, single-phase, 3-wire circuit to be rated 20 amperes, 125 volts, NEMA Type 5-20R. heavy-duty general-use receptacle. Hubbell or approved equal. Specification grade.
- B. Duplex Receptacles: Provide NEMA WD 1, B. Ground Fault Interrupter Duplex Receptacles: Receptacles shall be rated 20 amperes and comply with UL-943, Class A. Provide Leviton 6398-HGI, 3M GFI-2701, or equal.
- C. Device Body: Brown plastic.
- D. Configuration: NEMA WD 6; type as specified and indicated.
- E. Ground Fault Interrupter Duplex Receptacles: Receptacles shall be rated 20 amperes and comply with UL-943, Class A. Provide Leviton 6398-HGI, 3M GFI-2701, or equal.
- F. Corrosion-Resistant Receptacles: Provide corrosion-resistant receptacles for areas identified as "Corrosive Area" in the drawings. Provide gray melamine, duplex receptacle, Hubbell 53CM62GY or equal.

16.7 Cover Plates

- A. Provide engraved or etched cover plates to indicate equipment or area served for pilot switches, control circuit switches, three-gang or larger gang switches, and switches from which the equipment controlled cannot be readily seen. Lettering shall be 1/8 inch high with filler of black color. Provide a separate nameplate mounted above receptacle for receptacles without cover plates or where engraving or etching is impractical. Nameplate shall be as described in Section 18-1 except with 1/8-inch-high lettering.
- B. In wet areas, areas subject to hosing down, areas identified as "Corrosive Area," or where indicated, use individually gasketed weatherproof cover plates.
 - 1. Switch plates shall be Carlon toggle switch cover part #E98TSCN-CAR or approved equal.
 - 2. Receptacle plates shall be polycarbonate and NEMA 3R rated while in use. Ideal, Tay Mac Corporation or equal.

- C. Provide satin stainless 430 plates in all remaining locations.

16.8 Interface With Other Products

- A. Coordinate locations of outlet boxes and obtain mounting heights specified unless otherwise indicated on Drawings.

16.9 Field Quality Control

- A. Inspect each wiring device for defects and solid Connections.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle is energized and will support load intended.
- D. Test each receptacle with a circuit tester that checks voltage, polarity, and grounded conditions. Repair or replace defective receptacles and repeat the test.
- E. Test each GFCI receptacle for proper operation. GFI receptacles shall be tested with the circuits energized. Devices shall be tested with a portable GFI receptacle tester capable of circulating 7.5 ma of current, when plugged in, between the "hot" line and "ground" to produce tripping of the receptacle. Resetting and tripping shall be checked at least twice at each GFI receptacle.

16.10 Grounding

Provide a bonding jumper between the grounded outlet box and the receptacle ground terminal.

1008-17 **PANELBOARDS**

17.1 Description

This section describes materials, testing, and installation of panelboards.

17.2 References

- A. ANSI/NFPA 70 – National Electrical Code.

- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

17.3 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

17.4 Delivery, Storage, and Handling

- A. Deliver, store, protect, and handle products to site under provisions the General Requirements.
- B. Accept panelboards on site. Inspect for damage.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Handle carefully to avoid damage to panelboard's internal components, enclosure, and finish.

17.5 Environmental Requirements

Conform to NEMA PB 2 service conditions during and after installation of panelboard.

All equipment to be furnished under this contract shall be designed, constructed, and installed in accordance with the earthquake regulations of the California Code Title 24, Section 2312 and the Uniform Building Code (UBC).

17.6 Manufacturers

- A. General Electric
- B. Square D.
- C. Cutler-Hammer
- D. Seimens ITE

E. Substitutions: or approved equal.

17.7 General

- A. Conform with NEMA PB 1 (panelboards) and UL 67 (electric panelboards).
- B. Surface mounted panelboard

17.8 Panelboards Description

- A. Panelboard shall be dead front, safety-type panelboards with voltage ratings as scheduled. Panelboards shall be circuit breaker type and suitable for the short circuit ratings as specified. Panelboards shall be UL listed surface mounted as noted on the drawings, with hinged doors, latch, typewritten index card holders located on door, and permanent type plastic or metal numbers on adjacent rim removable only from back of trim, to identifying the branch circuit breakers. Lighting, power and receptacle panelboards shall be single phase, three wire, S/N 120/240, 100 ampere, or as indicated on drawings. All boxes shall be formed of galvanized metal, chemically cleaned and all breaks in galvanizing shall be painted with metallic aluminum paint. Maximum size: 22" wide by 5-3/4" deep unless noted otherwise on the drawings. All trims and doors shall be chemically cleaned. Provide ASA 61 synthetic alkaloid factory enamel finish on the exterior and interior of panels. The sheet steel enclosure shall be of the drip-proof type, NEMA 1. Finish: Medium light gray (ANSI #49) per Section 09900.

17.9 Breakers

- A. Circuit breakers shall be full module size; two poles shall not be installed in a single module. Multiple circuit breakers shall be of the common-trip type having a single operating handle. Circuit breakers shall be bolt-on type. Circuit breakers shall be minimum 22,000 ampere interrupting rating for all branch circuit panelboards unless noted otherwise on drawings. Protective devices feeding receptacle circuits may be equipped with ground fault circuit breakers (UL listed and approved for 22,000 amperes interrupting rating) in lieu of using GFCI type receptacles.
- B. Furnish ground fault interrupter (GFI), 5-ma trip, 22,000-ampere interrupting capacity circuit breakers where indicated.

17.10 Breaker Connections

Circuit breaker current-carrying connections to the bus shall be bolted type.

17.11 Bus Bars

Bus bars shall be copper. Provide a copper ground bus bar installed on the panelboard frame, bonded to the box, and containing at least 10 terminal screws. Provide tin plated covered, copper bussing, and main lugs or main protective device as indicated on the drawings. Bussing: To be minimum of 100 amperes with feeder and breaker protecting panel permits lower amperage. All panelboards shall be equipped with a separate ground bus.

17.12 Space Only

Where "space only" is noted in the drawings, provide connectors and mounting brackets for the future insertion of an over-current device of the size indicated.

17.13 Directories

Provide typed circuit directories on the inside face of the door of each panel. Do not provide handwritten directories. Indicate the load in watts for each circuit in the directory.

17.14 Nameplates

Provide nameplates as specified in Section 18. Designate the identifying nomenclature, voltage, and phase of the panel as shown in the drawings; for example, "PANEL A, 120/240-volt, single phase, 3-wire, 100-ampere bus

17.15 Examination

Verify that location is suitable for transformer installation.
Verify that location indicated on plan meets manufacturer recommended ventilation requirements.

17.16 Installation

Install panelboards in accordance with manufacturer's written instructions and NEMA PB 2.1. All panelboards shall be rigidly supported within vertical section of motor control center. Install panelboards so that the top of the highest circuit breaker is not more than 6 feet 6 inches above grade.

17.17 Field Quality Control

- A. Field inspection and testing will be performed under provisions of the General Requirements.
- B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- C. Check tightness of accessible bolted mounting and supports using calibrated torque wrench.
- D. Operate each circuit breaker and verify that all phases of each load are disconnected.

17.18 Adjusting

- A. Tighten bolted terminal connections in accordance with manufacturer's instructions.
- B. Provide coordination study and settings required for circuit breakers to coordinate with motor control center breakers.

17.19 Cleaning

- A. Touch up scratched or marred surfaces to match original finish and paint.
- B. Service Switchboards

17.20 System Description

- A. System Characteristics: 200 amp, 277/480 volts, three phase, four-wire, 60 Hertz.

17.21 Environmental Requirements

- A. Equipment shall be rated and conform to site environmental conditions.
- B. Conform to NEMA PB 2 service conditions during and after installation of equipment.
- C. All equipment to be furnished under this contract shall be designed, constructed, and installed in accordance with the earthquake regulations of the California Code Title 24, Section 2312 and the Uniform Building Code (UBC).

17.22 Manufacturers

- A. Cutler-Hammer
- B. Square D.
- C. General Electric
- D. Substitutions: or approved equal.

17.23 Utility Meters

- A. Meters will be furnished by SCE.

17.24 Utility Meter Base

- A. Description: Meter base shall meet Utility company requirements. Base shall include test blocks and bypass switch per utility company standard. Meter jaws shall conform to utility company standard.

17.25 Utility Service Entrance Switchgear

- A. Locate meter section and main outdoors and provide for separate utility access.
- B. Main service switchboard shall be a freestanding, dead-front type low-voltage distribution switchboard utilizing group-mounted circuit protective devices as specified herein and as shown on the drawings. Switchboard shall require front access only.
- C. Provide switchboards installed outdoors with a NEMA 3R non-walk-in type enclosure. Provide 10-inch-minimum front access space between the exterior door and the front of the interior switchboard door. Provide thermostatically controlled space heaters in each section.
- D. Construct sections with a minimum thickness of 12-USSG formed sheet steel and of overall dimensions that will fit within the space limitation indicated in the drawings.
- E. Provide metering and current transformer space, pull sections, and fully removable front covers of the widths, depths, and heights required by the service utility and as necessitated by the physical requirements of the conduits and cables entering the sections.

- F. Switchboards shall comply with EUSERC, NEMA PB-2, and UL 891. Provide UL label on each switchboard section.

17.26 Bussing

- A. Provide switchboard with rectangular tin-plated copper busing. Busing shall be braced to withstand 65,000 amperes symmetrical fault current. Ground bus (minimum 1/4 by 2 inches) shall extend the entire length of the switchboard sections.
- B. Connections shall be tin plated. All hardware used on conductors shall be high-tensile strength and zinc-plated. Provide conical spring-type washers at each bolted bus joint.
- C. Provide heavy-duty pressure-type terminal lugs for connections of incoming and outgoing cables. Support cables and internal wiring with bolted cleats.

17.27 Main Circuit Breaker

Circuit breakers shall be molded-case type, fixed mounting, electrically operated with a solid-state trip device having an adjustable long time delay, adjustable short time delay, adjustable instantaneous trip, fixed, high-set instantaneous (15X), and a stored-energy close and trip mechanism. Provide integral ground fault protection with adjustable time delay and trip settings.. Provide quick-make and quick-break toggle mechanism, inverse time trip characteristics, and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings and number of poles as indicated in the drawings. Provide provisions for padlocking external disconnect handles in the OFF position.

17.28 Nameplates

Provide nameplates as specified in Section 16010. Provide a nameplate for each circuit breaker to indicate load served. The main nameplate shall give the switchboard designation in 1/2-inch-high letters. A second line in 1/4-inch-high letters shall indicate the voltage and phases.

17.29 Instruments

Ammeter and voltmeter shall be integral part of the phase monitoring relay described under "Main Disconnect."

17.30 Surge Suppressor

Provide lightning and surge suppressors as shown on the single line diagram. Suppressors shall be listed in accordance with UL-1449, Standard for Safety, Transient Voltage Surge Suppressors and shall comply with ANSI/IEEE C62.41 Category C3 environments. Suppressors shall be solid-state type and shall operate bi-directionally. Surge capacity shall be a minimum of 130,000 amperes/phase with a voltage suppression rating of 1,200 volts L-G for a 480-volt system. Provide an integral 30-ampere disconnect.

17.31 Seismic Requirements

The complete assembly including anchoring shall be capable of withstanding seismic forces per Section 16012. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in Title 24 and the UBC. Seismic qualification is achieved when the capability of the equipment, as described by the test response spectra, meets or exceeds the required response spectra as specified in Title 24 and the UBC, for all equipment natural frequencies up to 35 Hz.

17.32 Utility Meters

A. Meters will be furnished by Utility Company.

17.33 Utility Meter Base

A. Description: Meter base shall meet SCE requirements.

17.34 Examination

- A. Verify that surface is suitable for panel installation.
- B. Verify that service equipment is ready to be connected and energized.

17.35 Preparation

- A. Make arrangements with Utility Companies to obtain new permanent electric service.
- B. Coordinate location of Utility Companies facilities to ensure proper access is available.
- C. Obtain the SCE's approval of the Service Panel submittal prior to fabrication.

- D. Verify that location is suitable for installation with front, back, and side recommended clearances as required by the manufacturer and or Utility company.
- E. Verify that location indicated on plan meets manufacturer recommended ventilation requirements

17.36 Installation

- A. Install service entrance conduits from Utility Companies indicated point of connection to building service entrance equipment per Utility Companies drawings. Connect service lateral conductors to service entrance conductors.
- B. Install panels in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.
- C. Secure switchboard to floors or mounting pads with anchor bolts or Phillips Drill Company concrete anchors. Anchor bolts or concrete anchors shall be Type 304 stainless steel. Brace switchboard every 10 feet and within 3 feet of each end with 1/4-inch angle iron, P1000 Unistrut and fittings, or equal. The adjacent sections of the lineup shall also be bolted to each other per manufacturer's recommendations. The back of the switchboard shall be mounted as close as possible to building wall to prevent buildup of debris behind switchboard.
- D. Install in locations shown on Drawings, and in accordance with manufacturer's written instructions and NEMA PB 2.1.
- E. Tighten accessible bus connections fasteners after placing panels.
- F. Service panels exposed to view to the public shall have the boxes and trims factory painted. All panelboard covers shall bear a sign indicating "DANGER - HIGH VOLTAGE". Sign shall be as manufactured by Brady or equal.

17.37 Quality Control

- A. Field inspection and testing will be performed under provisions of the General Requirements.
- B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

- C. Check tightness of accessible bolted bus joints using calibrated torque wrench.

17.38 Field Tests

- A. Ground Fault Protective Equipment: The ground-fault protection system shall be performance tested after installation in accordance with NEC 230-95C. Submit a written record of the test to the District's Representative. Record current pickup level and time delay settings to which the equipment was finally adjusted. Measure and record relay pickup current and the relay time delay at two values above pickup. Test for correct system operation at 57% rated voltage. If relay pickup current is not within 10% of the manufacturer's calibration marks or fixed setting or relay timing does not conform with manufacturer's published time-current characteristic curves, repair or replace equipment and repeat test.
- B. Voltage:
 - 1. When the installation is essentially complete and the plant is in operation, check the voltage at the point of termination of the power company supply system to the project. Check voltage amplitude and balance between phases for loaded and unloaded conditions.
 - 2. If the unbalance (as defined by NEMA) exceeds 1%, or if the voltage varies throughout the day and from loaded to unloaded conditions more than $\pm 5\%$ of nominal, make a written request to the power company that the condition be corrected. If corrections are not made, request from a responsible power company official a written statement that the voltage variations and/or unbalance are within their normal standards.
- C. Operate each circuit breaker at least three times, demonstrating satisfactory operation each time.
- D. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- E. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 1000 volts; minimum acceptable value for insulation resistance is 2 mega ohm.
- F. Check tightness of accessible bolted bus joints using calibrated torque wrench.

17.39 Adjusting

- A. Adjust all operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections in accordance with manufacturer's instructions.
- C. Provide coordination study and settings required for circuit breakers to coordinate with motor control center breakers.

17.40 Cleaning

- A. Touch up scratched or marred surfaces to match original finish and paint.

1008-18 GROUNDING AND BONDING

18.1 Section Includes

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

18.2 References

- A. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- B. NFPA 70 - National Electrical Code.

18.3 Grounding System Description

- A. Metal frame of enclosure.
- B. Ground ring.
- C. Rod electrode.

18.4 Performance Requirements

- A. Grounding System Resistance: 25 ohms.

18.5 Submittals For Review

- A. Submit shop drawings in accordance with the General Requirements.
- B. Product Data: Provide for grounding electrodes and connections.
- C. Submit material list for all grounding materials and equipment. Indicate size, material, and manufacturer.

18.6 Submittals for Information

- A. Test Reports: Submit test results. Indicate overall resistance to ground and resistance of each electrode.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

18.7 Submittals for Closeout

- A. Project Record Documents: Record actual locations of components and grounding electrodes.
- B. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

18.8 Performance Requirements

- A. Grounding System Resistance:
 - 1. Transformer Grounding Electrode: 25 ohms.
 - 2. Separately Derived Sources Grounding Electrode: 10 ohms.
 - 3. Non-Current-Carrying Metal Parts: 25 ohms.
 - 4. Grounds Not Covered Above: 25 ohms.

18.9 Regulatory Requirements

- A. Conform to requirements of NFPA 70.

- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- 18.10 Rod Electrodes
 - A. Material: Copper-clad steel.
 - B. Diameter: 3/4 inch.
 - C. Length: 10 feet.
- 18.11 Mechanical Connectors
 - A. Material: Bronze with hardened steel points.
- 18.12 Exothermic Connections
 - A. Manufacturers: Cadweld or equal.
- 18.13 Wire
 - A. Material: Stranded copper.
 - B. Minimum size buried conductors: 2/0 AWG
 - C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements
- 18.14 Grounding Well Components
 - A. Well Pipe: 8 inch NPS (DN200) by 24 inch (600 mm) long concrete pipe with belled end.
 - B. Well Cover: Cast iron with legend "GROUND" embossed on cover.
 - C. Ground Clamps: Clamps for connection of ground wire to ground rod shall be bronze.
- 18.15 Examination
 - A. Verify that final backfill and compaction has been completed before driving rod electrodes.
- 18.16 Installation

- A. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Install ground rods in the presence of a District representative.
- B. Provide grounding well pipe with cover rod locations where indicated. Install well pipe top flush with finished grade.
- C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.
- D. Provide bonding to meet Regulatory Requirements.
- E. Bond together metal siding not attached to grounded structure; bond to ground.
- F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable, lug, bus, or bushing.

18.17 Ground Electrode

Encase a bare copper ground loop in the bottom of the concrete footing for electrical slab as shown in the drawings. Bring both ends of the loop to the ground bus within the main service switchboard. Buried or concealed joints or terminations are not permitted. Protect wires with a rigid steel conduit where wires stub up through slab at switchboard.

18.18 Equipment Grounding

- A. Connect the ground buses of lighting panels, distribution panels, and motor control centers to the ground bus within the main service switchboard with a grounding conductor.
- B. Ground raceways and non-current carrying parts of electrical equipment in accordance with NEC Article 250. Use the metallic conduit system for equipment and enclosure grounding. Grounding through the conduit system shall be in excess of any ground conductors shown in the drawings.
- C. Circuits in nonmetallic conduit shall carry one ground conductor for equipment grounding.

18.19 Ground Test Well

Provide a hand hole and ground rod as detailed in the drawings to aid in performing ground testing and connecting additional ground rods if required by the test results. Connect ground wire from ground rod to main service switchboard ground bus as detailed in the drawings.

18.20 Connections

Exothermic weld all underground connections.

18.21 Tests

Before making connections to the ground electrode, measure the resistance of the electrode to ground using a ground resistance tester specifically designed for ground resistance testing. Perform testing in accordance with test instrument manufacturer's recommendations using fall-of-potential method. Perform the test not less than two days after the most recent rainfall, and in the afternoon after any ground condensation (dew) has evaporated. If a resistance less than the performance requirements is not obtained, provide a ground rod driven 6 inches below grade spaced 10 feet away from the ground well and connect to ground test well with No. 4 AWG bare copper wire and repeat the test. If the performance requirements are still not obtained, inform the District for resolution.

1008-19 EQUIPMENT WIRING SYSTEMS

19.1 Section Includes

- A. Electrical connections to equipment specified under other sections.

19.2 References

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. ANSI/NPPA 70 - National Electrical Code.

19.3 Submittals

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

19.4 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

19.5 Coordination

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- D. Sequence electrical connections to coordinate with start-up schedule for equipment.

19.6 Cords and Caps

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- C. Cord Construction: ANSI/NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations
- D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit over current device.

19.7 Examination

- A. Verify that equipment is ready for electrical connection and energization.

19.8 Electrical Connections

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.
- E. Provide suitable 316 S.S. strain-relief fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices as indicated.

1008-20 SUPPORTING DEVICES

20.1 Section Includes

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

20.2 References

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

20.3 Submittals

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.

20.4 Regulatory Requirements

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Provide all supports in conformance with Uniform Building Code Seismic Zone 4 requirements. Contractor shall include with the submittal calculations demonstrating the seismic adequacy of the number, placement and size of all seismic restraints.

20.5 Product Requirements

- A. Materials and Finishes: Provide resistance to environment such as rain, wind, sunshine, etc. Materials and finishes shall be suitable to location where installed.
- B. Provide adequate corrosion Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use precast insert system, expansion anchors and preset inserts.
 - 2. Steel Structural Elements: Use beam clamps and fasteners. Crouse Hinds, Appleton or Oz Gedney.
 - 3. Concrete Surfaces: Use expansion type stud anchors. Hilti or approved equal.

20.6 Support Channel

- A. All hardware shall be 316 stainless steel. All channel shall be machine cut at precisely 90° and neatly filed. Corners shall be radiused. Strut in dry locations shall be galvanized. Strut used to support PVC coated conduit shall be FRP or stainless steel.

20.7 Installation

- A. Install products in accordance with manufacturer's instructions and recommendations.

- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment or conduit.
- D. Spring steel clips and clamps shall not be used.
- E. Powder-actuated anchors shall not be used.
- F. Structural members shall not be modified.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- I. Touch up cut ends on galvanized strut with galvanized paint.

1008-21 ELECTRICAL IDENTIFICATION

21.1 Section Includes

- A. Nameplates and labels.
- B. Wire and cable markers.

21.2 References

- A. ANSI/NFPA 70 - National Electrical Code.

21.3 Submittals

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.

21.4 Regulatory Requirements

- A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

21.5 Nameplates and Labels

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background. Seton Identifications Products or approved equal.
- B. Locations: Each electrical distribution and control equipment enclosure.
- C. Letter Size:
 - 1. Use 1/8 inch letters for identifying individual equipment and loads.
 - 2. Use 1/4- inch letters for identifying grouped equipment and loads.
- D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.. Use only for identification of individual wall switches and receptacles, and control device stations.

21.6 Wire Markers

- A. Description: Slip-on PVC sleeve type as manufactured by Brady or approved equal.
- B. Locations: each conductor at terminal boards and at each termination.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 - 2. Control Circuits: Control wire number indicated on shop drawings.

21.7 Preparation

- A. Degrease and clean surfaces to receive nameplates and labels.

21.8 Application

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment surface using 316 stainless steel machine screws. Sheet metal screws shall not be used.

- C. Wire numbers shall be precisely located on each conductor, 3/8" from end of insulation. Where solderless type terminals are used, the number shall be applied to the wire not the terminal insulator.

1008-22 ENCLOSED SWITCHES

22.1 Section Includes

- A. Fusible switches.
- B. Non-fusible switches.
- C. Fuses.

22.2 References

- A. NEMA KS 1 - Enclosed Switches.
- B. NFPA 70 - National Electrical Code.
- C. UL 198C – High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E - Class R Fuses.

22.3 Quality Assurance

- A. Perform Work in accordance with NECA Standard of Installation.

22.4 Regulatory Requirements

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

22.5 Extra Materials

- A. Provide three of each size and type fuse installed.
- B. Fuses shall be packaged by size and type.
- C. Provide an itemized listing of locations of fuses showing size and type.

22.6 Materials

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to

prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.

- B. Non-fusible Switch Assemblies: NEMA KS 1, Type LD or HD load interrupter enclosed knife switch. Provide non-fusible disconnect switches with ampere rating and number of poles as indicated in the drawings. Switches for use on circuits 240 volts and below shall be NEMA general duty Type LD. Switches for use on 480-volt circuits shall be NEMA heavy-duty Type HD. Unless indicated otherwise, provide switches indoors in NEMA Type 1 enclosures and outdoors, or where indicated to be weatherproof, in NEMA Type 3R rain-tight enclosures. Mechanisms shall have quick-make and quick-break operating handles and provisions for padlocking in the "OFF" position. The switch shall have an interlock to prevent unauthorized opening of the hinged cover when the switch is in the "ON" position and an interlock to prevent closing the switch mechanism with the hinged cover open. On the front of the enclosure, attach a nameplate that identifies the load per Section 16195.
- C. Enclosures: NEMA KS 1, Type 4X.

22.7 Manufacturers

- A. Square D.
- B. General Electric.
- C. Cutler Hammer

22.8 Fuses

- A. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1. Size to suit load served.
- B. Interrupting Rating: 200,000 rms amperes.

22.9 Installation

- A. Install disconnects and switches where indicated on the drawings.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

- D. Paint exterior

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MOTOR CONTROL CENTERS

23.1 References

- A. NFPA 70 – National Electrical Code.
- B. NEMA AB 1 – Molded Case Circuit Breakers.
- C. NEMA ICS 2 – Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers.

23.2 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Shop Drawings: Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time/current curves of all equipment and components.
- C. Submit manufacturer's descriptive and technical literature.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- E. Test Reports: Indicate field test and inspection procedures and test results.
- F. Complete pump control system hydraulic, pneumatic, and electrical diagrams with functional description and catalog brochures shall be submitted to the Engineer for approval prior to fabrication. The submittal for the electrical controls shall include a layout dimension and weights; schematic diagram; a wiring diagram; an interconnection diagram; a narrative that explains the sequence of operation of the RTU, each relay, coil, solenoid, contact, and other control devices; and a list of material that includes all control circuit subassemblies, parts, components, and devices and their manufacturer's part number. Schematic, wiring, and interconnection diagrams shall be in AutoCAD.

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- G. Terminal numbers shall be shown for all items in the motor control sections, all items in the control section, on all interconnection wiring, and on the interconnection diagrams. Wiring from these numbered terminals must be shown to all control section and remote devices with the connections on both ends clearly indicated on the schematic, wiring, and interconnection diagrams. Terminals on the remote devices shall be numbered and identified so that continuity may be checked by the District and later verified in the field.
- H. Motor control center heat load calculations. Include cooling fans in calculations.

23.3 Certification

- A. Written certification, in a form approved by the District, shall be provided by the equipment manufacturer or his authorized representative. This certification shall verify:
 - 1. That the equipment and its installation has been inspected on the job by the manufacturer and that the equipment is in first-class condition throughout, has been installed in accordance with manufacturer's requirements and recommendations, and that the installation is approved by the manufacturer.
 - 2. That the equipment is operating in a safe and satisfactory manner and is delivering capacities and performance not less than the capacities and performance specified and/or indicated on the drawings.

23.4 Ratings

Motor horsepower ratings and enclosures shown are minimum expected. This does not limit the equipment size. When motors furnished differ from the minimum ratings indicated, make the necessary adjustments to wiring, conduit, disconnect devices, motor starters, branch circuit protection, and other affected material or equipment to accommodate the motors actually installed, at no additional cost to the District.

23.5 Extra Materials

- A. Provide the following spare parts delivered to the District in the manufacturer's original containers labeled to describe the contents and the equipment for which it is furnished:

1. Control Fuses: Five of each type provided.
2. Contactor: One of each size provided.
3. Control Relay: Five of each type provided.
4. Time Delay Relay: Five of each type provided.
5. Intrinsically Safe Relay: One.
6. Lamps: Twenty of each type provided.
7. Moisture Detection Control Unit: One.
8. Motor Saver: One.

23.6 Quality Assurance

- A. Perform Work in accordance with NEMA ICS 2.3.

23.7 Regulatory Requirements

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

23.8 Delivery, Storage, and Handling

- A. Deliver, store, protect and handle products to site under provisions of General Provisions.
- B. Deliver in individually wrapped sections, for protection with shipping splits, and mounted on shipping skids.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water and construction debris.
- D. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

23.9 Environmental Requirements

- A. Conform to NEMA ICS 2 service conditions during and after installation of motor control centers.

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- B. Cover Mounted Pilot Devices: oil tight type. NEMA ICS 2, heavy duty
- C. Pilot Device Contacts: NEMA ICS 2, Form C, rated A150.
- D. Pushbuttons: Recessed type.
- E. Indicating Lights: Transformer, push to test incandescent type.
- F. Selector Switches: Extended lever rotary type.
- G. Relays: NEMA ICS 2.
- H. Control Power Transformers: 120 volt secondary, sized as required in each motor starter. Provide fused primary and secondary, and bond un-fused leg of secondary to enclosure.
- I. Hour Meters: 120 volt non re-settable type with 1/4" high characters minimum.
- J. Phase Voltage Relay: Provide Motor Saver or phase voltage relay for each motor.
- K. Wire Identification: Provide slip on PVC sleeve type as manufactured by Brady or approved equal. Labels shall correspond to shop drawings.

23.10 General

- A. Motor Control Centers: modified. NEMA ICS 2, Class II, Type B
- B. Main Over-current Protection: As shown on the drawings.
- C. Voltage Rating: Hertz. 277/480 volts, three phase, three wire, 60Hz
- D. Horizontal Bus: Tin plated copper, with a continuous current rating of 1000 amperes minimum. Include 1/4" x 1" tin plated copper ground bus entire length of control center.
- E. Vertical Bus: Tin plated copper, with a continuous current rating of 200 amperes. Provide vertical ground bus for unit ground stub.
- F. Integrated Equipment Short Circuit Rating: 65,000 amperes rms symmetrical at 480 volts.
- G. Configuration: Units shall be front mounting only, accessible from the front only.
- H. Enclosure: NEMA ICS 6, Type 3R, Outdoor. Section lineup and configuration shall be as indicated on the drawings.

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- I. Finish: Manufacturer's standard grey.

23.11 Motor Control Center Construction and Assembly

- A. Motor control centers shall be dead front, dead rear, floor standing, and front accessible NEMA 3R gasketed construction enclosure with locking provisions. Provide 10-inch minimum front access space between the exterior door and the front of the motor control center. The NEMA 3R enclosure shall be provided with fluorescent light fixtures and a thermostatically controlled space heaters and ventilation fans for each vertical motor control section. The voltage and ampere rating and physical dimensions shall be as indicated in the drawings. Wiring shall be NEMA Class 3R, Type B, with wiring schematics showing field devices and connections. Tag control wiring within 2 inches of termination at each device and terminal board. Schematics shall also show terminal numbers and interior and field wire numbers.
- B. Provide channel iron sills and removable lifting angles.
- C. Provide a separate vertical wiring compartment for each motor control center section. Provide cable supports and a hinged door separate from the unit starters.
- D. Provide individual compartments separated by steel barriers and with separate hinged doors for each starter, circuit breaker, or other unit. Locate equipment to enable termination of field wiring from front without equipment removal.
- E. Mechanically interlock starter and circuit breaker doors so doors cannot be opened with unit energized. Provide defeater mechanism to allow intentional access while starter or circuit breaker is energized. Make provisions for padlocking external disconnect handles in the OFF position.
- F. Bus bars shall be tin-plated copper and braced to withstand the rms symmetrical short-circuit current ratings of 42,000 amperes. Provide full horizontal bus rating for entire length of the motor control center. Do not taper the bus.
- G. Buses within starter, feeder, and spare cubicles shall be factory insulated.
- H. Provide a continuous, front accessible 400-ampere-minimum ground bus extended the full length of the motor control center.

- I. Feeder circuit breakers shall be molded-case type. Provide quick-make and quick-break toggle mechanism, inverse-time trip characteristics, and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings and number of poles as indicated in the drawings. Provide breakers with fault current interrupting ratings equal to or greater than the motor control center short-circuit current rating shown in the drawings. All circuit breakers shall be capable of being locked in the "off" (open) position and come equipped with auxiliary contacts.
- J. All control wiring from remote devices shall terminate on a labeled terminal strip.
- K. Combination starters shall be as described in "Combination Magnetic Motor Starters" in this section.
- L. Each compartment shall have nameplates as specified in Section 16010.
- M. Motor control centers shall comply with applicable NEMA, UL, and ANSI standards for industrial control.
- N. The complete assembly, including anchors, shall be capable of withstanding seismic forces per Section 16012.
- O. No components or terminals shall be mounted on sides of cubicles or in pull sections. Only mounting on back panels is acceptable. All devices shall be mounted without obstructions to be readily accessible. Any wiring between shipping splits shall be continuous. No splices, plugs, or intermediate terminations shall be allowed.
- P. Starter cubicles shall have 12-inch vertical space in addition to the manufacturer's recommended standard space.

23.12 Combination Magnetic Motor Starters

- A. Comply with NEMA ICS, Class A, and with NEC Article 430.
- B. Combination motor starters shall be circuit-breaker type equipped with adjustable magnetic-trip circuit breakers (motor circuit protectors) as noted in the drawings. The short-circuit rating shall be at least 26,000 amperes symmetrical.

- C. Solid-state controller shall be as described in the subsection on "Solid-State Controller."
- D. Provide 120-volt control circuit transformer where indicated. Provide 100-volt-ampere spare capacity that is in addition to contactor load plus other loads specified. Fuse one side of secondary winding and ground other side. Provide primary winding fuses where shown in drawings. Transformer shall be NEMA ST1, machine tool grade with isolated secondary winding.
- E. The manufacturer shall verify the motor ratings and coordinate the starter overloads with the actual horsepower ratings of the motors installed.
- F. Provide externally operable overload relay reset buttons and disconnect operators.
- G. Starters shall have nameplates

23.13 Solid-State Controllers (Soft Starter)

- A. The solid-state controller shall be a 6-SCR device fully rated for continuous operation for 50°C ambient. The control section shall be digital microprocessor based.
- B. The controller shall comply with the following requirements:
 - 1. Dielectric withstand per UL-508.
 - 2. Noise and RF immunity per NEMA ICS-2-230 and IEEE STD 472.
- C. Buses shall be factory insulated as specified in paragraph 2.01.
- D. Provide the following functions:
 - 1. Soft Start with Selectable Kickstart.
 - 2. Current Limit.
 - 3. Soft Stop.
- E. The acceleration ramp time shall be selectable from 2 to 30 seconds.

- F. The initial torque shall be adjustable from 5% to 90% of locked rotor torque.
- G. Kickstart function shall provide an adjustable time pulse of current prior to the normal start mode. The current shall be held at 500% plus or minus of full load for an adjustable time. This feature shall be field defeatable.
- H. Provide the following protection during "starting" and "running" modes. When these conditions are detected, starting of the controller shall be inhibited or the controller shall be shut down if it is operating:
 - 1. Start Fault (faulty SCR firing).
 - 2. Line Fault (phase loss, open motor lead, shorted SCR).
 - 3. Temperature Fault (SCR rated temperature exceeded).
 - 4. Stalled Motor.
- I. Provide LED indicators for advisory status and fault annunciation. The LEDs shall be color coded for distinct annunciation and shall consist of:
 - 1. Control Voltage Present (green).
 - 2. Starting (amber).
 - 3. Running (green).
 - 4. Stopping (amber).
 - 5. Fault (red).
 - 6. Start Fault (amber).
 - 7. Stalled Motor (amber).
 - 8. Temperature Fault (amber).
 - 9. Line Fault (red).
- J. In lieu of the LED indicators, a built-in alphanumeric backlit LCD display may be provided.

- K. Provide a latch circuit for three-wire control. It shall also be possible to wire it for two-wire control.
- L. Include two Form C auxiliary contacts for customer use. The contacts shall change state instantaneously on a start command and when the logic completes the ramp-down feature. It shall be possible to reconfigure the system via a switch such that the contacts change state when the controller has determined that the motor is "up-to-speed" and when the motor starts to decelerate.
- M. Provide a Form C auxiliary dry contact for common fault signal.
- N. Soft Stop: The deceleration ramp time shall be selectable with settings from 2 to 60 seconds. This feature shall be field defeatable.
- O. Equip the controller with integral heatsink assemblies.
- P. Provide grounding provisions for the controller mounting flange.
- Q. Incorporate integral fan(s) for forced air ventilation.
- R. Provide metal oxide varistors for transient protection.
- S. Equip controller with lugs to accept the wire sizes indicated in the drawings.
- T. The controller shall be capable of:
 - 1. 600% current rating, 10 seconds
 - 2. 450% current rating, 30 seconds
- U. The controller shall operate properly within the outdoor motor control center and at the temperature, humidity, and altitude of the project. Provide oversized starter and/or cabinet supply fans and vents to comply with this requirement.
- V. Provide 3-phase motor thermal overload relay protection for both normal and bypass configurations.
- W. Provide a phase rebalance feature which would regulate the individual phase output voltages from the controller to maintain equal 3-phase current to the motor.
- X. Equipment to be consistent with District's existing equipment and

spare parts. No substitutions will be acceptable.

Y. Provide Allen-Bradley SMC-Plus or equal.

23.14 Variable Frequency Drive (VFD)

- A. Provide solid state AC adjustable frequency controllers to provide stepless variable speed over a 30% to 100% of motor base 60 hertz.
- B. Speed regulation with 100 percent load change shall be within 3 percent of maximum speed.
- C. Power factor of motor and controller combined shall be a minimum of 0.90 lagging over entire speed and load range.
- D. Designed to operate on 480 volt AC, 3 phase, 60 Hertz.
- E. Control Signal: 4-20 ma with an option to be controlled from Telemetry (in automatic mode).
- F. Input Protection:
 - 1. Phase sequence protection.
 - 2. Protection during single phasing or loss of input.
 - 3. Undervoltage trip provides shutdown in event of power drop or interruption. Automatic reset. (Auto restart in ON position).
 - 4. Input fusing, fast acting, current limiting.
 - 5. Current limit, adjustable 100 percent - 50 percent of rated motor current.
 - 6. Transient suppression protects IGBT's from line notching and spikes.
 - 7. Input current shall not exceed 150 percent of motor full load current at start up.

G. Nominal Output Power:

1. The Variable Frequency Drive shall be rated for the HP, full load amperes and rpm of the motors. The inverters shall be microprocessor-based static variable frequency controller designed to provide continuous speed adjustment of three-phase motors. In the event of motor and pump critical speeds the drive control shall have the capability of being programmed to quickly "drive through" or avoiding prolonged operation at the critical speed. The adjustable frequency output voltage shall provide constant volts-per- Hertz excitation to the motor terminals up to 60 Hertz. The AC current output when connected to its motor shall have a maximum harmonic content of 8% of base frequency.
2. The Adjustable Frequency Drive shall be capable of sustaining a 130% torque overload for one minute period in order to allow for breakaway torque.

H. The Variable Frequency Drive (VFD) shall be of modular construction and be Pulse Width Modulated (PWM) design and provide the following basic capabilities.

1. Designed in protection against overloads, output short circuits, ground faults and ac line disturbances. Any kind of fault in the driven motor or motor circuit conductors shall not cause damage to the drive control.
2. Diagnostic/troubleshooting capability.
3. The minimum VFD efficiency shall be 94% at 100% speed and 86% at 60% speed.
4. The inverter shall be rated for an ambient temperature of 0 degrees C to 50 degrees C, and altitude of up to 3,300 feet above sea level and humidity of 0 to 95% non-condensing. All components shall have an anti-corrosion coating.
5. 20-60 Hertz continuous operating range with standard motor. Harmonic content - 8 percent of fundamental maximum.
6. Six (6) pulse, non sine wave output.

I. Output Power Control and Protection:

1. Instantaneous Overvoltage Trip:
2. VFD must be capable of withstanding ground faults and short circuit faults on the motor load side without damage to the VFD.

3. Instantaneous static over-current trip.
4. Fault sensing and trip circuit with manual reset.
5. Over-speed trip.
6. Module over-temperature trip.

J. Control Features:

1. Provide Hand-Auto selector switch and speed adjust potentiometer for remote mounting on pump control. Provide "Power On" indicating light on front of VFD and terminations for remote control devices. Provide an enable circuit to energize VFD from starter.
2. Provide elapsed time meters on VFD control or starter.
3. Provide 115V AC control power for operator devices.
4. Provide unidirectional operation, coast to rest upon stop.
5. Provide linear independent timed acceleration and deceleration, adjustable.
6. Provide adjustable full time torque limit throughout the operating range.
7. Provide 20 to 60 Hertz constant torque operation.
8. Provide adjustment potentiometers as follows:
 - a. Minimum speed - 20 to 40 Hertz - set at 40 Hertz.
 - b. Maximum speed - 40 to 60 Hertz - set at 60 Hertz.
 - c. Torque limit - 50 - 100%.
 - d. Acceleration rate - 1 to 30 Hertz per second - set at 10 Hertz per second.
 - e. Deceleration rate - 1 to 30 Hertz per second - set at 10 Hertz per second.
 - f. Low frequency boost - 0 to 10 percent - set at 2 percent.
 - g. Volts per Hertz - Adjustable from 3.83 to 11.5 volts per Hertz.
 - h. Stability adjustment.
9. Provide the following features:
 - a. Electrical isolation between the power and logic circuit, as well as between the 115 V AC control power and the static digital sequencing.
 - b. Door mounted operator interface diagnostic display of over-frequency, instantaneous overcurrent, DC overvoltage, AC undervoltage/loss-of- phase, emergency stop, overload, overtemperature, inverter trip.
 - c. Process instrument follower control for a 4-20 mA DC control signal.

- K. Cabinets: NEMA 3R pad mounted enclosure. VFD enclosure shall be furnished with external A/C unit rated at or above drive specific generated heat load.
- L. Provide one (1) set of manufacturer's recommended spare parts for VFD. At a minimum include following spare parts:
 - 1. 1 set input rectifying components.
 - 2. 1 set of fuses.
 - 3. 1 set of circuit cards.
 - 4. 1 set of output devices.
- M. Acceptable manufacturer:
 - 1. Allen Bradley Power Flex 70 series model #20AC8P0A3AYNAEGN, 6 pulse, non sine wave," or current model. No other manufacturers will be accepted.

This above listing does not in any way reduce the responsibility of the manufacturer to provide the data required above in the submittal paragraph.

23.15 Harmonic Filters Line Reactors:

- A. Harmonic filters shall be provided as required to attenuate system harmonics to below IEE519 distortion limits. Unless otherwise specified in the specific project VFD requirements herein or shown on the drawings. Harmonic filters shall be passive or active type as determined by the manufacturer's harmonic distortion study. Active filters shall constantly monitor on the line and inject equal and opposite harmonics as necessary.
 - 1. Passive Filters
 - 2. Passive filters, if selected, shall be provided for each VFD unit. Passive (trap) filters shall contain tuned circuits designed to remove harmonics generated within the power distribution system while improving the system power factor. Passive filters shall consist of inductive and capacitive elements arranged in a series configuration and tuned to resonate just below the harmonic frequency for which they are designed to filter. Passive filters shall be manufactured by Allen Bradley, or pre-approved equal.

3. Enclosure shall be rated for outdoor installation.

- B. All filters shall be protected and fed by a three phase protection circuit. High frequency current transformers shall be provided for the Active filter to monitor bus current. These transformers shall be installed as required per manufacturer's specifications. The active filter manufacturer shall determine the proper sizing of the CT ratio for functioning with the active filter.

23.16 Relays and Miscellaneous Control Devices

- A. Relays, control switches, push buttons, indicator lights, etc., shall be installed in a separate controls compartment as detailed on the drawings, unless specifically shown to be mounted in the starter compartment. The compartment door shall have full height piano hinge. Provide separate terminal boards and physical separation for controls associated with each pump. Provide red nameplate within section "Foreign power—breakers to all pump starters and instrumentation section must be off to remove all power."
- B. Provide separate terminal blocks for current transformers. Label "Current transformers—de-energize prior to disconnecting."
- C. Provide relays with the number of contacts shown on the schematic diagrams. Utilize additional contact blocks or relays to satisfy the required number of contacts shown at no additional cost to the District.
- D. Control relays mounted within starter compartments shall be magnetically held and shall have convertible contacts. Control relays shall be UL listed with NEMA A300 rated contacts and coil voltage, number of poles, and pole arrangement as indicated in the drawings. Relays shall be Allen-Bradley Bulletin 700 Type P, Cutler-Hammer Type Westinghouse Type AR, Square D Type H, or equal.
- E. Control relays mounted within the controls compartment shall be plug-in type with tube base and socket. Relays shall be UL component recognized with 10-ampere, NEMA B300 rated contacts and coil voltage, number of poles and pole arrangement as indicated in the drawings. Equip with pilot light. All relays that fit the same bases shall be interchangeable. Provide Allen-Bradley Bulletin 700 Type HA, Square D Type KP, Cutler-Hammer Type Westinghouse Type MR, Idec RH series, or equal.
- F. Time-delay relays shall be UL listed with contacts rated 10-ampere non-inductive load, 120 volts, with coil voltage, number of poles, pole

arrangement, and maximum timing adjustment as indicated in the drawings. Relays shall be plug-in, solid-state type with timing knob adjustment. All relays that fit the same bases shall be interchangeable. Provide Potter Brumfield, Syracuse Electronics, ISSC, or equal.

- G. Time-delay relays with contacts indicated as instantaneous close time open (ICTO) or instantaneous open time close (IOTC) shall be solid-state digital timer with a self-contained adjustment potentiometer. Output contact shall be 5 amperes minimum. Relay shall be Allen-Bradley Bulletin 852S or equal.
- H. Control switches shall be 30-mm round, oil-tight type, complete with legend plates and quantity of contact blocks required for the control function.
- I. Indicating lights shall be oil-tight type, complete with color of lens indicated in drawings and legend plate. Provide 22-mm LED lamps operating on 120-volt a-c.
- J. Elapsed time meters shall be synchronous motor driven, 0- to 99,999.9-hour range, non-reset type, suitable for semi-flush, panel mounting. Provide General Electric Model KT-8 or equal.
- K. Motor Saver:
 - 1. Motor Saver shall be a fully programmable electronic overload relay designed to monitor 3-phase systems. It shall have a communication port with the capability of forming a network and monitoring the motors from a laptop or desktop computer.
 - 2. The Motor Saver shall include three built-in current transformers with the ability to handle applications from 2-150 FLA. External current transformers shall be capable of handling applications up to 150 FLA. The Motor Saver shall be able to view the following 16 parameters from three-digit alphanumeric LED or from a network computer: low voltage set point, high voltage set point, voltage unbalance set point, CT size/loops setting, over-current trip point, undercurrent trip point, current unbalance trip point, trip classes, rapid cycle timer, overload restart delay, under-load restart delay, number of starts after an overload, unbalance, single phase (manual or automatic), RS485 address, number of restarts after an under-load fault, under-load trip delay, and ground fault trip point. Individual line voltages and current levels, as well as average voltage and average current, shall be viewed while the motor is running.

3. The Motor Saver shall be equipped with an RS485 port allowing multiple Motor Savers to be linked together. From the computer, an operator shall be able to control the motor, view the operating parameters, view the last faults by time and date, or log information. Software and RS485 to RS232 converter modules shall be provided. If no PC is available provide flush mounted remote display.
4. Furnish a Motor Saver model #777 or approved equal.

23.17 Handle

- A. An industrial, heavy duty, flange mounted handle mechanism shall be supplied for the control of each disconnect switch or circuit breaker. This mechanism shall be engaged with the disconnect device at all times as an integral part of the unit regardless of door position. The handle shall be lockable in the OFF position.

23.18 Disconnecting Means

- A. Circuit breakers shall be available in combination starter units and circuit breakers in feeder units. Breakers shall be thermal magnetic type with the interrupting ratings indicated.

23.19 Overload Relays

- A. Starter overload relay shall be electronic thermal overload, manually reset with the option to convert to automatic reset in the field, and phase reversal, high and low volts
- B. Overload relay shall have two auxiliary contacts. An extra normally closed contact shall be provided to interface with a remote main control panel, or SCADA, and an extra N.O. contact for run/fail.

23.20 Examination

- A. Verify that motor control center is ready to be connected and energized.

23.21 Preparation

- A. Make sure MCC is same configuration as approved shop drawings.

- B. Set metal rails in housekeeping pad to match configuration of MCC. All sides of MCC shall be 3 foot clear of all concrete masonry wall, piping, or any other structures.

23.22 Installation

- A. Installation of all MCC equipment specified herein shall be in accordance with all applicable codes, standards, and practices.
- B. Installation of all MCC equipment specified herein shall be in accordance with the recommendations of the manufacturer.
- C. Install starters and controllers in the motor control center. Show motor control center mounted against building wall or 24 inches from block wall where located outdoors.
- D. Secure motor control centers to floors or mounting pads with anchor bolts or Phillips Drill Company concrete anchors. Anchor bolts or concrete anchors shall be Type 304 stainless steel. Brace motor control center every 10 feet and within 3 feet of each end with 1/4-inch angle iron, P1000 Unistrut and fittings, or equal. The adjacent sections of the lineup shall also be bolted to each other per manufacturer's recommendations. The back of the motor control center shall be mounted as close as possible to building wall to prevent buildup of debris behind the motor control center.

23.23 Tests

- A. Test the operation of each interlock to verify that the interlock performs its function.
- B. Operate each breaker and verify that all phases of each load are disconnected.
- C. Set adjustable trip circuit breakers two settings above the setting that causes the breaker to trip during motor starting. Do not adjust the setting above 1,300% of the motor nameplate current rating.

23.24 Inspection

Inspect each instrument and piece of equipment for damage, defects, completeness and correct operation before installing. Inspect previously installed related work and verify that it is ready for installation of instruments and equipment.

23.25 Preparation

Ensure that installation areas are clean and that concrete or masonry operations are completed prior to installing instruments and equipment. Maintain the installation areas in a broom-clean condition during operations.

23.26 Installation

- A. Mount electrical equipment and instruments on backpanel in accordance with suppliers recommendation.
- B. All devices shall be accessible to District for servicing, operating, reading, etc.
- C. All flexible sensor cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance. All connectors shall be, as a minimum, water tight.
- D. All wire and cable shall be connected from terminal to terminal without splices. Installed wire and cable shall be arranged in a neat manner and securely supported in cable groups. All wiring shall be protected from sharp edges and corners.

23.27 System Validation

- A. Provide the services of factory trained and field experienced control system engineer(s) to validate each system is operational and performing its intended function. During system validation, make provisional settings on level, alarms, etc.
- B. Cause malfunctions to sound alarms or switch to standby to check system operation. Check all systems thoroughly for correct operation. Test equipment for this function shall be specified under "Instrument Calibration".
- C. Immediately correct all defects and malfunctions disclosed by tests. Use new parts and materials as required and approved and retest. Provide a report certifying completion of system validation. This report shall indicate that the system meets the complete intent of these specifications.

23.28 Automatic Transfer Switch

- A. Transfer switch shall be open type and installed in a vertical section of the motor control center as shown in the drawings. Transfer switch shall have the number of poles, amperage, and voltage ratings as shown in the drawings. Withstand current rating shall not be less than 42,000-ampere rms symmetrical.
- B. Transfer switch shall be listed per UL 1008 as a recognized component for emergency systems and rated for all classes of loads.
- C. Transfer switch shall be electrically operated and mechanically held in each direction by an operating mechanism momentarily energized from the source to which the load shall be transferred. Accomplish mechanical locking in each direction without the aid of latching solenoids, toggle mechanisms, or gear arrangements. Total operating transfer time shall not exceed one-sixth of a second.
- D. Transfer Switch shall be equipped with signal contacts to identify switch position, power availability from both sources, and a pre-transfer signal to allow for normal shutdown of pumping equipment before automatic transfer back to utility source occurs.
- E. Electrical spacing must not be less than those listed in Table 15.1 of UL 1008. Provide a handle to permit no-load manual operation.

23.29 Automatic Transfer Switch Accessories

- A. Provide a solid-state sensing and control logic panel. Include the following operational characteristics:
 - 1. Adjustable (.5 to 6.0 seconds) time delay on engine starting to override momentary dips in normal source, set at 1 second.
 - 2. Full phase voltage relay supervision of the normal source with at least one close differential relay to detect "brownout" condition, set at 70% dropout and 90% pickup.
 - 3. Voltage/frequency lockout relay to prevent premature transfer, set at 90% voltage and 90% frequency.
 - 4. Engine starting control contacts (one normally open and one normally closed).
 - 5. Adjustable (2 to 25 minutes) time delay on retransfer to normal, set at 20 minutes.

6. Unloaded running time delay for generator cool down (adjustable .1 to 10 minutes), set at 5 minutes.
 7. Transfer to emergency time delay (adjustable 1 to 300 seconds), set at 1 second.
 8. Adjustable time delay for load disconnecting - Pre-Transfer (adjustable 1 to 300 seconds).
- B. Provide a maintained system test switch on the front of the enclosure that simulates loss of normal power source.
- C. Manual push button to bypass the time delay on re-transfer.
- D. Pilot lights to indicate source to which the load is connected.
- E. Pilot light to indicate presence of normal power source.
- F. Auxiliary contacts for remote indication of switch position, two normally open and two normally closed contacts for normal and emergency position.
- G. An in-phase monitor shall control transfer/re-transfer operation between live sources when the sources are approaching and are sufficiently close to a zero-phase angle difference so as to avoid excessive motor inrush currents. The monitor shall cause in-phase transfer/retransfer to take place over engine/generator frequency ranges of 58 to 62 Hz with a utility source of 60 Hz. Normal transfer/retransfer operation shall automatically occur, without the use of manual overrides, in the event of a complete failure of the load-carrying source.
- H. Transfer switch shall include two 10 amperes at 120-volt a-c that open 3 to 300 seconds (nominal) prior to transfer and re-close three seconds (nominal) after transfer. These contacts shall de-energize motor loads during the pre-transfer time of the switch and shall send indication to PLC.
- I. Provide remote control circuit that will transfer the switch to emergency position by closing a remote contact and retransfer to normal by opening the contact from the RTU.
- J. Provide local "hand-off-auto" switch to allow transfer switch's run signal sent to generator to be selectable. Hand mode shall be circuited to so that generator is set in stand-by. Auto mode will allow remote starting

of generator when only when utility source is not available. Off mode will not allow transfer switch to start generator. Switch shall have name plate identifying "stand-by", "off", and "remote"

- K. Provide a "Pre-Transfer" relay that shall have an adjustable time delay of 0 to 300 seconds. Pre-Transfer relay shall be equipped with 10 amp 120 volt AC contacts. Contact shall be normally closed and set to open before at 30 seconds before automatic transfer switch transfers from emergency generator side of switch back to utility side of switch. After transfer switch transfers back to utility power side of switch, a 5 second delay shall occur before the Pre-Transfer relay shall resets and contact change states back to normally closed position.

23.30 Automatic Transfer Switch – Manufacturers

The transfer switch shall be manufactured by Automatic Switch Company (7000 Series), Russelectric (RMT), Zenith (ZTS), or Cutler-Hammer (ATC) to be consistent with District's existing equipment and spare parts.

23.31 Automatic Transfer Switch – Testing

- A. Field inspection and testing will be performed under provisions of the General Requirements..
- B. Field test and calibrate timing and monitoring logic. All adjustments shall be within 5% of the previously specified set points.
- C. Field test and calibrate the in-phase monitor. Demonstrate that the switch transfers when source phase differences are within 20 degrees under varying generator speeds.
- D. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- E. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 600 volts; minimum acceptable value for insulation resistance is 2 mega ohm.
- F. Check tightness of accessible bolted bus terminals using calibrated torque wrench.

23.32 Automatic Transfer Switch – Adjusting

- A. Adjust all operating mechanisms for free mechanical movement.

- B. Tighten bolted bus connections in accordance with manufacturer's instructions.

1008-24 LIGHTING

24.1 Description

This section includes materials and installation of lighting fixtures.

24.2 Related Work Specified Elsewhere

Section 1008-1 – General

24.3 Submittals

- A. Submit shop drawings in accordance with the General Requirements.
- B. Submit manufacturer's catalog data including complete catalog number, photometric data, and descriptive literature.
- C. Submit pole dimensions, anchor bolt details, wind loading data, materials, and finish.

24.4 General

- A. Furnish lighting fixtures of the type indicated in the drawings, complete with lamps, sockets, wiring, and mounting hardware.

24.5 Lamps

- A. Fluorescent: 32-watt - F032, T-8, 4,100K, 75 CRI, 2,850 lumen minimum output lamps.
- B. Incandescent: Rough service type, 125 volts, of the type and wattage shown in the drawings.
- C. High-Pressure Sodium: Suitable for burning position as required for the light fixture, conforming to ANSI C78.388.
- D. Manufacturers: General Electric, Sylvania, Westinghouse, or equal.

24.6 Ballasts

- A. Fluorescent: Electronic Ballasts—Provide solid-state electronic ballasts compatible with the lamps provided. Provide ballasts with 97% minimum power factor, less than 20% THD, less than 1.7 current crest factor, Class A sound rating, IEEE 587A (ANSI C62.41) transient protection, FCC Part 18C, Class A EMI filtering, and UL listed.
- B. High-Pressure Sodium: Provide indoor-outdoor type ballasts. Ballasts shall be single lamp, volts and watts as indicated. At any lamp voltage, from nominal through life, lamp wattage regulation spread at that lamp voltage shall not exceed 5% for $\pm 10\%$ line voltage variation. Ballasts shall have a minimum power factor of 90%.
- C. Manufacturers: Advance, General Electric, Jefferson, Universal, or equal.

24.7 Steel Poles

Select square pole and hinge feature below if District desires a hinge-type pole. Make sure fixture/pole schedule on drawings shows hinged pole also.

- A. Pole shaft shall consist of square steel possessing a minimum yield strength of 46,000 psi per ASTM A 500, Grade B.
- B. Design poles, including handholes and luminaires, for a minimum yield safety factor of 1.5 when subjected to a sustained wind velocity of 100 mph and wind gusts of 130 mph. In addition, limit the deflection to 5% of pole length under these conditions.
- C. Equip with handhole of sufficient size to permit the pulling and splicing of wires and grounding of the pole. Equip handhole with a cover.

24.8 Installation

- A. Install lighting fixtures as close as possible to the locations shown in the drawings, making adjustments only for the purpose of avoiding interferences.
- B. Install lighting fixtures plumb and level, with fixture surfaces parallel and perpendicular to walls and other major structures.
- C. Install continuous rows of fixtures straight and true and equip with joining straps, couplings, and nipples as recommended by the manufacturer.

- D. Remove ballasts which are judged by the District's Representative to be excessively noisy and replace at no cost to the District.
- E. Provide pendant stem-mounted fixtures with swivel hangers. Stem shall be one piece without coupling and shall be finished the same color as the canopy and the fixture, unless otherwise noted.

1008-25

MEASUREMENT AND PAYMENT

Payment for all electrical work, equipment, panels, conductors, conduit, boxes and all other appurtenances necessary to complete the installation shall be included in the lump sum price bid for Bid Item No. 8.

Such payments shall include full compensation for all labor, materials, tools and equipment to install the electrical power system including all appurtenant materials, work and support, in accordance with the plans and specifications.

END OF SECTION

SECTION 1009 PUMP STATION CONTROL STRATEGIES

1009-1 GENERAL

1.1 General

The Booster Pump Station will be constructed with three 7.5 hp variable speed vertical turbine pumps and a single fixed 40 hp fixed speed high flow pump. The pump station will be supplied with domestic water from the suction reservoir (tank) and will supply water to the 1180 Zone water system.

Pump P-1, P-2, and P-3 will alternate in operation. One pump will operate at a given time, when needed, to maintain the system hydraulic grade line. The pumps will pump into a "closed" water system.

The following summarizes the pumps, flow rates and horsepower.

Pumps	Flow (gpm)	Horsepower
P-1	75	7.5
P-2	75	7.5
P-3	75	7.5
P-4	1000	40

Pump control will be provided by on site PLC receiving District call signal or monitoring system pressure (low system pressure signal). Booster pump motor to run at full speed (starter to ramp motor up to full speed).

1.2 Operation Scenarios – Booster Pump

The individual pumps will be equipped with Hand/Off/Automatic (HOA) switches. In the Automatic mode, the Remote Terminal Unit (RTU) will signal PLC to automatically "Start/Stop" and alternate booster pumps into operation. The PLC will monitor system pressure and start or stop booster pump motor base on system pressure. In the Hand mode, Booster pump will be signaled to start independently of RTU and PLC. Pump motor will only stop running when switched out of "Hand" mode. NOTE: The Pressure Relief Valve (PRV) will prevent excessively high pressure from building up in the system.

Under Automatic mode, the PLC will control the starting and stopping of pumps to maintain the hydraulic grade of the system. The PLC will also monitor the station flow, suction and discharge pressures, and all station and equipment status and alarms.

1.3 PLC Operational and Telemetry Functions

The pressure transducer, pressure switch and flow meter locations are shown on the plans. The programming of the operational PLC functions required will be provided by the PLC provider. The RTU and RTU signal programming shall be furnished by the telemetry contractor.

1.4 High-Flow Booster Pump Start-Up and Shut-Down Sequence

A. Start-Up

Upon starting the booster pump, the pump motor shall ramp up to a speed sufficient to produce 1000 gpm. If system pressure remains constant or increases, the pump shall continue to operate at 1000 gpm until system operating pressure of 69 psi is reached (1303 foot HGL measured at pump-discharge manifold).

The PLC will automatically start booster pump operation when the water pressure in the discharge manifold decreases below the programmed "On" pressure level – provided that there are no system alarm active – see alarms below.

B. Shut-Down

The PLC will automatically stop the booster pump operation when any of the following conditions are met:

1. RTU signal to stop operation.
2. When the water pressure in the discharge manifold increases to above the programmed "Off" pressure level and the Pump has run at least 5 minutes or if the PRV valve is open for 2 minutes.
3. Any motor, starter, power, or current alarm.

Some alarms must be manually reset others reset automatically see alarms below.
4. Excessive flow - 1400 gpm
5. Low suction or high discharge pressures.

Alarms must be manually reset.

1.5 Alarms

Pumps will shut down in both hand mode and automatic mode when:

A. High Discharge Pressure Switch

Individual motor/pump condition (Must be reset manually)

Waterworks District 1
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- B. Motor Overload
 - Under current/overcurrent
 - Individual motor/pump condition (Must be reset manually)
- C. Motor Thermal Fail
 - Individual motor/pump condition (Must be reset manually)
- D. Control Valve Fail
 - Individual motor/pump condition (Must be reset manually)
- E. Phase / Voltage/ Power Loss
 - All motor / pump condition (Automatic reset)
- F. Ground Fault condition
 - All motor / pump condition (Must be reset manually)
- G. Tank Level / Suction Pressure on System (transducer)
 - All motor / pump condition (Automatic reset)

1.6 Duty Pump Start Setting

P-1, P-2, and P-3 will alternate in operation as called to start by the PLC.

Pump start pressure in the discharge manifold shall be 53 psi.

1.7 Pump Stop Settings

Duty pump "stop" shall occur at a discharge pressure of 69 psi.

High pressure shut down for entire pump station = 90 psi.

Low suction shut down for entire pump station = 1 psi.

1.8 Sequence of Operation – Automatic Mode

A. Water Pumping Station RTU Programming

B. RTU Programming [Central Control]:

1. Upon receipt of a pump call signal from central, an associated pump shall start when determined by the PLC and continue to run until PLC signals pump to stop or receipt of a pump stop signal from central.

2. If the pump fails to stop, the associated overrun alarm shall activate. The alarm condition shall be deactivated after pressing local reset push button on the OI panel. The central shall also be able to energize the overrun output remotely.

C. PLC Programming [Local Control]:

1. The PLC shall control four pumps – three duty pumps and one high flow pump. The PLC shall be programmed to alternate the three duty pumps so that even running time on each pump is maintained. Automatically alternate the modes every 24 hours. The various modes are:

- a. P1 Lead
 P2 Lag
 P3 Stand-by
- b. P1 Lead
 P3 Lag
 P2 Stand-by
- c. P2 Lead
 P3 Lag
 P1 Stand-by
- d. P2 Lead
 P1 Lag
 P3 Stand-by
- e. P3 Lead
 P2 Lag
 P1 Stand-by
- f. P3 Lead
 P1 Lag
 P2 Stand-by

2. On/off level set points for pump start and stop shall be programmed in PLC.

Low flow pumps shall be speed controlled by the PLC. The PLC shall be programmed to adjust pump speed as required to maintain constant pressure on discharge manifold.

Low flow pump(s) shall not operate while high flow pump is in operation.

Upon receipt of a pump override signal from central, the associated pump shall start or stop, regardless of the local level controls as controlled by the PLC.

If a pump fails to run within a set time of a run command, the next pump in the sequence shall run in its place.

Prohibit start or stop of pump if pump control valve is not closed, as sensed by its limit switch.

1.9 Sequence of Operation – High Flow Pump Operations

Booster pump will be equipped with Hand/Off/Automatic (HOA) switch. In the Automatic mode, the RTU will automatically “Start/Stop” the high flow booster pump into operation. The PLC will monitor flow, discharge pressure, valve position, power consumption, and the existing reservoir’s water level. In the Hand mode, well will be signaled to start independently of RTU. The high flow booster pump will only stop running when switched out of “Hand” mode or system alarm occurs.

1.10 RTU Operational and Telemetry Functions

The pressure and level transducer, pressure switch and flow meter locations are shown on the plans. The programming of the operational RTU functions required will be provided by the District’s Engineer. The RTU, PLC, radio, power supply, and associated equipment (i.e. DC/DC Converter, batteries) shall be furnished by the contractor. The RTU antenna locating, mounting, and signal programming shall be furnished by the District approved telemetry contractor (Systems Integrated), including all central station programming.

1.11 High Flow Pump Start-Up and Shut-Down - Sequence of Operation

A. Automatic Mode and Hand Mode – High Flow Booster Pump Start-Up

Under normal automatic starting conditions: With the “Off” - the RTU will receive a run or “Call” signal from the local RTU’s PLC. The RTU will immediately output a run signal to start the well. In “Hand Mode the run signal will be generated as long as the switch remains in the “Hand” position. The pumps relay logic shall immediately send a run signal to bearing lubrication solenoid to open. After a run signal is given, initially the high flow booster pump will be held “Off” until an adjustable time increment has expired (0 to 3 minutes). Once that time has elapsed, the high flow booster pump motor’s then be signaled to run. Once the run

signal is given to the motor's soft starter control logic controls, the motor should begin to ramp up to preprogrammed speed, and continue to run until call signal is removed. The RTU's run call signal shall be determined either by District command or low discharge pressure with (2) low flow booster pumps in operation. The high flow booster pump remain in operation until measures rate of flow decreases below 1250 GPM. Then a single low flow pump is called into operation and high flow pump is signaled to shut-down as soon as low flow pump's control valve reaches a fully opened position.

B. Automatic Mode and Hand Mode – High Flow Booster Pump Shut-Down

Under automatic mode with normal conditions: The PLC will determine the stop signal based on measured flow into discharge piping system. The PLC will immediately call the low flow booster pump into operation and the run signal to the high flow booster pump's relay logic shall be removed as soon as the low flow booster pump's control valve reaches the fully open position. The PLC's off call signal shall be determined either by District command or low discharge pressure. A low reservoir (tank) level signal shall also remove the run call signal regardless of discharge pressure / flow requirement. In "Hand Mode" the run signal will be open immediately with turning to switch to the "Off position" if a low reservoir (tank) level signal is received.

Upon opening the run signal, the pump's relay logic shall immediately de-energize the signal to control valve solenoid and allow the valve to open to waste. The high flow booster pump's motor will be held "On" until the control valve's position reaches 95% closed. At that point the motor will be signaled to ramp down and off.

C. System Alarm – Booster Shut-Down

The PLC will automatically stop the well's operation when any of the following conditions are met:

- A. RTU signal to stop operation.
- B. When the water pressure in the suction reservoir tank shows a high level.
- C. Any motor, starter, power, or current alarm.
- D. Control valve open failure
- E. High discharge pressures.

Alarm type C D and E must be manually reset.

Call signals type A and B automatically reset

1.12 Alarms

Pumps will shut down in both hand mode and automatic mode when:

- A. High Discharge Pressure Switch
(Must be reset manually)
- B. Motor Overload
Under current/overcurrent
(Must be reset manually)
- C. Motor Thermal Fail
(Must be reset manually)
- D. Control Valve Fail
(Must be reset manually)
- E. Phase / Voltage/ Power Loss
(Automatic reset)
- F. Ground Fault condition
(Must be reset manually)
- G. Tank Level / Suction Pressure on System (transducer)
(Automatic reset)

1.13 Additional Programming

- 1. Provide pump thermal fail detection for each pump and transmit to central. A pump has failed if the motor thermal switch opens. Activate associated local "thermal fail" alarm and shut down the motor until manually reset at the OI panel.
- 2. Provide pump fail detection for each pump and transmit alarm to central. A pump has failed if a run contact is not received within an adjustable time delay after a start contact was sent. Activate

associated local "pump fail" alarm and de-energize motor until manually reset at the OI panel.

3. Provide high discharge pressure shutdown for each pump and transmit alarm to central. Shutdown shall occur if pump is running and a high pressure condition exists for an adjustable time delay. Activate associated local "motor high discharge pressure" alarm and de-energize motor until manually reset at the OI panel.
4. All booster pumps shall be shut down if the tank level pressure falls below 1 psi or the discharge pressure rises to 90 psi or falls below 37 psi.
5. An intrusion signal shall be generated if any of the limit switches on the exterior MCC doors, utility service switchboard panel doors, reservoir telemetry enclosure doors, reservoir ladder, hatches, and vents is activated and the intrusion override key switch is not activated by an operator within 0-10 minutes (adjustable).
6. Prevent motors from starting simultaneously. Provide 0-3 minute (adjustable) delay between starts.
7. Information transmitted to central shall be:
 - a. Intrusion
 - b. Utility power failure.
 - c. Flow (both instantaneous and totalizer).
 - d. Reservoir Level / Suction pressure.
 - e. Discharge pressure.
 - f. Individual pump discharge valve positions (open and close).
 - g. Individual pump run status (contact in VFD or soft start starter).
 - h. Individual pump HOA status (manual and auto positions).
 - i. Individual pump soft start starter bypass switch status.
 - j. Individual pump overrun shutdown.
 - k. Motor high temperature trip alarm for each pump.

- o. Soft start starter failure for each pump.
 - p. Individual motor overload for each motor.
 - q. Pressure relief valve open.
 - r. ATS in normal.
 - s. ATS in emergency.
 - t. Individual pump discharge pressure failure.
 - u. Ground fault.
 - v. Individual pump control power available.
 - w. Individual pump emergency stop switch position.
 - x. Generator fail.
 - y. Generator run.
 - z. Generator alarm
8. Information transmitted from central to RTU:
- a. Booster pump on/off command.
 - b. On/off override for P1, P2, P3, and P4

1.14 Water Pumping Station RTU Inputs and Outputs

Refer to drawings for RTU digital and analog inputs and outputs.

END OF SECTION

EXHIBIT A

**PROPOSAL FROM DISTRICT APPROVED
TELEMETRY CONTRACTOR –
SYSTEMS INTEGRATED**



2200 North Glassell Street, Orange, CA 92865 714/998-0900 FAX 714/998-6059

April 16, 2009

Mr. Eric Keller
County of Ventura Public Works Agency
6767 Spring Road
Moorpark, CA 93020-0250

Re: Roseland Avenue Booster Pump Station Telemetry Quote

Dear Eric:

Systems Integrated is pleased to provide the following quotation to furnish one (1) SI model 5547-2 Remote Telemetry Unit kit for the Roseland Avenue booster pump station project.

Systems Integrated's scope of supply will include the following:

1. Furnish, program and configure one (1) ea. SI 5547-2 telemetry kit and a Generator monitor/control package as detailed in the price summary. The telemetry kit includes the following primary components (and all minor components, nameplates, panduit, terminals etc. required to create a fully functional RTU):
 - a. NEMA 12 Indoor enclosure
 - b. Allen Bradley CompactLogix PLC with I/O modules required to support the specification's I/O count.
 - c. Isolation modules and relays
 - d. A/C powered 24VDC power supply
 - e. Sealed lead-acid backup batteries and charger for 8 hour backup of RTU in standby mode.
 - f. PanelView OIT
 - g. Category 6e cable lightning protection for radio
 - h. Radio and antenna to join BPS with existing telemetry communication system.

Mr. Eric Keller
 County of Ventura Public Works Agency
 April 16, 2009
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- i. Generator monitor/control package requires additional Allen Bradley I/O modules, terminal blocks and programming to implement this function.
2. Provide all submittals for SI furnished equipment.
3. Perform all testing, training, and system startup duties required for SI furnished equipment. Provide all O&M manuals and other specification required documentation for supplied equipment.
4. Provide all required updates to existing Wonderware based SCADA system servers. This will include I/O database configuration, screen configuration, historical database configuration, alarm configuration, dial-out annunciation configuration. The completed work will fully integrate the pump station and allow for operation of the BPS from remote SCADA terminals.

Systems Integrated will not provide the following:

1. Any electrical installation materials or labor.
2. Housekeeping pads for equipment or antenna towers.
3. Field instrumentation or equipment not specified identified in the 5547-2 telemetry kit or included in the pricing summary.

Delivery and Installation Time:

Upon receipt of purchase order, Systems Integrated will provide delivery of the telemetry kit within 90 calendar days. Upon completion of all prerequisite construction items required to mount, wire instrumentation and power the RTU enclosure and all RTU components, Systems Integrated will complete local BPS and SCADA integration tasks including startup, test and training within 30 calendar days.

Pricing Summary:

The price for this scope of supply is as follows:

Item	Description	Qty	Unit Price	Total
1	5547-2 Telemetry Kit	1	\$45,880.00	\$45,880.00
2	Generator Monitor/Control Package	1	\$3,500.00	\$3,500.00
	Sales Tax 8.25%			\$4,073.85
	Total			\$53,453.85

Mr. Eric Keller
County of Ventura Public Works Agency
April 16, 2009
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Standard Terms & Conditions:

1. This quote is valid for 3 months from the date issued.
2. This quote guarantees that the all work meets the requirements and control functions of specification WW 09-06 for the Roseland Avenue BPS. This guarantee is limited to those specification sections and drawings applicable to providing the RTU telemetry kit and programming of the local and remote station.
3. The furnished telemetry kit and labor is provided with a warrantee for the duration specified in WW 09-06.
4. The payment schedule is as follows:
 - a. 65% upon delivery of equipment to site.
 - b. 20% upon completion of system testing.
 - c. 15% upon completion of as-built documentation and training.
5. Delivery to site included. Contractor is responsible for moving equipment into place.

If you have any questions regarding this quotation package please contact John Holbrook @ 760-473-4236.

Sincerely,

SYSTEMS INTEGRATED

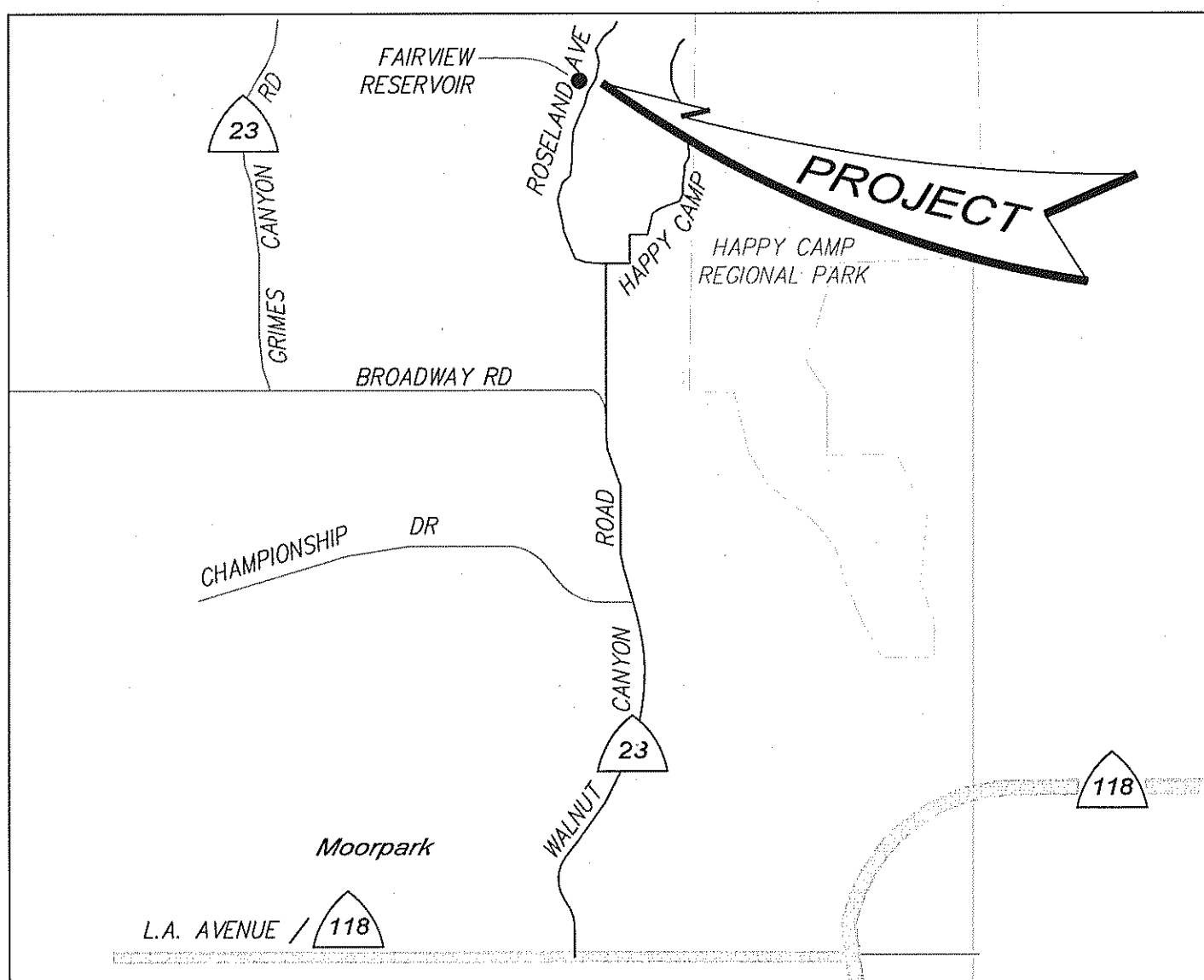
John Holbrook
Director

7477-0a2

VENTURA COUNTY WATERWORKS DISTRICT NO. 1

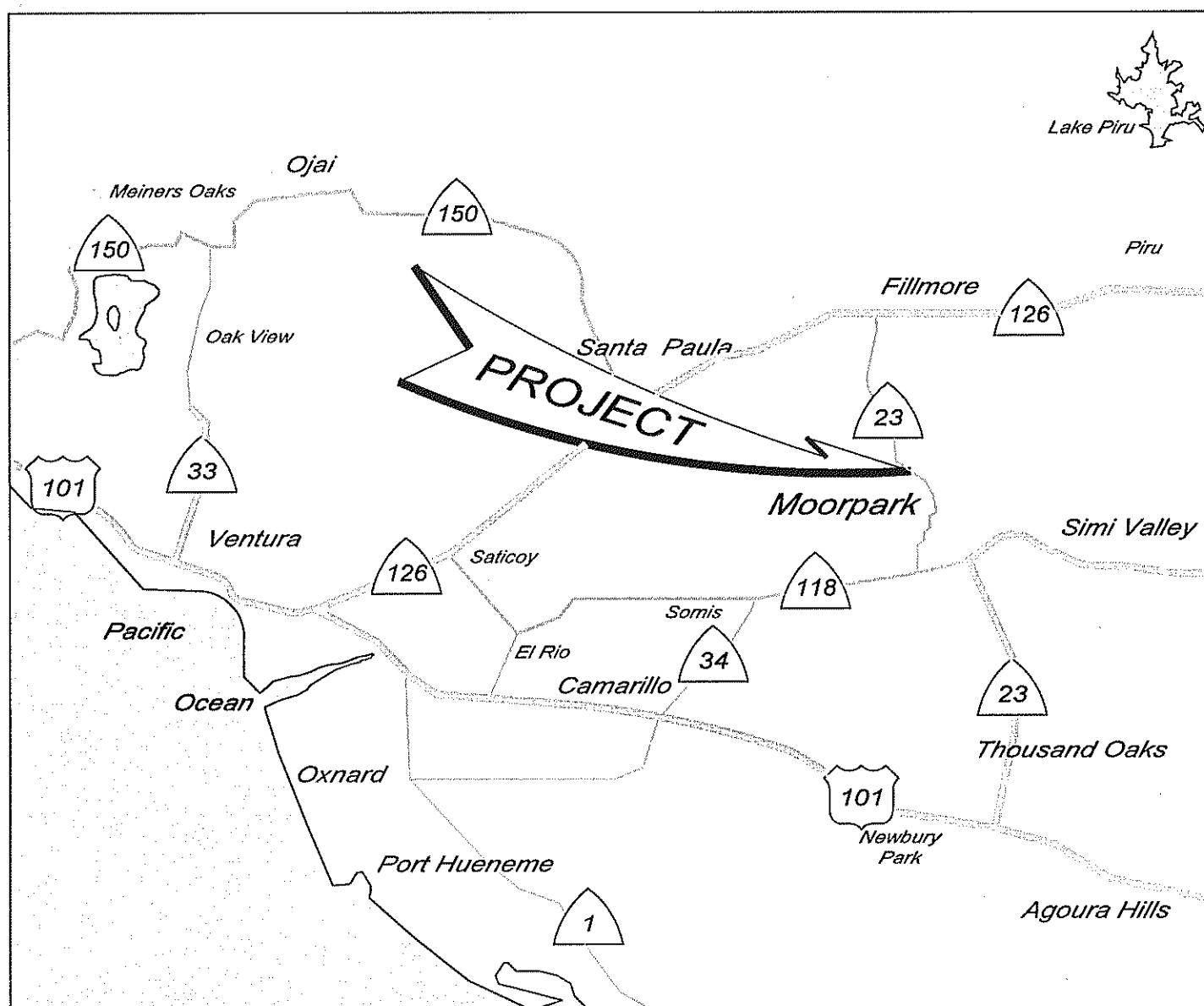


ROSELAND BOOSTER PUMP STATION



VICINITY MAP

NOT TO SCALE



LOCATION MAP

NOT TO SCALE

SHEET INDEX

SHEET	DWG NO	TITLE
1	112461	TITLE SHEET
2	112462	SITE PLAN
3	112463	BOOSTER PUMP STATION PLAN
4	112464	ELEVATIONS AND DETAILS
5	112465	SITE GRADING PLAN
6	112466	DETAILS
7	112467	ELECTRICAL GENERAL INFORMATION
8	112468	ELECTRICAL STATION POWER AND SIGNAL PLAN
9	112469	ELECTRICAL SITE PLAN
10	112470	ELECTRICAL SINGLE LINE DIAGRAM
11	112471	ELECTRICAL CONDUIT & CONDUCTOR CHARTS
12	112472	ELECTRICAL PUMP CONTROL DIAGRAMS
13	112473	ELECTRICAL CONTROL DIAGRAMS
14	112474	TELEMETRY CONTROL SCHEMATIC
15	112475	ELECTRICAL MCC ELEVATIONS AND DETAILS
16	112476	ELECTRICAL DETAILS

GENERAL NOTES

1. ALL WATER FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF VENTURA COUNTY WATERWORKS DISTRICT NO. 1.
2. ALL WORK SHOWN ON THESE PLANS SHALL BE PERFORMED IN ACCORDANCE WITH a) THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2009 EDITION, AND MODIFICATIONS THERETO BY THE VENTURA COUNTY STANDARD SPECIFICATIONS (VCSS), b) THE UNIFORM BUILDING CODE, c) THE PROJECT SPECIFICATIONS, d) NATIONAL ELECTRIC CODE, e) VENTURA COUNTY WATERWORKS MANUAL.
3. THE LOCATIONS OF EXISTING STRUCTURES AND SUBSTRUCTURES HAVE BEEN TAKEN FROM RECORDS AVAILABLE AND THEIR APPROXIMATE LOCATIONS ARE SHOWN ON THE PLANS TO THE EXTENT THE INFORMATION IS KNOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THEIR EXACT LOCATION AND PROTECT THEM FROM HARM DURING CONSTRUCTION.
4. 4" AND LARGER FITTINGS SHALL BE CAST OR DUCTILE IRON, DUCTILE IRON BOLTED FLANGE TYPE (ABOVE GROUND) OR MECHANICAL JOINT (BELOW GROUND) TO JOIN PVC OR DI PIPES TO ALL FITTINGS.
5. FOR PVC WATER LINES, PIPES ENTERING ALL FITTINGS AND VALVES SHALL HAVE A LENGTH OF AT LEAST 3 TIMES THE PIPE DIAMETER, BUT SHALL NOT BE LONGER THAN 3 FT. ALL VALVES SHALL BE BOLTED TO TEES.
6. CONTRACTOR SHALL CALL UNDERGROUND SERVICE ALERT AT (800) 422-4133 TO LOCATE UNDERGROUND UTILITIES AT LEAST 2 WORKING DAYS PRIOR TO DIGGING. CONTRACTOR SHALL FIELD VERIFY LOCATION AND DEPTH OF EXISTING IMPROVEMENTS PRIOR TO START OF CONSTRUCTION.
7. CONTRACTOR SHALL POTHOLE EXISTING WATER LINES AT ALL POINTS OF CONNECTION. IF TIE-IN IS TO AN EXISTING AC LINE, CONTRACTOR SHALL REPLACE EXISTING PIPE SECTIONS TO NEAREST JOINT, AS NECESSARY.
8. DISTRICT SHALL OPERATE ALL VALVES, FIRE HYDRANTS, BLOW-OFFS, CORPORATION STOPS AND OTHER WATER FACILITIES ON EXISTING WATER SYSTEM.
9. DISINFECTION SHALL BE IN ACCORDANCE WITH SUBSECTION 306-9 OF THE VENTURA COUNTY STANDARD SPECIFICATIONS (VCSS).



TEMPORARY BENCHMARK EL. 1137.44
SET T&N - 80'± SOUTH OF SOUTHERLY RES
PROPERTY LINE AND 3'± WEST FROM THE EAST
EDGE OF PAVEMENT ON EXISTING PRIVATE ROAD.

IMPORTANT NOTICE

Section 4216/4217 of the Government Code requires a DigAlert Identification Number be issued before a "Permit to Excavate" will be valid. For your DigAlert I.D. Number Call Underground Service Alert

TOLL FREE 1-800-422-4133

At least two working days before you dig



UNDERGROUND SERVICE ALERT(USA) OF SOUTHERN CALIFORNIA

REVISIONS	BY	DATE

PREPARED BY:

WREA

WATER RESOURCE ENGINEERING ASSOCIATES
2300 ALESSANDRO DR, SUITE 215, VENTURA, CA 93001 • 805.653.7900 • 800-25-WATER • FAX: 805.653.0610
LOUIS M. NAGY R.C.E. NO. 47648 EXP. 12-31-09 DATE 4/15/09

PROJECT MANAGER

DIRECTOR, WATER AND SANITATION DEPARTMENT

AGENCY DIRECTOR, PUBLIC WORKS AGENCY

4-15-09

DATE

4/15/09

DATE

4/15/09

DATE

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

SPEC. NO.

WW 09-06

PROJ. NO.

31886

ROSELAND BOOSTER PUMP STATION

TITLE SHEET

SHEET

1

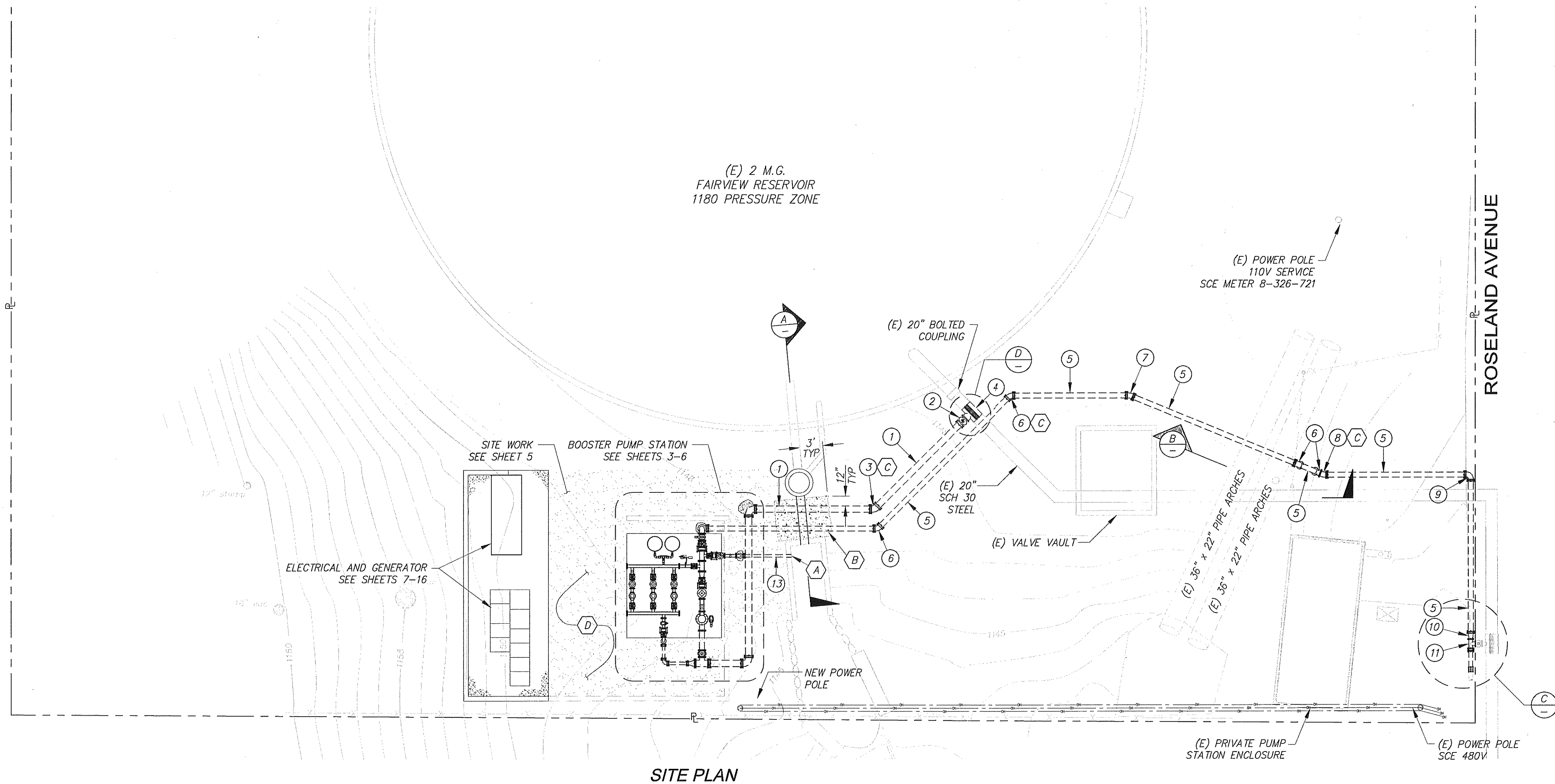
OF

16

DRAWING NO.

112461

SCALE: 1"=10'



SITE PLAN

SCALE: 1" = 10'

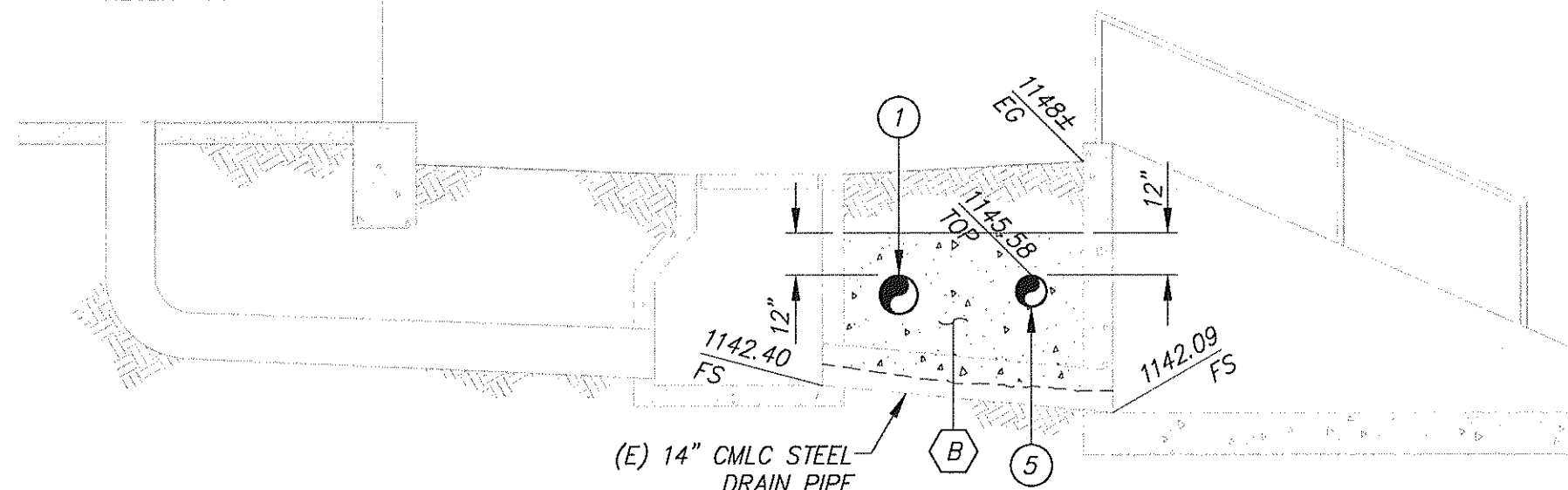
SHEET 2 PARTS LIST

- 10" CL 150 C900 PVC PIPE PER $\frac{E}{6} \times \frac{F}{6}$
- 10" FLG x M.J. RESILIENT WEDGE GATE VALVE PER $\frac{G}{6}$
- 10" M.J. 45° ELBOW WITH RESTRAINED JOINTS
- 20" x 10" SS TAPPING SLEEVE
- 8" CL 150 C900 PVC PIPE PER $\frac{E}{6} \times \frac{F}{6}$
- 8" M.J. 45° ELBOW PER $\frac{D}{6}$
- 8" M.J. 22-1/2° ELBOW PER $\frac{D}{6}$
- 8" M.J. 11-1/4° ELBOW PER $\frac{D}{6}$
- 8" M.J. 90° ELBOW PER $\frac{D}{6}$
- 8" x 6" M.J. x FLG REDUCER PER $\frac{D}{6}$
- 6" FLG TEE PER $\frac{D}{6}$
- 6" FLG x M.J. COUPLING $\frac{D}{6}$
- 4" CL 150 C900 PVC PIPE PER $\frac{E}{6} \times \frac{F}{6}$
- 8" DIP PER AWWA C104 AND C105
- STANDARD ROUND VALVE BOX

SHEET 2 CONSTRUCITON NOTES

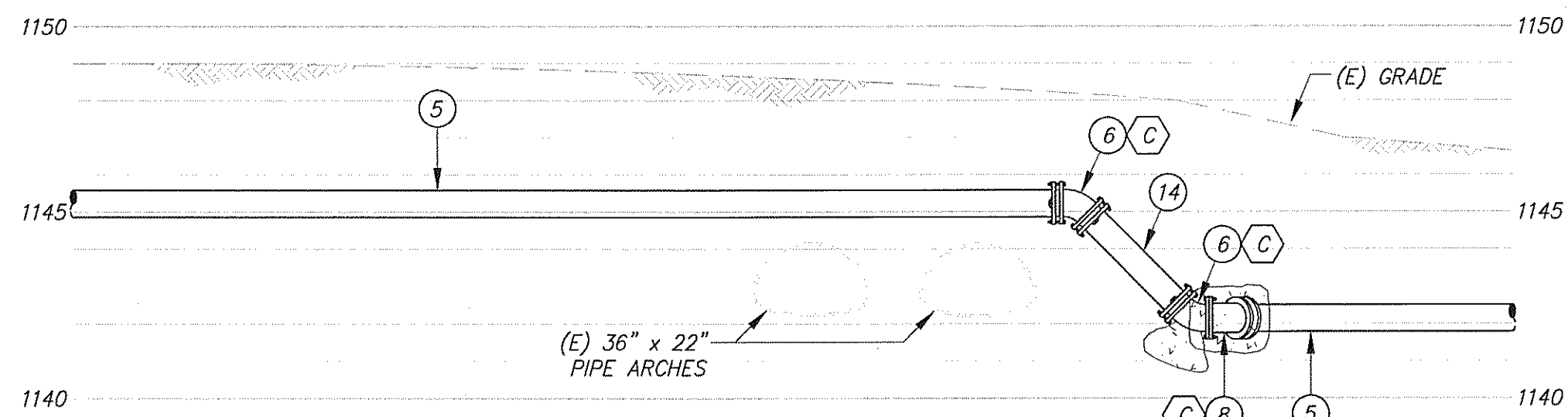
- BORE THROUGH CONCRETE FOR RELIEF VALVE DRAIN PIPE. INSTALL ELASTOMERIC SEALING COMPOUND AROUND PIPE PENETRATION
- POUR 2-SACK SLURRY AROUND PIPE TO SPRINGLINE OF EXISTING 14" CMLC STEEL DRAIN PIPE AND TO 12" ABOVE TOP OF PROPOSED 8" AND 10" PIPE
- RESTRAINED JOINTS MAY BE USED IN LIEU OF THRUST BLOCKS
- INSTALL 6" THICK COMPACTED PMB SURFACE
- REMOVE EXISTING 90° ELBOW AND REPLACE WITH 6" FLG TEE

(E) 2 M.G. FAIRVIEW RESERVOIR



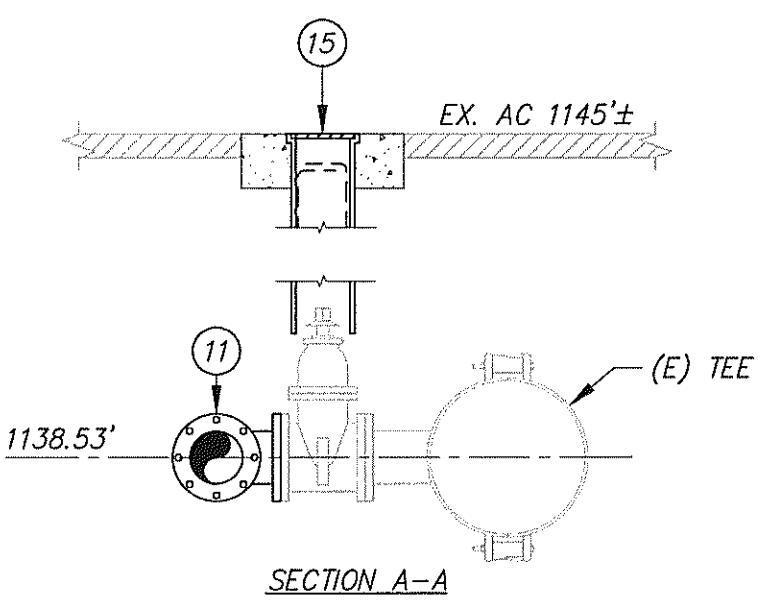
SECTION A-A

SCALE: 1" = 4'

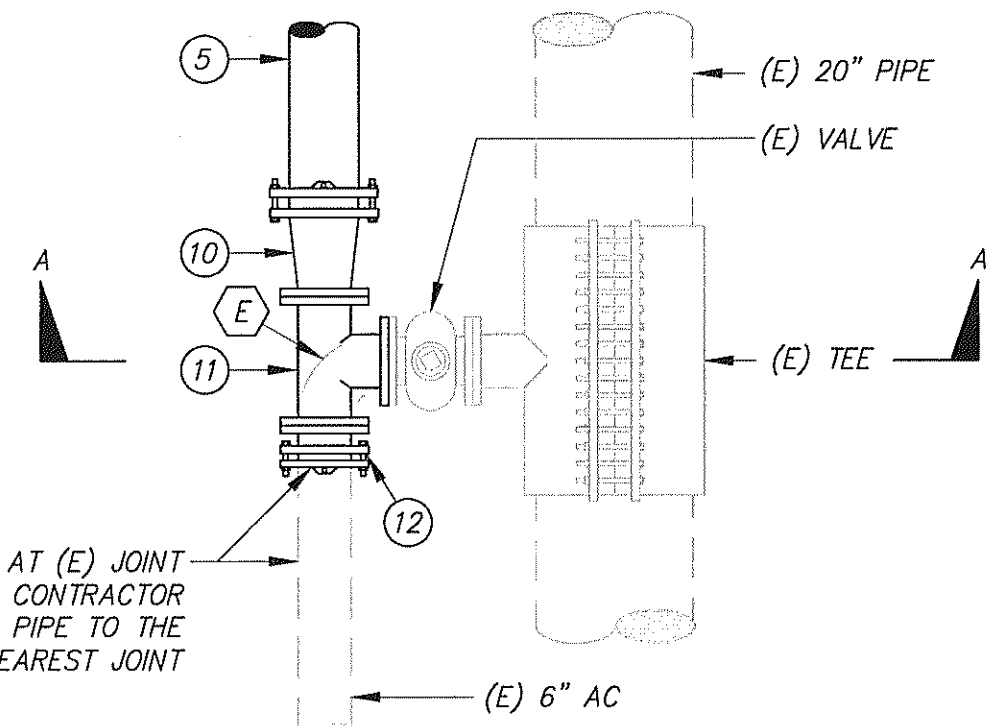


SECTION B-B

SCALE: 1" = 4'

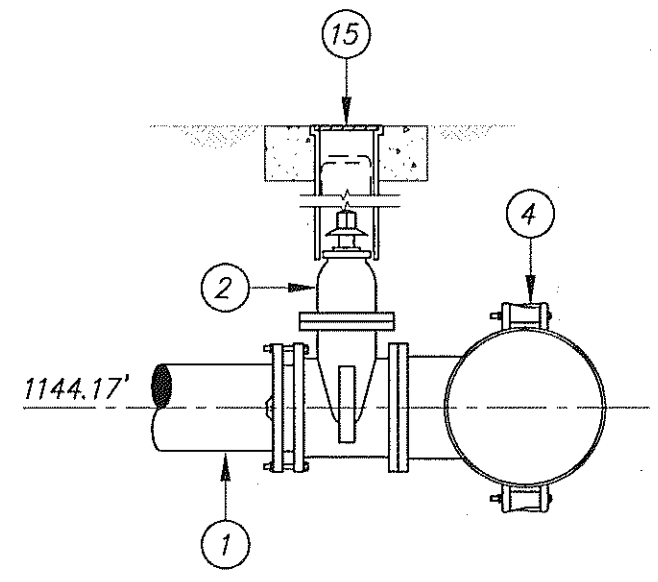


SECTION A-A



SECTION C-C

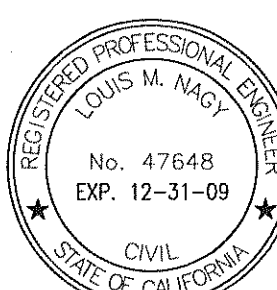
NOT TO SCALE



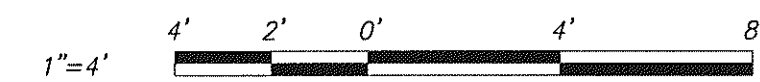
SECTION D-D

NOT TO SCALE

NOTE: IF CONNECTION AT (E) JOINT CANNOT BE MADE, CONTRACTOR SHALL REPLACE 6" PIPE TO THE NEXT NEAREST JOINT



GRAPHIC SCALE:



REVISIONS	BY	DATE

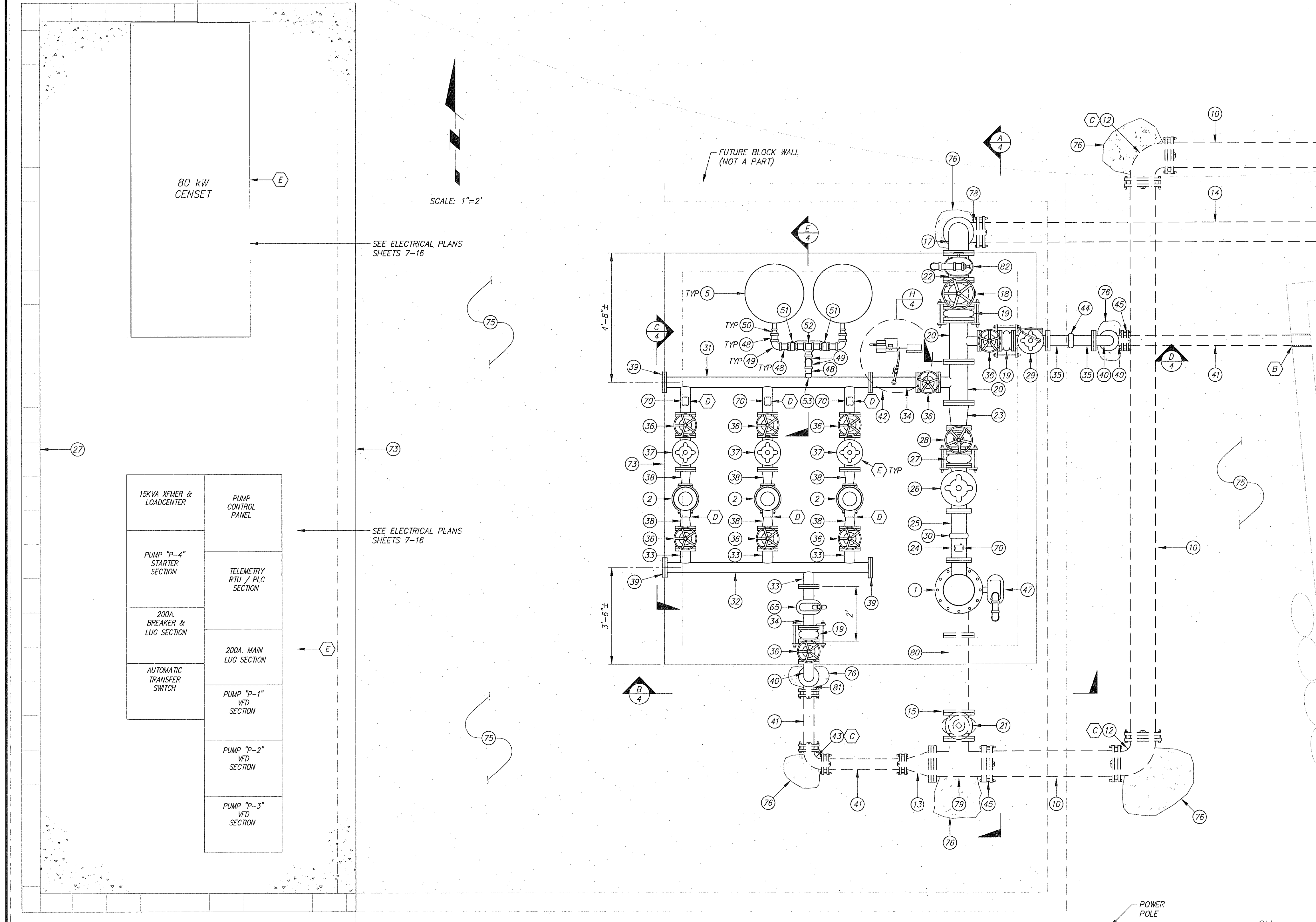
PREPARED BY:
WREA
WATER RESOURCE ENGINEERING ASSOCIATES
2300 ALESSANDRO DR, SUITE 215, VENTURA, CA 93001 • 805.653.7900 • 800-25-WATER • FAX: 805.653.0610
LOUIS M. NAGY R.C.E. NO. 47648 EXP. 12-31-09 DATE: 11/10/09

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

SPEC. NO.
WW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION
SITE PLAN

SHEET 2 OF 16
DRAWING NO.
112462



SHEET 3 AND 4 PARTS LIST

- 40 H.P. PUMP, DISCHARGE HEAD, AND MOTOR 1000 GPM TO 114' TDH
- 7.5 H.P. PUMP AND MOTOR 75 GPM TO 85' TDH
- 16" x 3/8" STANDARD STEEL PUMP CAN ASSEMBLY, VERIFY LENGTH WITH PUMP MANUFACTURER TO LEAVE 12" CLEARANCE FROM PUMP TO BOTTOM OF CAN.
- ADAPTOR FLANGE. CHECK PUMP HEAD MANUFACTURERS REQUIREMENTS.
- 86 GALLON PRECHARGED DIAPHRAGM TANK, 125 PSI RATING
- NOT USED
- FLANGE TO CONFORM TO SEISMIC ZONE 4 REQUIREMENTS, PER SURGE ARRESTOR MANUFACTURER DESIGN
- POURED-IN-PLACE CONCRETE PUMP CAN BASE
- PRESSURE GAUGE 0-160 PSI
- 10" CL 150 C900 PVC PIPE PER (D/6)
- NOT USED
- 10" M.J. 90° ELBOW
- 10" FLG x 4" M.J. REDUCER
- 8" CL 150 C900 PVC PIPE PER (D/6)
- 8" RESILIENT WEDGE FLG GATE VALVE
- 8" SCH. 40 STEEL FLG SPOOL, LENGTH AS REQUIRED
- 8" FLG 90° ELBOW
- 8" RESILIENT WEDGE, OS&Y FLG GATE VALVE
- LINE SIZE FLG FLEX COUPLING WITH FACTORY SUPPLIED CONTROL ROD ASSEMBLY
- 8" x 4" FLG TEE
- STANDARD ROUND VALVE BOX
- 8" SCH. 40 STEEL SPOOL WITH 2" WELDED HALF COUPLING
- 8" x 6" FLG REDUCER
- 6" FLG x GROOVE END STEEL SPOOL (LENGTH AS REQUIRED) WITH 1/2" WELDED HALF COUPLING
- 6" FLG x GROOVE END STEEL SPOOL, LENGTH AS REQUIRED
- 6" FLG PUMP CONTROL VALVE. WITH OPENING AND CLOSING SPEED CONTROLS
- RETAINING WALL PER SHEET 5
- 6" RESILIENT SEATED, OS&Y FLG GATE VALVE
- 4" PILOT OPERATED PRESSURE RELIEF AND SURGE ANTICIPATOR VALVE
- 6" GROOVE COUPLING, VICTAULIC STYLE 77
- 4" SCH. 40 STEEL DISCHARGE MANIFOLD WITH FLG OUTLETS AND 2" WELD HALF COUPLING PER (B/6)
- 4" SCH. 40 STEEL SUCTION MANIFOLD WITH FLG OUTLETS PER (A/6)
- 4" FLG OUTLET ON MANIFOLD
- 4" SCH. 40 STEEL FLG SPOOL WITH 2" WELD HALF COUPLING, LENGTH AS REQUIRED
- 4" FLG x GROOVE END STEEL SPOOL, LENGTH AS REQUIRED
- 4" RESILIENT WEDGE, FLG GATE VALVE
- 4" FLG DIAPHRAGM CHECK VALVE. CLA-VAL 81-02, WITH OPENING AND CLOSING SPEED CONTROLS
- 4" x 2" FLG REDUCER
- 4" BLIND FLG
- 4" 90° FLG ELBOW
- 4" CL 150 C900 PVC PIPE PER (D/6)
- NOT USED
- 4" M.J. 90° ELBOW
- 4" GROOVE COUPLING, VICTAULIC STYLE 77
- FLG x M.J. ADAPTOR, AS REQUIRED
- 4" FLG SCH. 40 STEEL SPOOL, LENGTH AS REQUIRED
- 2" AIR/RELEASE VALVE ASSEMBLY PER (F/4)
- 2" PIPE, LENGTH AS REQUIRED
- 2" 90° ELBOW
- 2" x 1-1/4" REDUCER
- 2" BALL VALVE
- 2" TEE
- 2" WELDED HALF COUPLING
- 50 MESH STAINLESS STEEL SCREEN AND PIPE CLAMP
- 1/2" NPT STAINLESS STEEL HARD SEAT NEEDLE VALVE
- 1/2" NPT STAINLESS STEEL ADJUSTABLE SNUBBER
- 2" x 1/2" STAINLESS STEEL BUSHING
- 1/2" NPT STAINLESS STEEL PIPE, LENGTH AS REQUIRED
- 1/2" NPT STAINLESS STEEL 90° ELBOW
- 1/2" NPT STAINLESS STEEL TEE
- 1/2" NPT STAINLESS STEEL BALL VALVE
- 1/2" NPT STAINLESS STEEL UNION
- 1/2" 90° ELBOW
- 2" UNION
- 1/2" AIR/RELEASE VALVE ASSEMBLY PER (F/4)
- 1/2" PIPE, LENGTH AS REQUIRED
- 1/2" BALL VALVE
- 2" x 1/2" BUSHING
- PRESSURE TRANSMITTER, ROSEMOUNT SMART 3051S ULTRA (SEE ELECTRICAL PLANS) OR EQUAL
- PRESSURE SWITCH (LOW PRESSURE SHUT-OFF ON INLET HIGH PRESSURE SHUT-OFF ON OUTLET) PER (G/4)
- PIPE SUPPORT ASSEMBLY AS NECESSARY. CHANNELS, STRUTS, PIPE STRAPS, HANGERS, AND CLAMPS.
- PIPE SUPPORT ASSEMBLY INCLUDING STEEL PIPE, COUPLING, FLOOR FLG AND PIPE SADDLE SUPPORT SEE SHEET 6 FOR TYPE AND LOCATION
- CONCRETE SLAB PER SHEET 5
- 12" x 12" CONCRETE PUMP PEDESTAL. CHECK HEIGHT IN FIELD
- 6" COMPACTED PMB SURFACE, SEE SHEET 5 FOR LIMITS
- THRUST BLOCK AS REQUIRED PER (D/6)
- 1/2" STAINLESS STEEL FLEXIBLE PIPE
- 8" FLG x M.J. 90° ELBOW PER (D/6)
- 10" x 8" FLG TEE PER (D/6)
- 8" DI FLG SPOOL PER AWWA C104 AND C105
- 4" FLG x M.J. 90° ELBOW PER (D/6)
- 2" COMBINATION AIR/VAC VALVE ASSEMBLY PER (F/4)

SHEETS 3 AND 4 CONSTRUCTION NOTES

- (A) PUMP CAN AND OTHER FABRICATED STEEL PIPE AND FITTING ASSEMBLIES SHALL BE SHOP FABRICATED TO THE SIZES AND DIMENSIONS AS SHOWN ON PLANS.
- (B) INSTALL ELASTOMERIC SEALING COMPOUND AROUND PIPE PENETRATION
- (C) RESTRAINED JOINTS MAY BE USED IN LIEU OF THRUST BLOCKS
- (D) EACH PUMP TO HAVE LOW-SUCTION AND OVER PRESSURE CUT-OUT SWITCHES. SEE ELECTRICAL PLANS SHEETS 7-16.
- (E) BOLTING TO CONFORM TO SEISMIC ZONE 4 REQUIREMENTS PER MANUFACTURER DESIGN. SEE SHEETS 7-16.

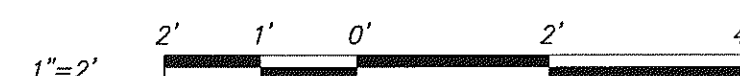
NOTE: ALL 1/2", 3/4", 1", AND 2" PIPE, FITTINGS, AND VALVES TO BE EITHER COPPER/BRASS/BRONZE, OR STAINLESS STEEL. PROVIDE AN INSULATING UNION (DIELECTRIC COUPLING) AT THE POINT OF TRANSITION FROM ANY DISSIMILAR METAL PIPES SUCH AS COPPER PIPE TO FERROUS PIPE.

BOOSTER PUMP STATION PLAN

FOR SLAB LOCATIONS, DIMENSIONS, AND DETAILS SEE SHEET 5

SCALE: 1" = 2'

GRAPHIC SCALE:



IMPORTANT NOTICE
Section 4139.1 of the Government Code requires a Digital Identification Number to be used before a "Digital Signature" will be valid. For your Digital ID Number, Call Underground Service Alert.



REVISIONS	BY	DATE

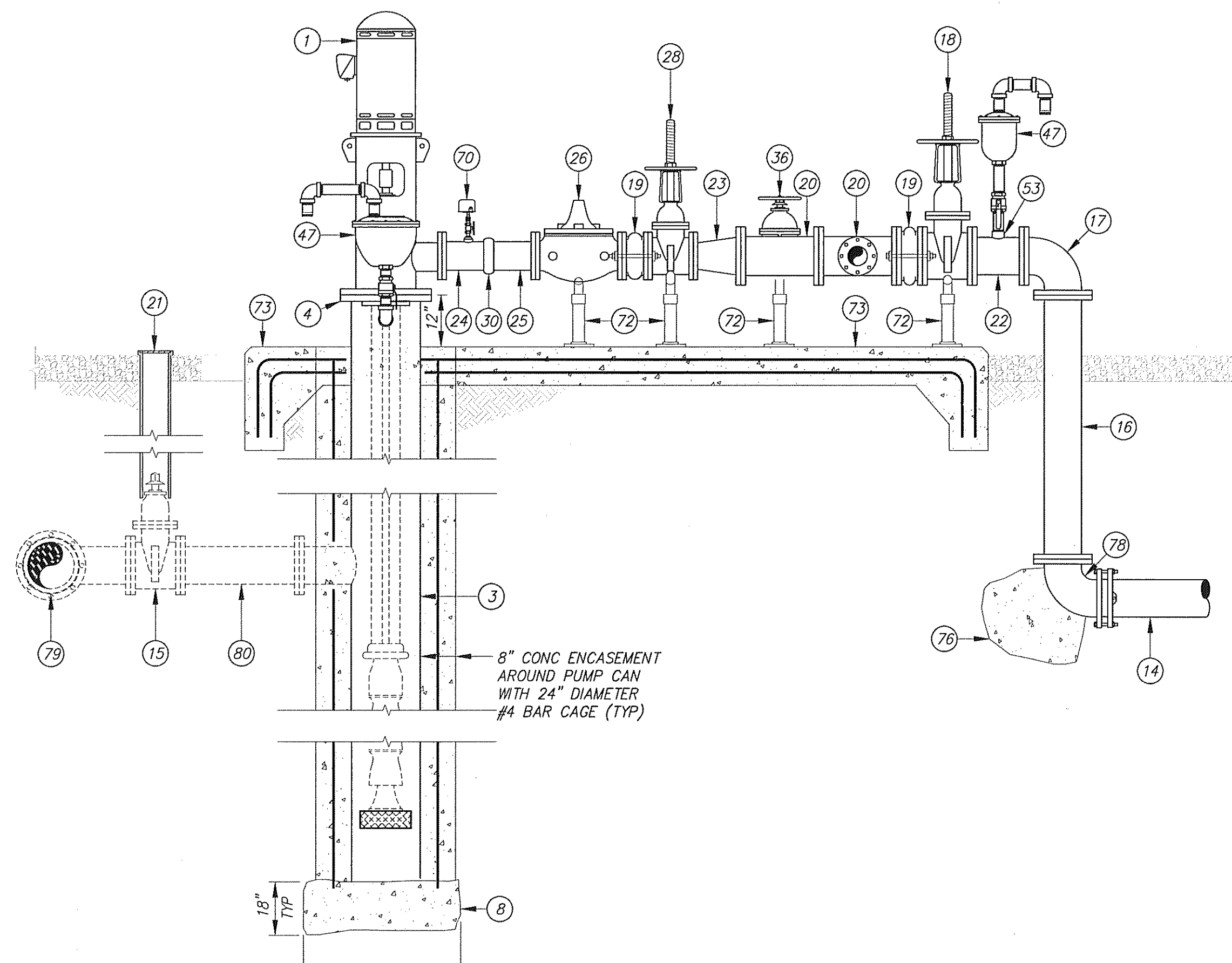
PREPARED BY:
WREA
WATER RESOURCE ENGINEERING ASSOCIATES
2300 ALESSANDRO DR, SUITE 215, VENTURA, CA 93003 • 805.653.7900 • 800-25-WATER • FAX: 805.653.0610
LOUIS M. NAGY R.C.E. NO. 047648 EXP. 12-31-09 DATE

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

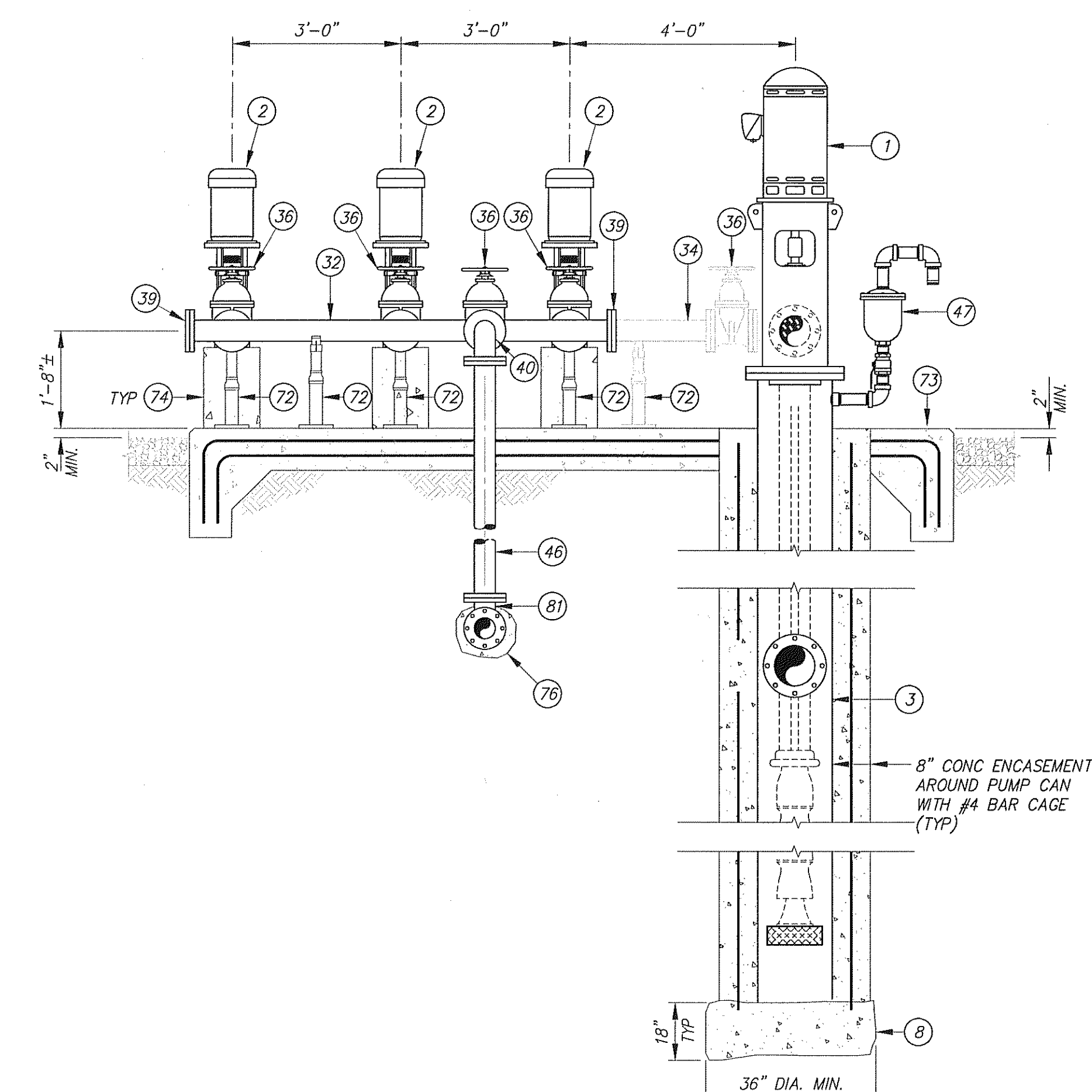
SPEC. NO.
WW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION
BOOSTER PUMP STATION PLAN

SHEET **3**
OF **16**
DRAWING NO.
112463



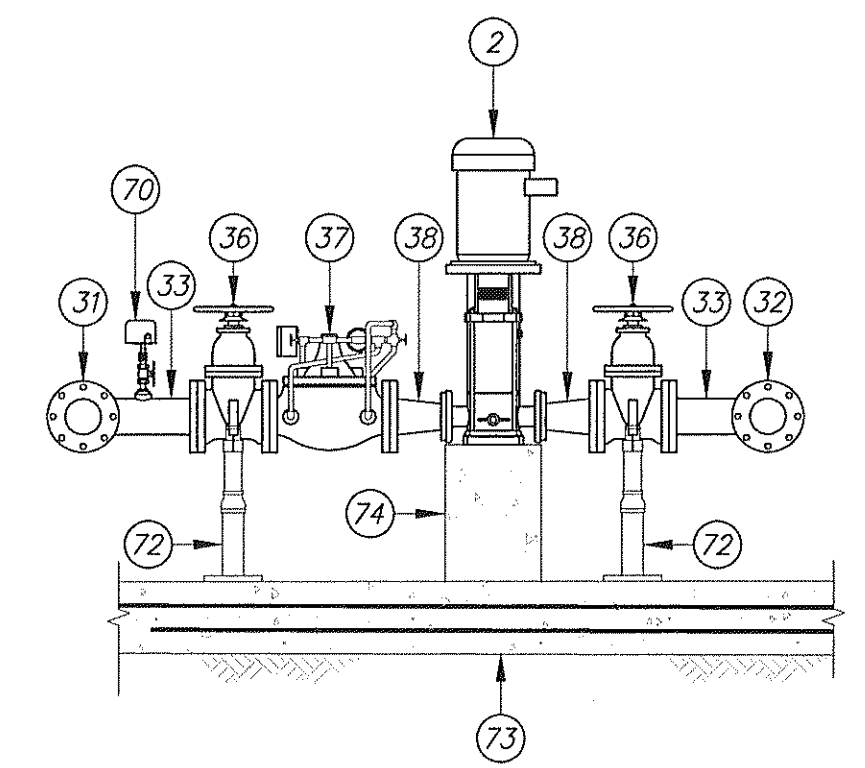
A PUMP AND PIPING ELEVATION
NOTE: SOME ITEMS MAY BE ROTATED FOR CLARITY
SCALE: 1" = 2'



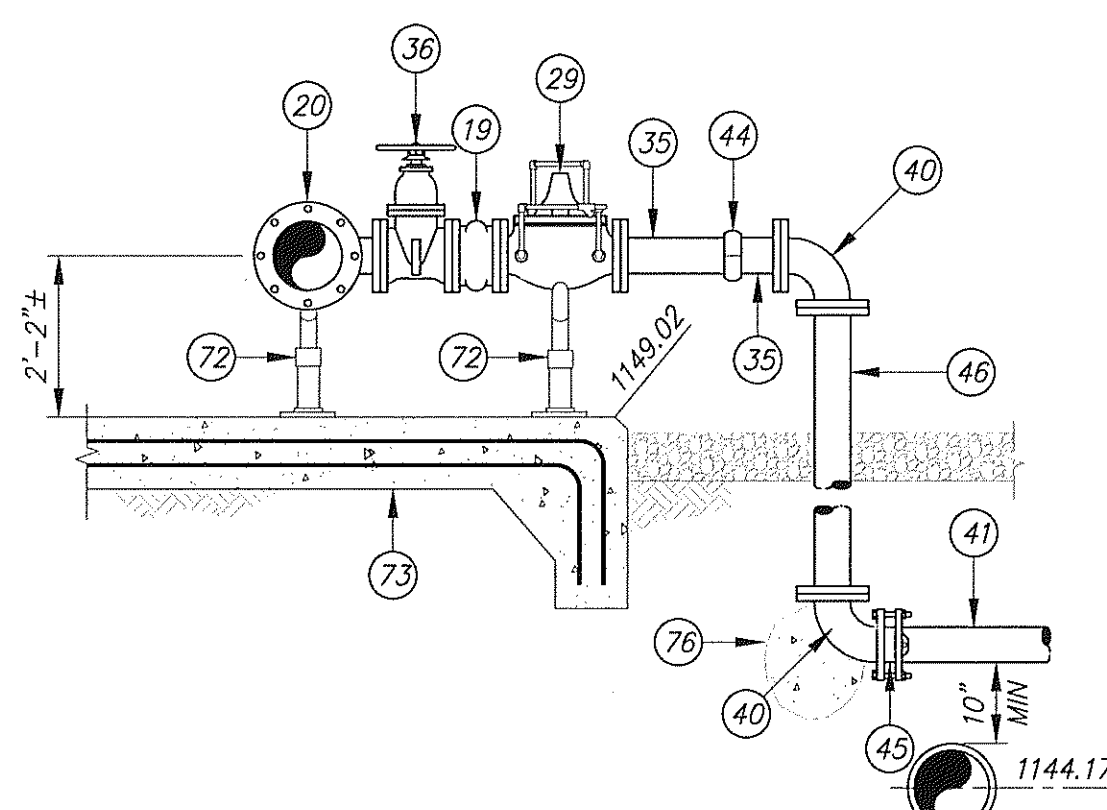
B PUMP AND PIPING ELEVATION
SCALE: 1" = 2'

*SEE SHEET 3 FOR PARTS LIST

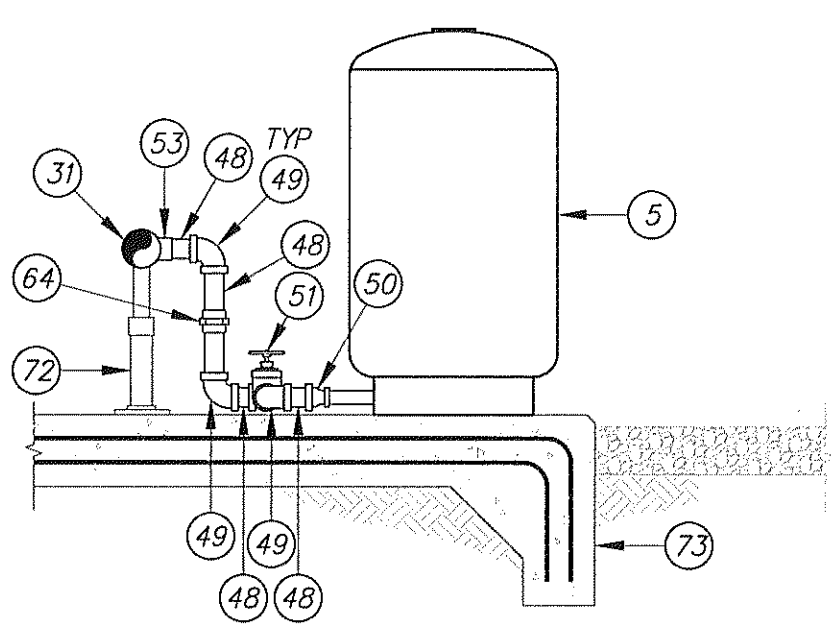
- NOTES:
1. PUMP CAN AND OTHER FABRICATED STEEL PIPE AND FITTING ASSEMBLIES SHALL BE SHOP FABRICATED TO THE SIZES AND DIMENSIONS AS SHOWN ON PLANS.
 2. FABRICATION PROCEDURES SHALL CONFORM TO AWWA STANDARDS E-101 AND C-208. EACH ENTIRE ASSEMBLY SHALL BE EPOXY LINED AND COATED PER AWWA METHOD C-210 (FOR LIQUID EPOXY COATING SYSTEMS) OR C-213 (FOR FUSION BONDED EPOXY COATING SYSTEMS) AFTER FABRICATION. DAMAGE TO SHOP APPLIED COATING SHALL BE FIELD REPAIRED PER AWWA STANDARDS C-210 OR C-213. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO THE DISTRICT FOR APPROVAL PRIOR TO FABRICATION.



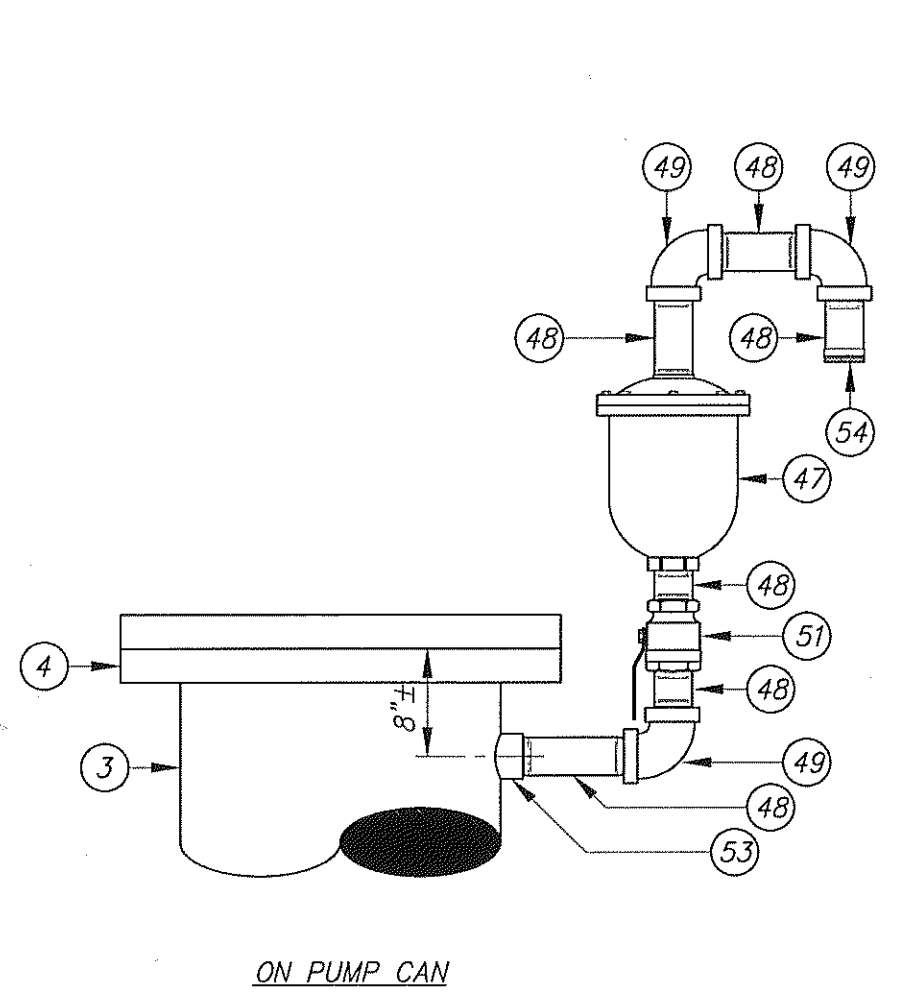
C PIPING ELEVATION
SCALE: 1" = 2'



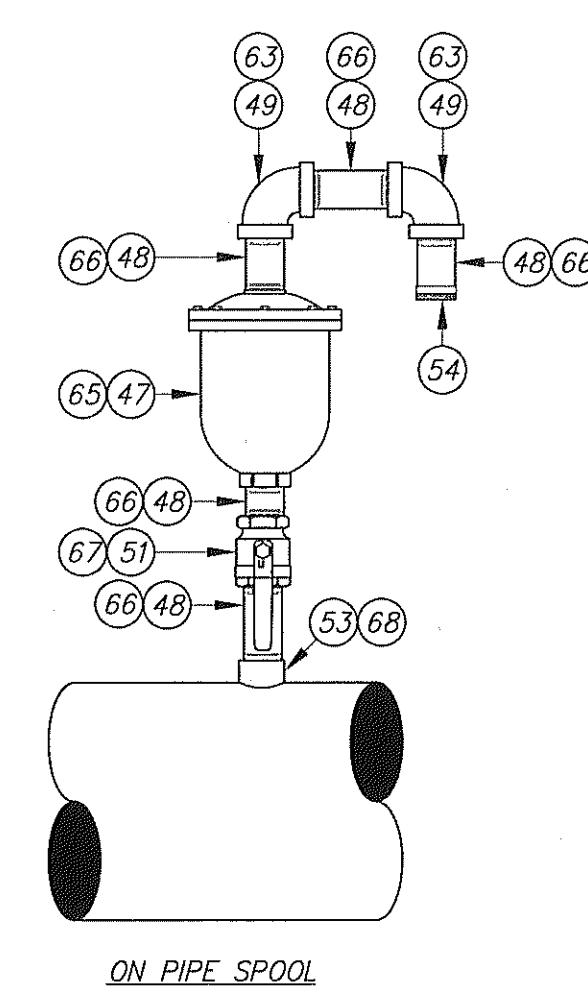
D PIPING ELEVATION
SCALE: 1" = 2'



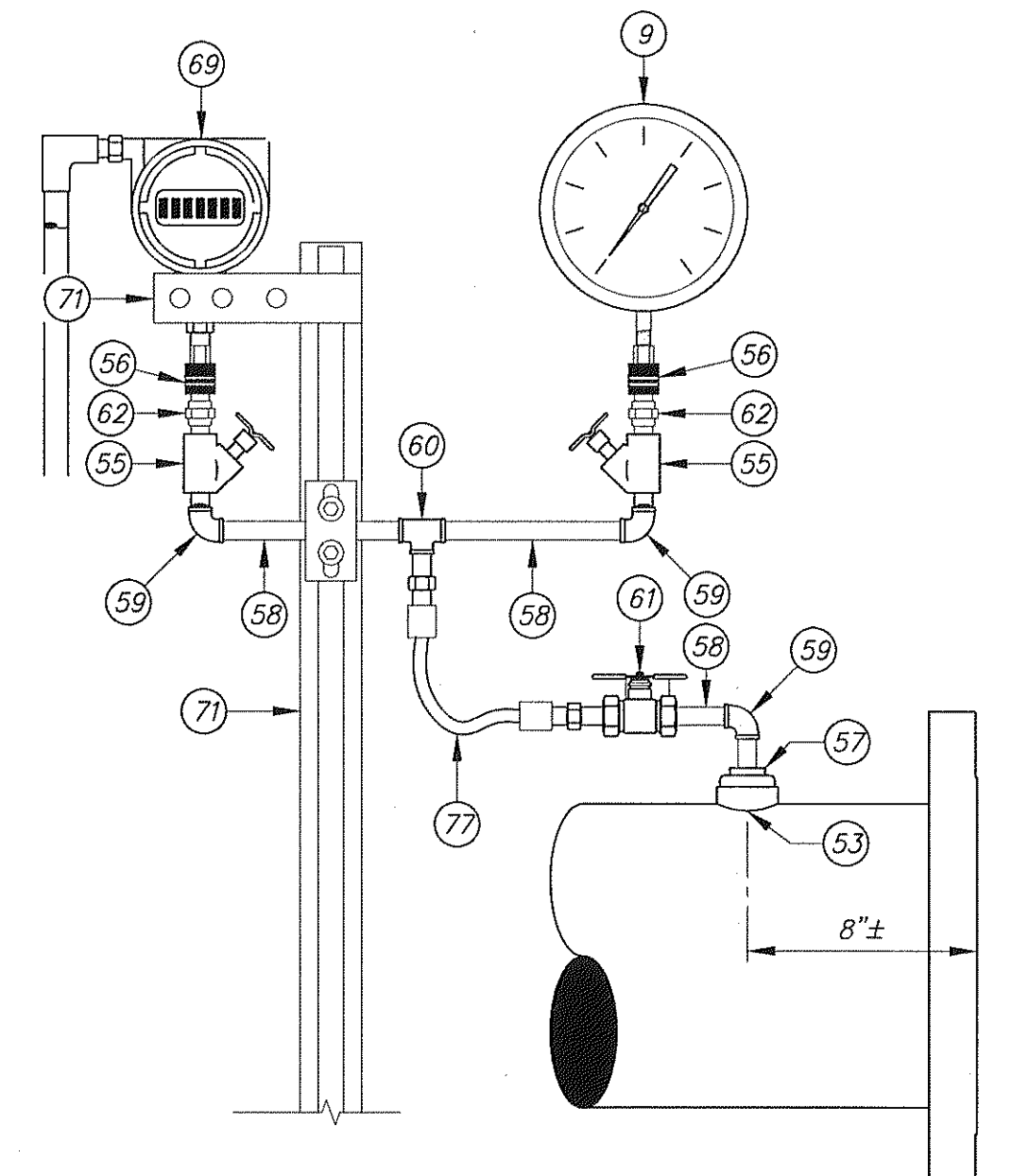
E PIPING DETAIL
NOTE: SOME ITEMS MAY BE ROTATED FOR CLARITY
SCALE: 1" = 2'



F AIR / RELEASE VALVE ASSEMBLY
NOT TO SCALE



G PRESSURE SWITCH ASSEMBLY
NOT TO SCALE

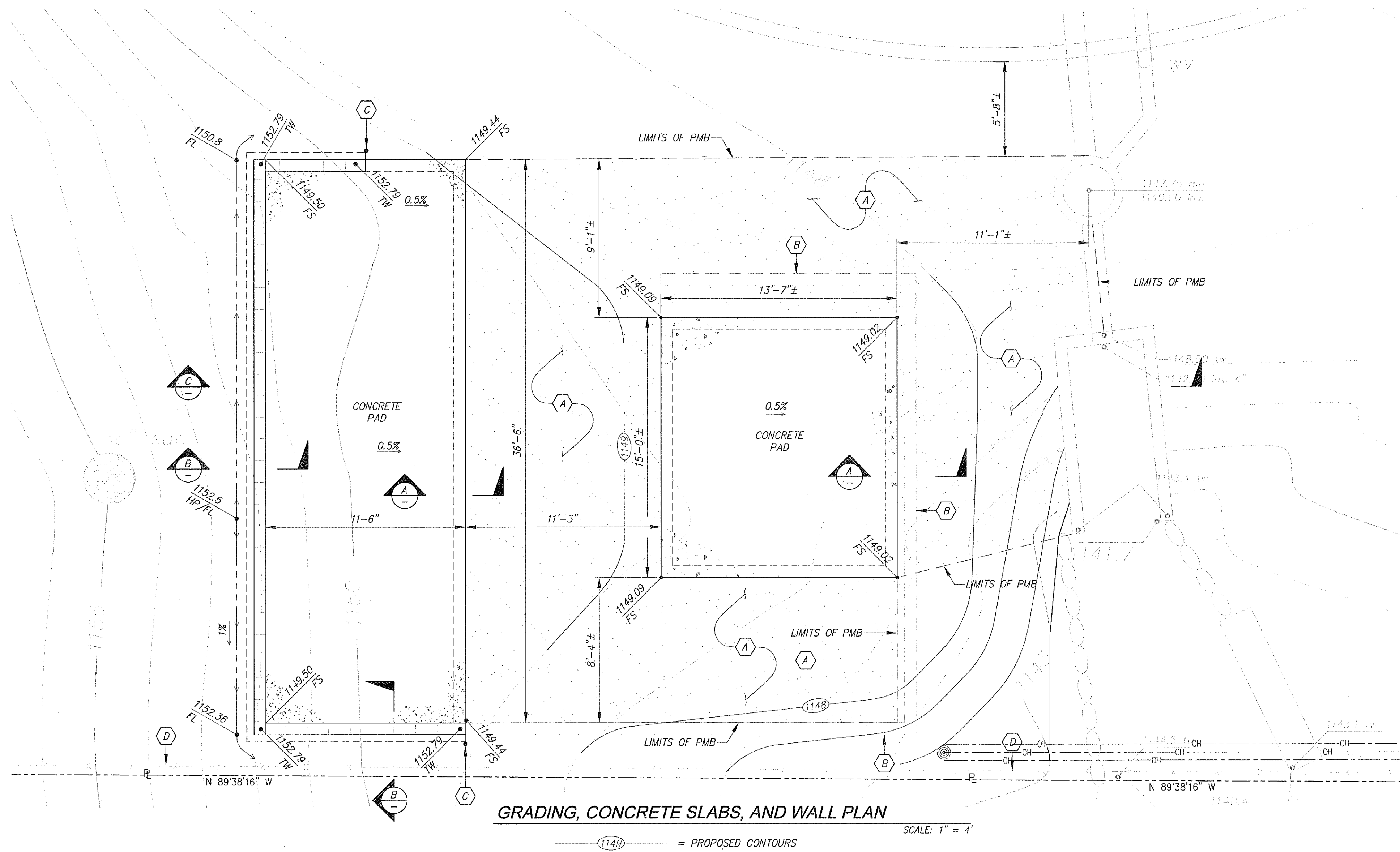


H INSTRUMENT DETAIL
NOT TO SCALE



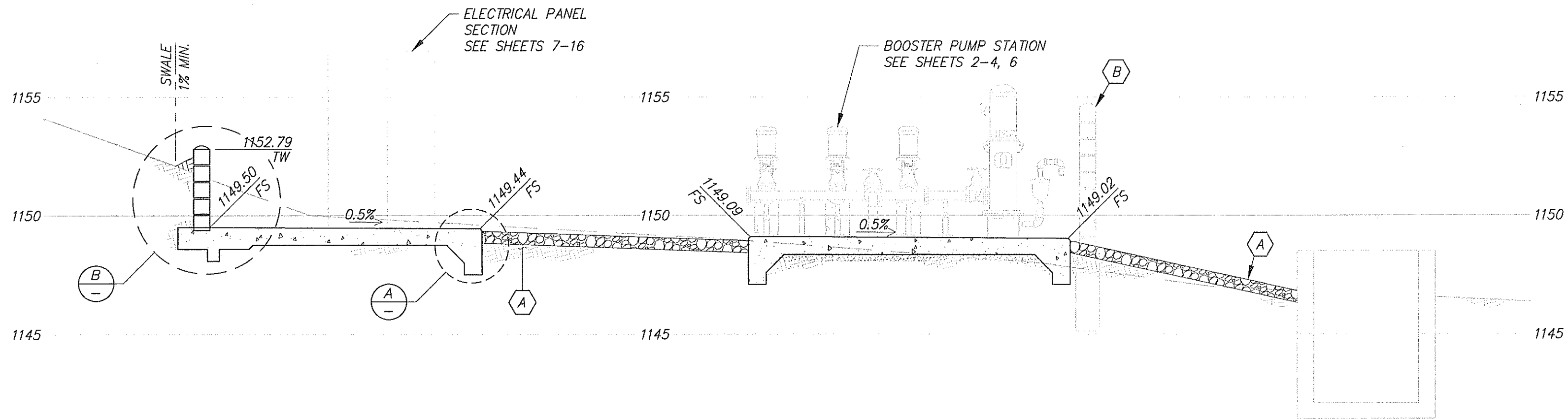
REVISIONS		BY	DATE	PREPARED BY: <div>WREA</div> <div>WATER RESOURCE ENGINEERING ASSOCIATES</div> <div>2300 ALESSANDRO DR, SUITE 215, VENTURA, CA 93001 • 805.653.7800 • 800-72-WATER • FAX: 805.653.0610</div> <div>LOUIS M. NAGY R.C.E. NO. 047648 EXP. 12-31-09</div>		VENTURA COUNTY WATERWORKS DISTRICT NO. 1		SPEC. NO. WW 09-06 PROJ. NO. 31886	ROSELAND BOOSTER PUMP STATION ELEVATIONS AND DETAILS	SHEET 4 OF 16 DRAWING NO. 112464
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SCALE: 1"=4'



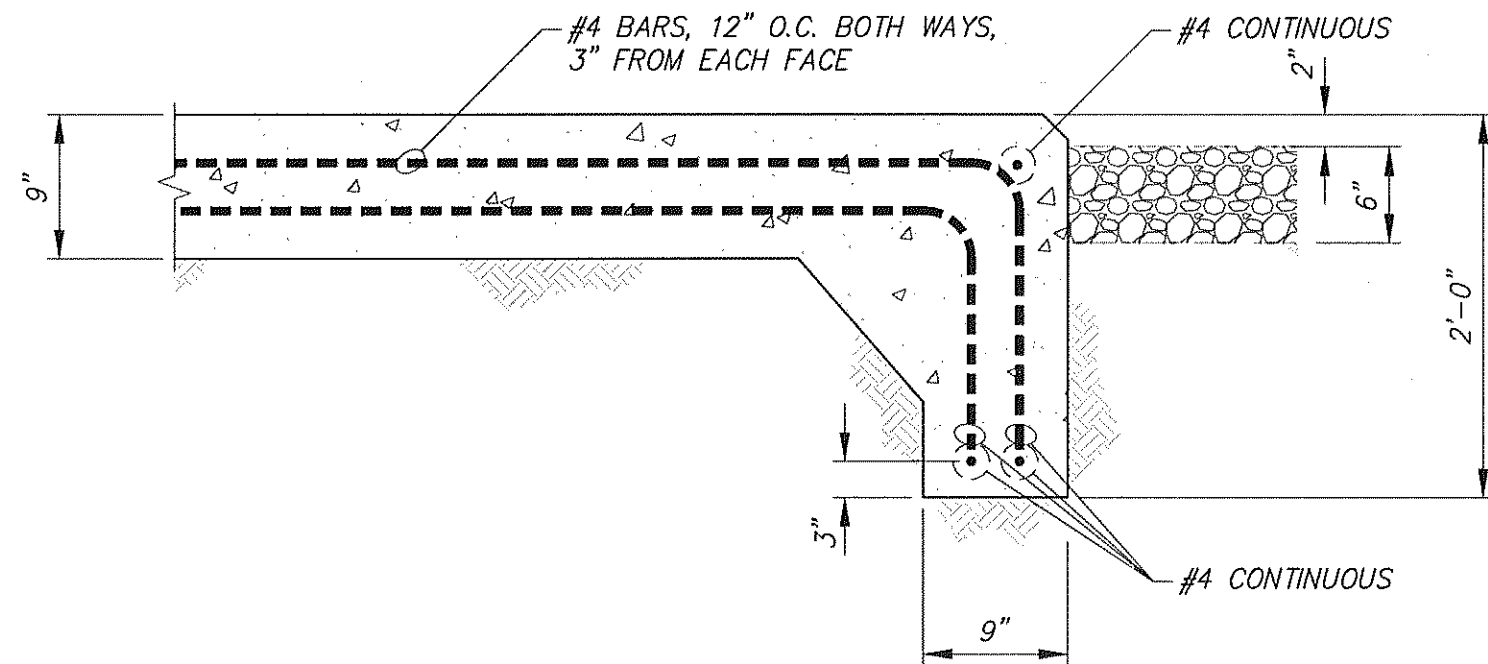
GRADING, CONCRETE SLABS, AND WALL PLAN

SCALE: 1" = 4'



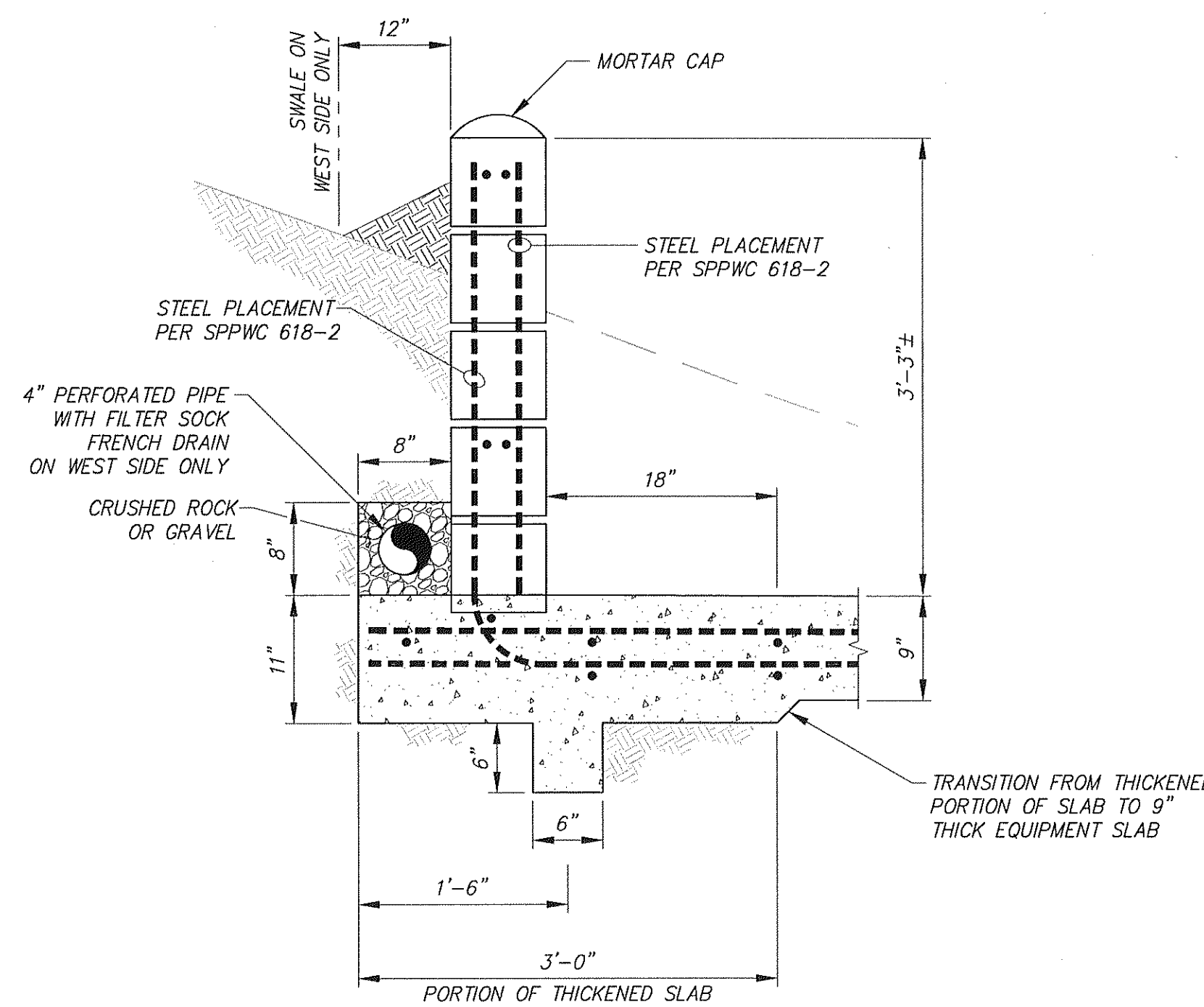
CONCRETE SLABS, AND WALL SECTION

SCALE: 1" = 4'



SLAB DETAIL

OMIT FOOTING IN WALL AREA NOT TO SCALE

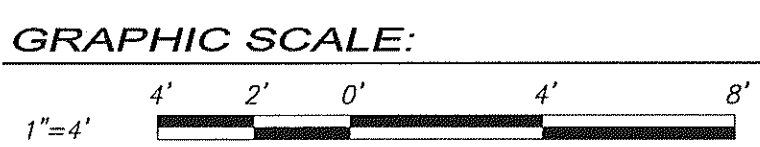


RETAINING WALL ELEVATION DETAIL

RETAINING WALL TO BE CONSTRUCTED PER SPPWC 2006 STANDARD PLAN 618-2 RETAINING WALL, TYPE B NOT TO SCALE

CONSTRUCTION NOTES

- INSTALL 6" THICK COMPACTED PMB SURFACE
- FUTURE REINFORCED CONCRETE BLOCK WALL. (NOT IN CONTRACT)
- DAYLIGHT OF FRENCH DRAIN
- PROTECT EXISTING FENCE IN PLACE, OR REPAIR AS NEEDED DURING COURSE OF CONSTRUCTION.



REVISIONS	BY	DATE

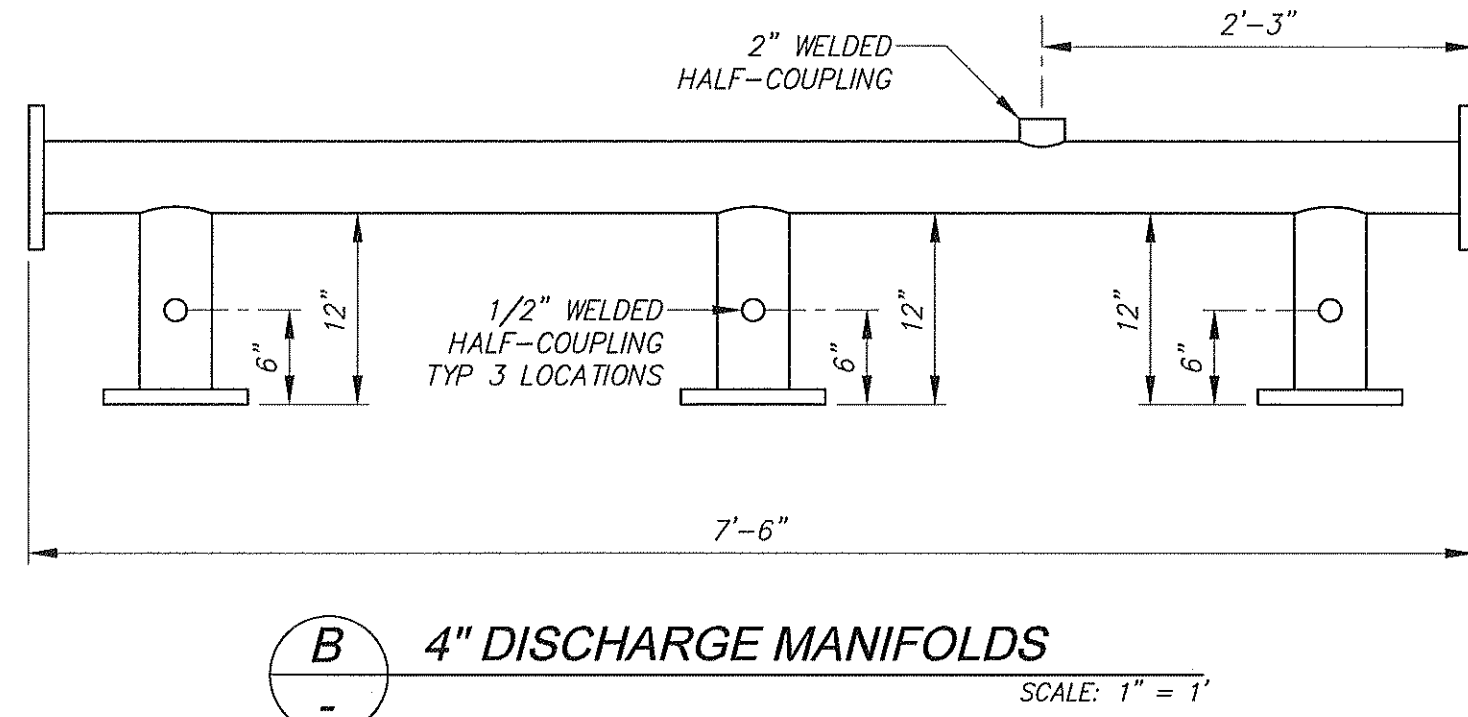
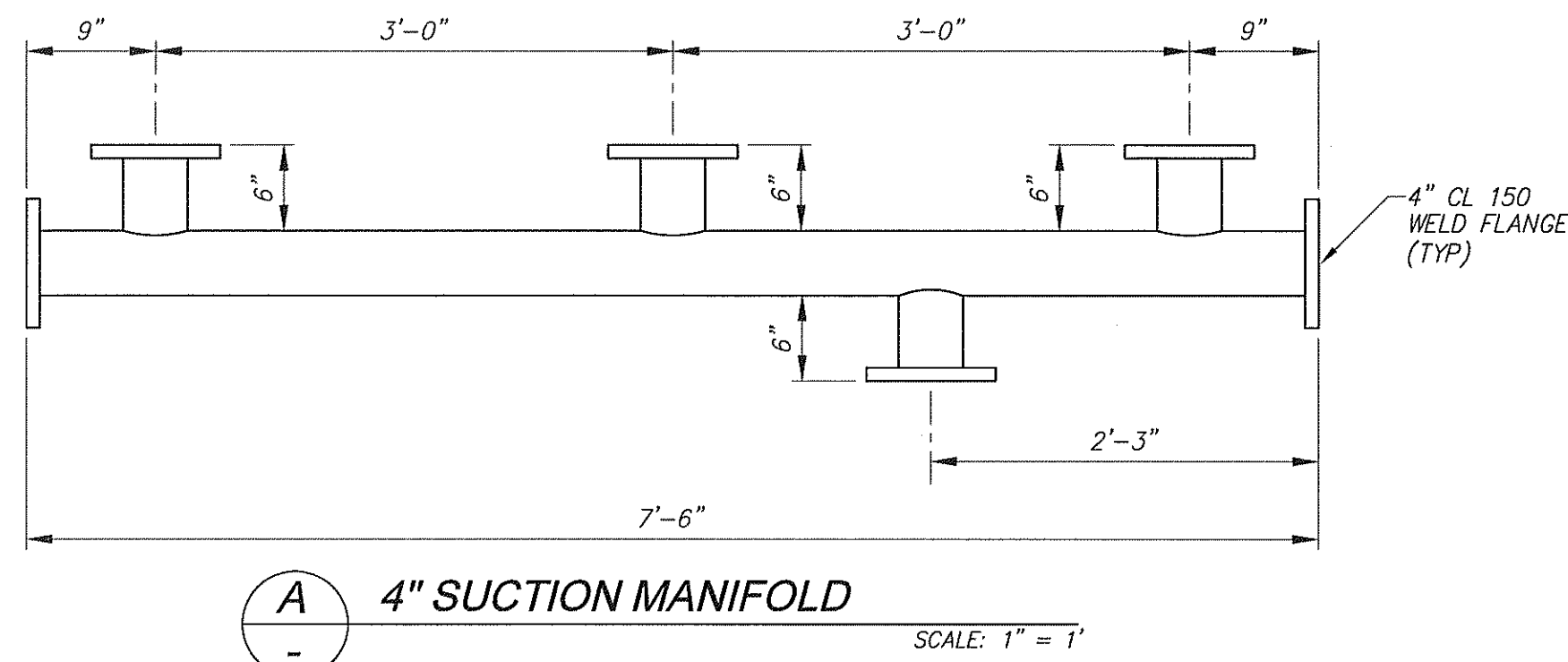
PREPARED BY: **WREA**
WATER RESOURCE ENGINEERING ASSOCIATES
2300 ALESSANDRO DR, SUITE 215, VENTURA, CA 93001 • 805.653.7900 • 800.25-WATER • FAX: 805.653.0610
LOUIS M. NAGY R.C.E. NO. 047648 EXP. 12-31-09 DATE

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

SPEC. NO.
WW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION
SITE GRADING PLAN

SHEET 5 OF 16
DRAWING NO. 112465



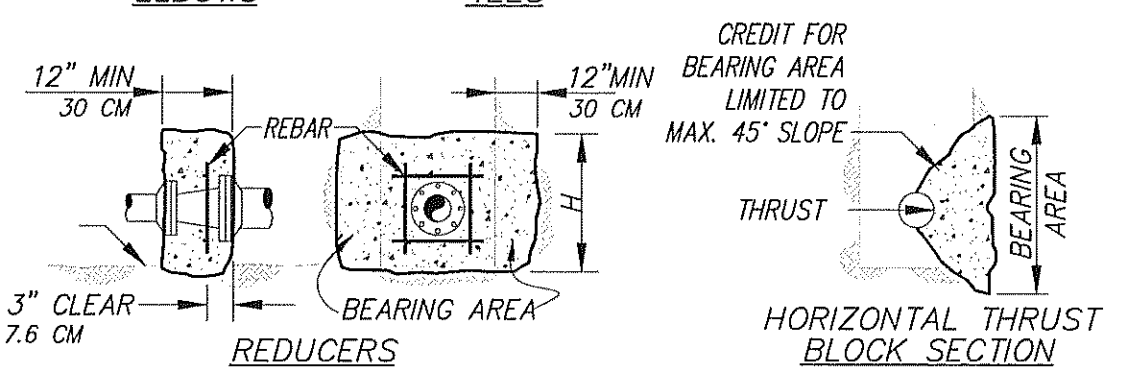
THRUST BLOCK SIZES

MINIMUM BEARING AREA IN SQUARE FEET AND SQUARE METERS OR CENTIMETERS (CM)
LOCATIONS

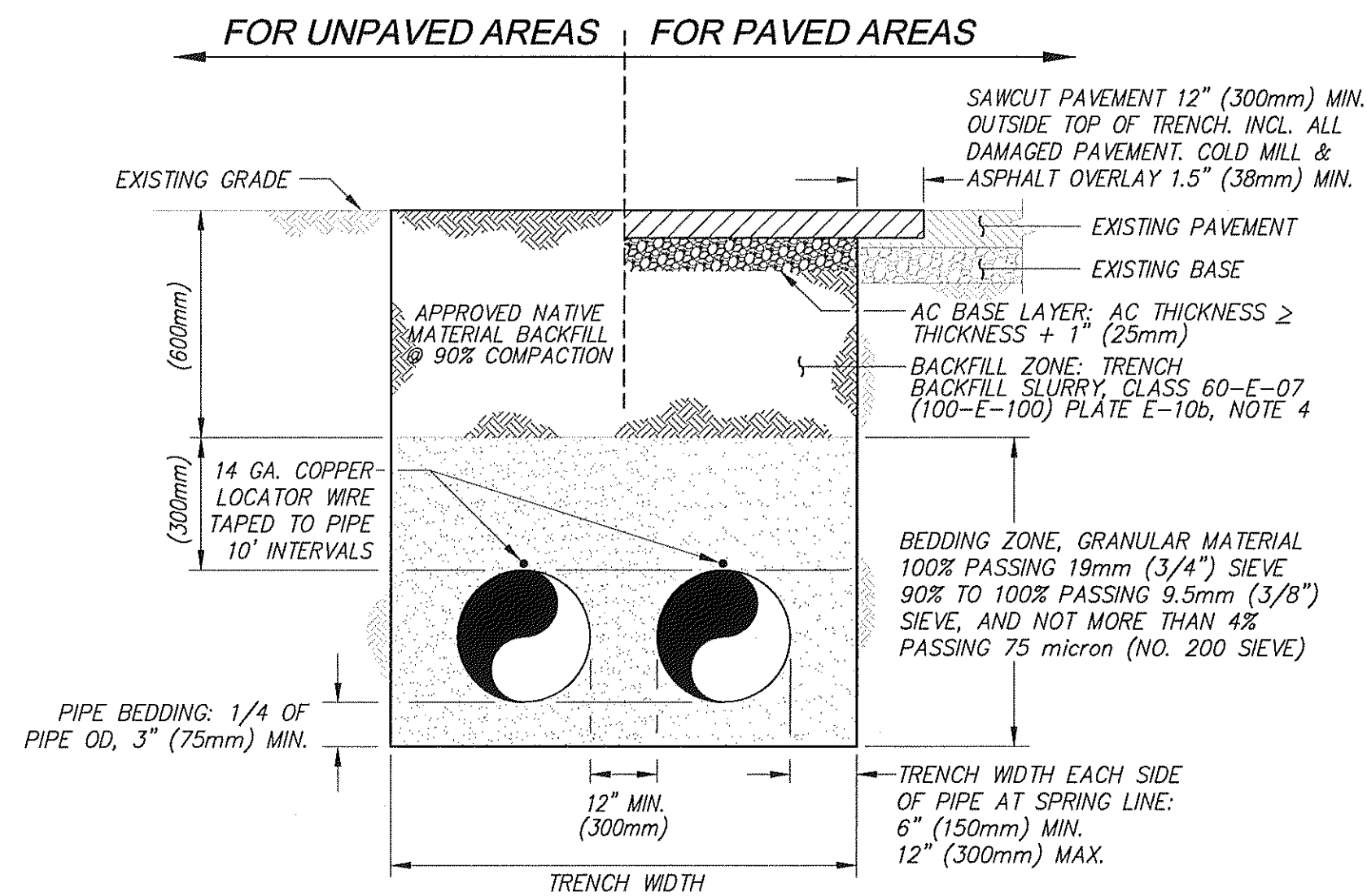
PIPE SIZE	ELBOWS					CAPPED END OR TEE	REDUCER H	REBAR
	90°	45°	22 1/2°	11 1/4°				
4"	.3	.2	.1	.1	.3	3	2'-0" 61 CM	No. 4
6"	.7	.4	.2	.1	.5	5	2'-0" 61 CM	No. 5
8"	1.4	.7	.4	.2	.9	9	2'-6" 76.2 CM	No. 5
10"	1.9	1.1	.6	.3	1.4	14	2'-6" 76.2 CM	No. 5

FOR MADE-UP FITTINGS OF INTERMEDIATE VALUES, USE THE NEXT HIGHER ANGLE VALUE.

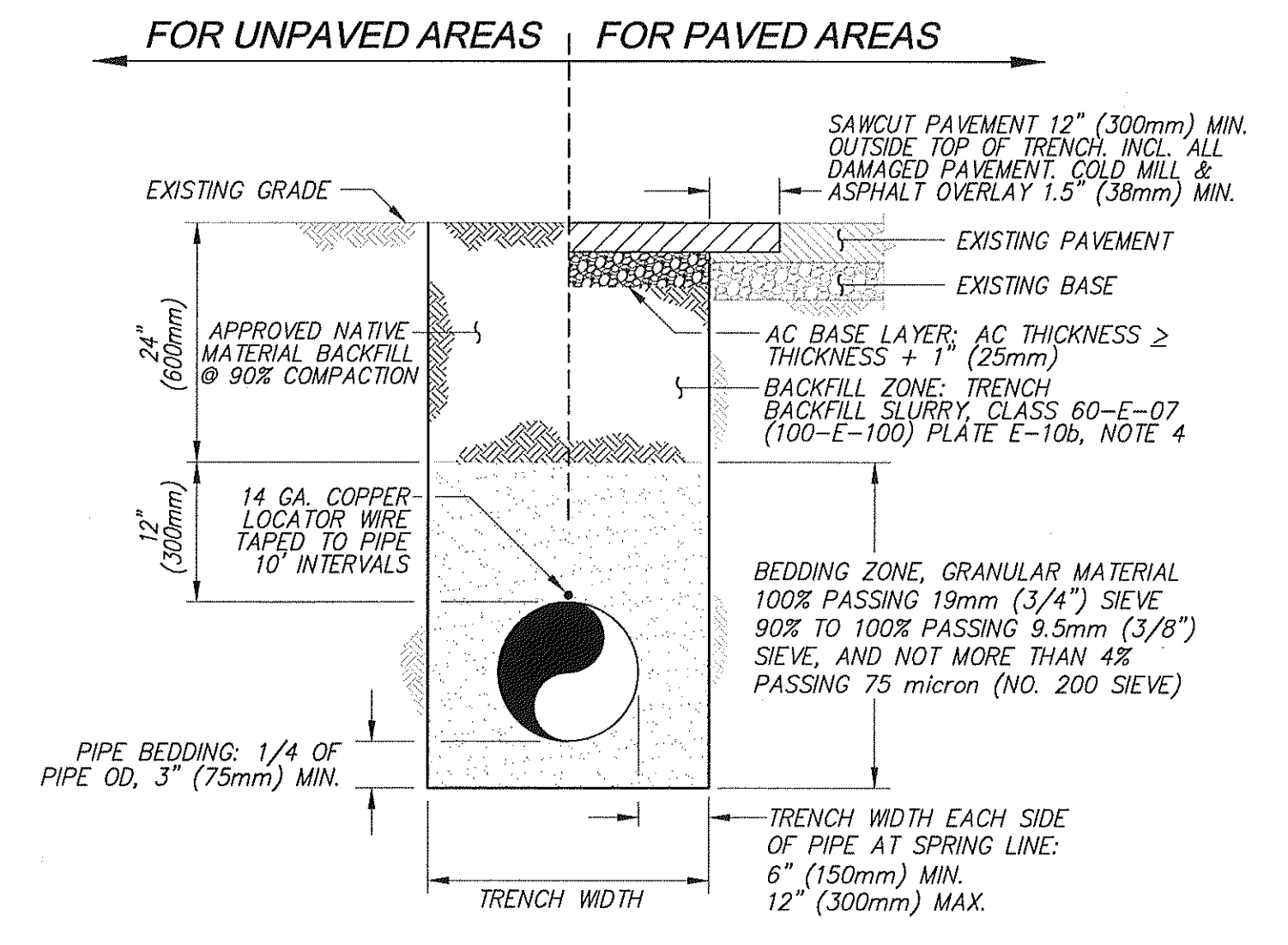
- NOTES:
- THRUST BLOCKS SHALL BEAR ON UNDISTURBED EARTH.
 - SPECIAL DESIGN REQUIRED FOR VERTICAL ANGLES GREATER THAN 45°.
 - CONCRETE TO EXTEND MIN. 12" (30 CM) ABOVE & 6" (15.2 CM) BELOW PIPE.
 - SIZES BASED ON 1500 PSF BEARING SOIL.



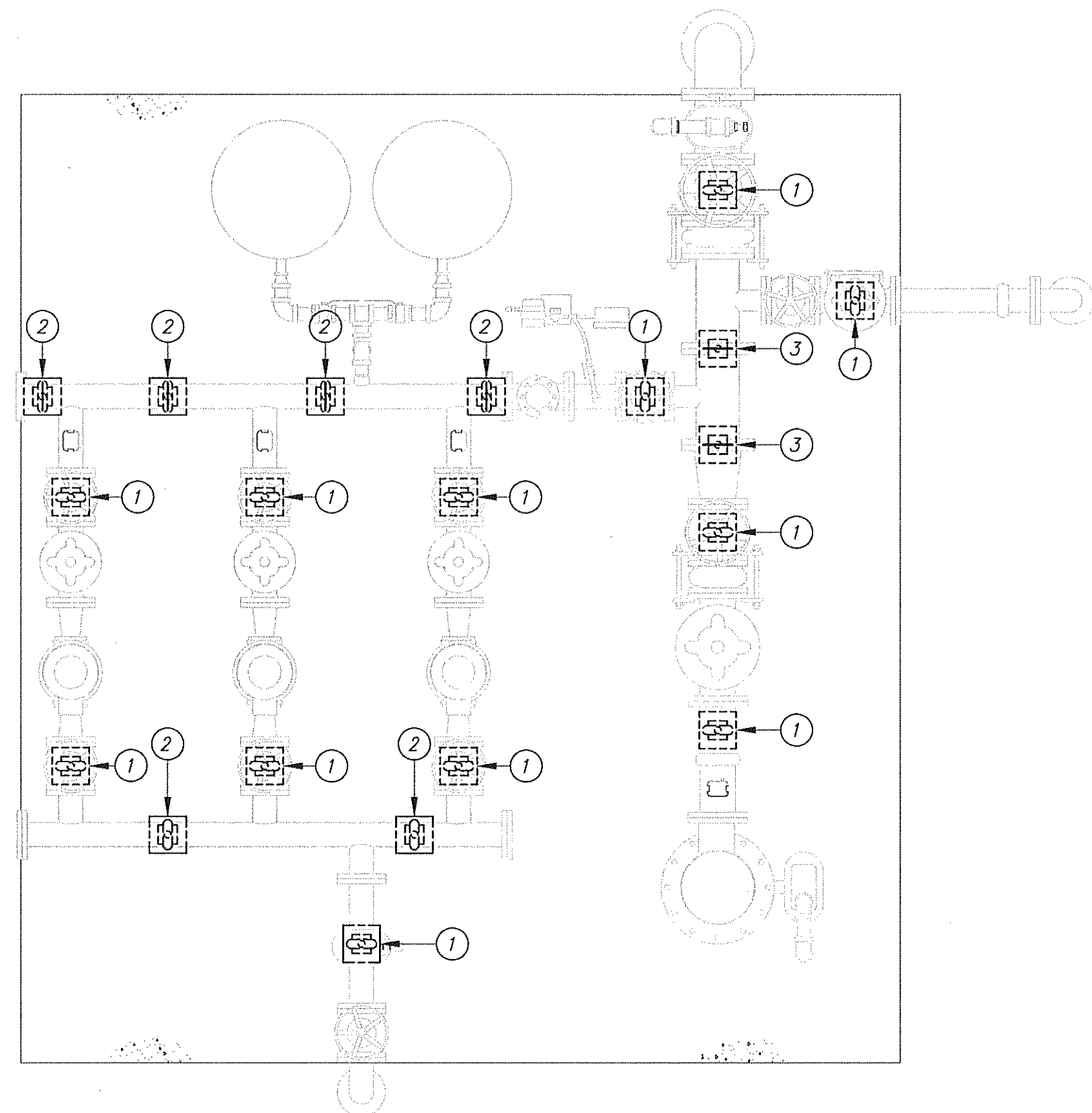
D THRUST BLOCK SCHEDULE & DETAILS
NOT TO SCALE



E TYPICAL TRENCH AND BACKFILL - DUAL PIPE
NOTE: COMPACTION TESTS REQUIRED FOR ALL TRENCHES
NOT TO SCALE



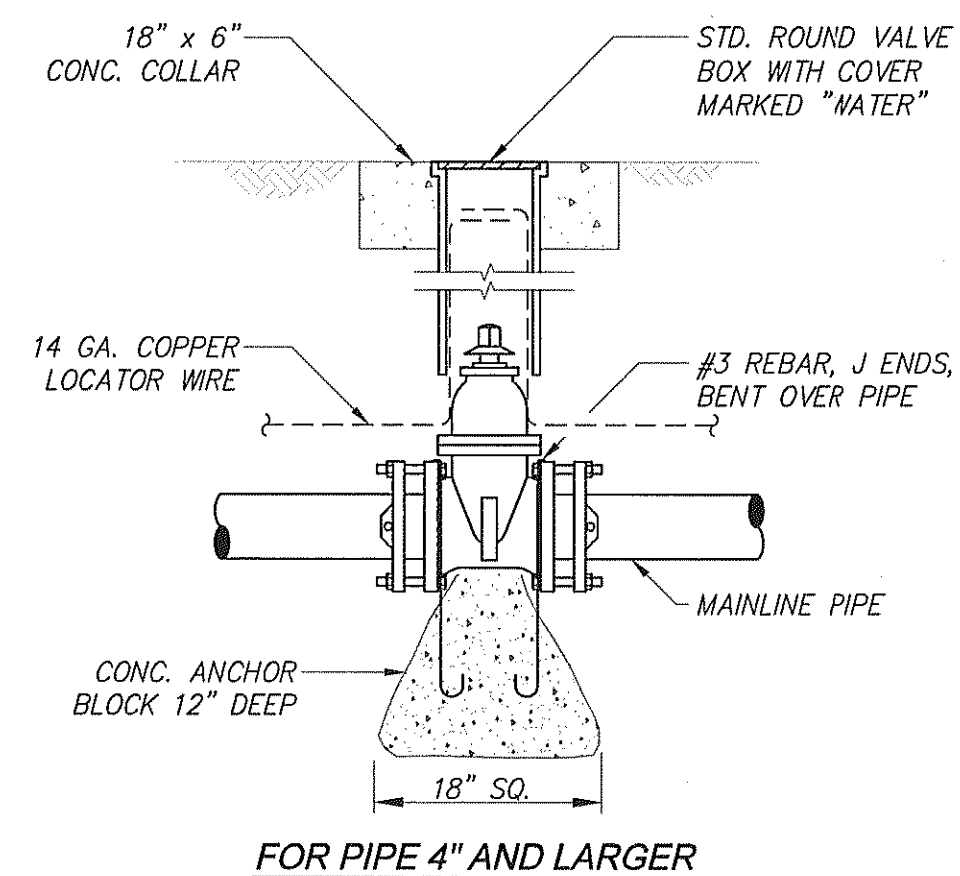
F TYPICAL TRENCH AND BACKFILL - SINGLE PIPE
NOTE: COMPACTION TESTS REQUIRED FOR ALL TRENCHES
NOT TO SCALE



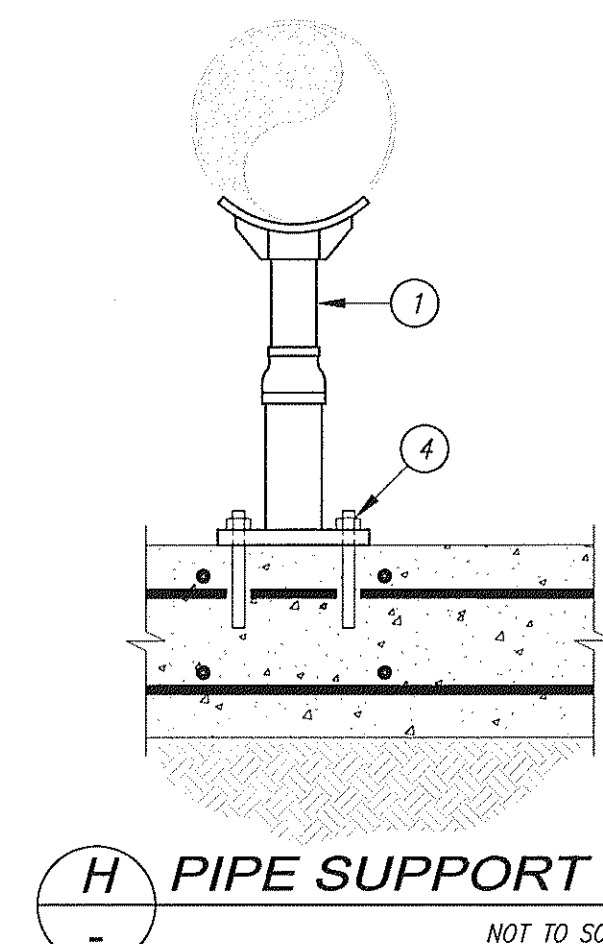
C PIPE SUPPORT LAYOUT DIAGRAM
SCALE: 1" = 2'

PIPE SUPPORT PARTS LIST

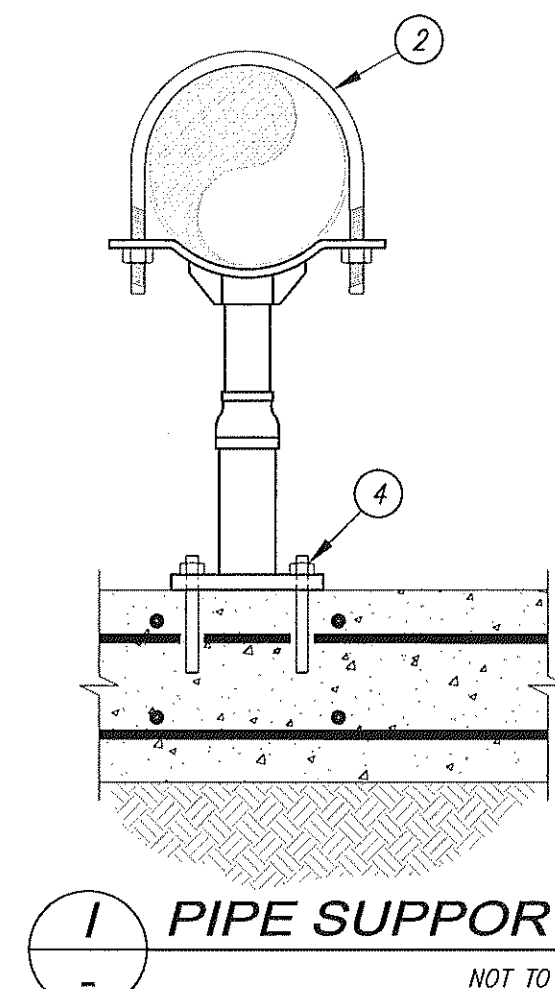
- PIPE SUPPORT: SADDLE TYPE
- PIPE SUPPORT: SADDLE AND U-BOLT
- PIPE SUPPORT: FLG TYPE
- 1/2" WEDGE ANCHORS



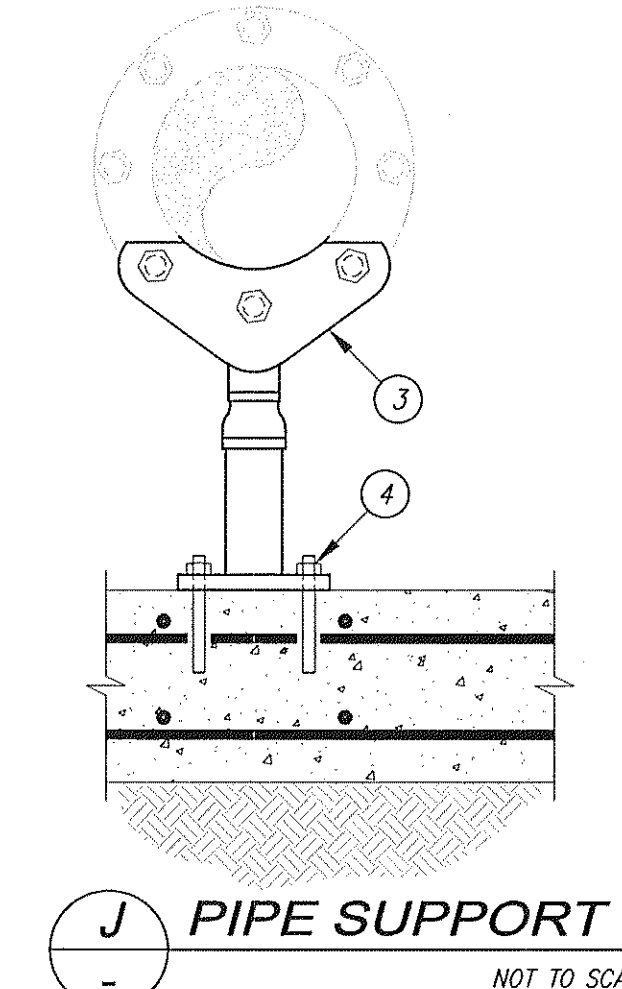
G BURIED GATE VALVES
NOT TO SCALE



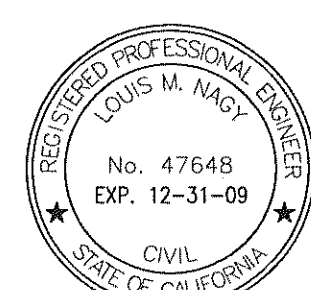
H PIPE SUPPORT
NOT TO SCALE



I PIPE SUPPORT
NOT TO SCALE



J PIPE SUPPORT
NOT TO SCALE



REVISIONS	BY	DATE

PREPARED BY: **WREA**
WATER RESOURCE ENGINEERING ASSOCIATES
2300 ALESSANDRO DR., SUITE 215, VENTURA, CA 93001 • 805.653.7900 • 800-25-WATER • FAX: 805.653.0610
LOUIS M. NAGY R.C.E. NO. 047648 EXP. 12-31-09 DATE

**VENTURA COUNTY
WATERWORKS DISTRICT NO. 1**

SPEC. NO.
WW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION

DETAILS

SHEET **6**
OF **16**
DRAWING NO.
112466

ELECTRICAL SYMBOL LIST				LIGHTING FIXTURE SCHEDULE						GENERAL NOTES		
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	TYPE	DESCRIPTION	FINISH	LAMP	REMARKS	MFR. & NO.			
	CONDUIT HOMERUN TO PANELBOARD. LETTER AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER(S).		GROUND		SINGLE LUMINAIRE POLE TOP MOUNTED RECTANGULAR 16" SQ. x 6.5" DEEP FIXTURE WITH ALUMINUM HOUSING AND GASKETED LENS DOOR, SQUARE CUT-OFF TYPE, PULSE START METAL HALIDE, POLE TOP MOUNTED LUMINAIRE WITH TEMPERED GLASS LENS, ADJUSTABLE KNUCKLE AND 2" FITTER FOR TENON MOUNTING. FIXTURE TO BE COMPLETE WITH ALL REQUIRED HARDWARE.	FACTORY FINISHED DARK BRONZE	(1) 400W. METAL HALIDE STANDARD MOGUL BASE	COMPLETE WITH HIGH POWER FACTOR BALLAST RATED FOR 240V. OPERATION, FIXTURE TO BE COMPLETE WITH MOUNTING 15" TALL BY 4" SQUARE STRAIGHT STEEL POLE, WITH 2" TENON ON TOP AND AND WEATHERPROOF G.F.I. RECEPTACLE. FACTORY BRONZE POWDER COAT FINISH. SEE SHEET E5 FOR ADDITIONAL REQUIREMENTS. EPA = 1.3 W/ ARM WEIGHT 26.5 lbs.	FIXTURE: RUUD LIGHTING #FS3640-M (240V.) POLE: HUBBELL LIGHTING #PS4R15CT OR APPROVED EQUAL			
	CONDUIT RUN, CONCEALED IN CEILING, WALLS OR UNDER FLOOR.		CONDUCTORS CONNECTED.									
	CONDUIT RUN, UNDERGROUND (P.V.C. SCHED. 40)		CURRENT TRANSFORMERS									
	CROSS LINES ON CONDUIT INDICATE NUMBER OF #12 AWG., 600V. CONTAINED THEREIN. TWO #12'S ARE INDICATED WHEN CROSS LINES ARE NOT SHOWN. NUMERAL AT CROSS LINES INDICATES THE SIZE OF CONDUCTOR(S) IN LIEU OF #12. CODE SIZE CONDUIT. CROSS LINE IN ELLIPSE INDICATES GROUND, #12 UNLESS NOTED OTHERWISE.		TRANSFORMER, DESCRIPTION AS NOTED.									
	CONDUIT RUN, EXPOSED, RIGID GALVANIZED STEEL.		DELTA-WYE TRANSFORMER CONNECTION.							1. THE CONTRACTOR SHALL SUPPLY POWER TO AND MAKE CONNECTIONS TO ALL MOTORS AND EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS AS SHOWN ON THE SINGLE LINE DIAGRAM, ELECTRICAL PLANS, AND THE MECHANICAL AND PLUMBING DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW THE DRAWINGS OF THE MECHANICAL AND PLUMBING SECTIONS FOR CONTROL DIAGRAMS, SIZE OF EQUIPMENT AND LOCATION. ALL CONDUIT, WIRING, CONTROL ITEMS, ETC. FOR MECHANICAL AND PLUMBING OPERATION SHALL BE PROVIDED. 2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSTALL CONDUIT AND/OR ELECTRICAL EQUIPMENT IN A LOCATION WHICH WILL CAUSE AS LITTLE INTERFERENCE AS POSSIBLE WITH THE INSTALLATION AND MAINTENANCE OF ANY OF THE MECHANICAL AND/OR PLUMBING DUCTS, LINES AND EQUIPMENT. 3. ALL FINAL CONNECTIONS TO OWNER-FURNISHED EQUIPMENT SHALL BE MADE BY THE CONTRACTOR UNLESS NOTED OTHERWISE. 4. THE NUMERAL(S) SHOWN AT TOP OF LIGHT FIXTURE IDENTIFICATION SYMBOL WHICH INDICATE NUMBER OF LIGHT FIXTURES REQUIRED SHALL NOT BE USED BY THE CONTRACTOR FOR DETERMINATION OF HOW MANY FIXTURES WILL BE INSTALLED. THE CONTRACTOR SHALL COUNT ALL LIGHT FIXTURES WHEREVER A FIXTURE OUTLET IS SHOWN ON DRAWINGS. 5. CONTRACTOR SHALL VISIT THE SITE AND THOROUGHLY FAMILIARIZE THEMSELVES WITH THE EXISTING CONDITIONS AND ACCEPT THE CONDITIONS UNDER WHICH HE WILL BE REQUIRED TO WORK. 6. WHEREVER A DISCREPANCY IN SIZE OF CONDUIT, WIRE OR EQUIPMENT ARISES ON THE DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING THE LARGEST SIZE OF THE ITEMS IN QUESTION. 7. SEE SINGLE LINE DIAGRAM FOR CONDUIT AND CONDUCTOR SIZES TO PANELS, TRANSFORMERS, MOTOR CONTROL CENTERS, MECHANICAL EQUIPMENT, ETC. FEEDERS TO PANELS MAY NOT BE SHOWN ON PLAN DRAWINGS, BUT IS A PART OF THIS CONTRACT. 8. ALL ITEMS RELATED TO THE ELECTRICAL POWER SERVICE SUCH AS SERVICE CONDUIT, CONDUCTORS, DUCTS, PAD MOUNT, RISERS, PULL BOXES, PERMITS, FEES, AND PROTECTIVE COVERING FROM SERVICE POLE LOCATION SHALL BE PROVIDED AND/OR INSTALLED AND SHALL BE VERIFIED WITH SERVING UTILITY. CONTRACTOR SHALL INSTALL SERVICE IN COMPLIANCE WITH THE SERVING UTILITY AND ENGINEER AND TO PAY ALL CHARGES LEVIED BY THE SERVING UTILITY FOR THIS SERVICE, EXCEPTING FIRST BILLING PERIOD. 9. CONTRACTOR SHALL BE RESPONSIBLE TO SUBMIT CONTROL DRAWINGS FOR THE BOOSTER PUMP CONTROL PANEL/SYSTEM TO THE ENGINEER FOR APPROVAL PRIOR TO INSTALLATION. 10. BY ACCEPTING THE CONTRACT, CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION, OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THE PROJECT EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER. 11. ALL CIRCUITS SHALL BE INSTALLED IN AN APPROVED RACEWAY. 12. ANY FLEXIBLE CONDUIT USED SHALL BE LESS THAN 6'-0" IN LENGTH AND MUST CARRY AN APPROVED SIZE GROUND WIRE. 13. THE CONTRACTOR SHALL SECURE AND PAY FOR PERMITS AND FEES FOR EXECUTION AND COMPLETION OF ELECTRICAL WORK, INCLUDING ALL CHARGES BY THE LOCAL GOVERNMENT AGENCIES. 14. THERE ARE WATER LINES AND OTHER UNDERGROUND UTILITIES IN THE AREAS WHERE TRENCHING FOR THE ELECTRICAL DUCT LINES ARE LOCATED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE ALL REPAIRS TO ANY UNDERGROUND UTILITY DAMAGED WHILE DIGGING ON THE SITE. 15. ALL ELECTRICAL EQUIPMENT IN THIS PROJECT SHALL BE U.L. LISTED. 16. ALL WIRING DESIGN IS BASED ON 75 DEGREE C CONDITIONS FOR COPPER CONDUCTORS OF TYPE THWN UNLESS OTHERWISE STATED. ELECTRICAL CONTRACTOR TO SIZE ALL WIRING NOT EXPLICITLY SHOWN ON DRAWINGS ACCORDING TO THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE (NEC) FOR THE SPECIFIC APPLICATION AND CONDITIONS. 17. ALL CONDUCTORS SHALL BE COPPER (MINIMUM SIZE #12 AWG UNLESS SPECIFICALLY NOTED OTHERWISE). ALL INDICATIONS OF NUMBER OF CONDUCTORS EXCLUDE GREEN WIRE GROUND CONDUCTOR WHICH MUST BE PROVIDED. CONTRACTOR SHALL SUBMIT SEISMIC ANCHORAGE CALCULATION IN CONFORMANCE W/CODE REQUIREMENTS. 18. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO CONFORM TO ALL LOCAL CODES AND ORDINANCES, THE STATE OF CALIFORNIA ELECTRICAL SAFETY ORDERS, THE NATIONAL ELECTRICAL CODE AND ANY ADDITIONAL JURISDICTION RELATING TO THE WORK. 19. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUIT, WIRE, JUNCTION BOXES, AND WATER TIGHT FLEXIBLE CONDUIT CONNECTIONS TO ALL ELECTRICAL EQUIPMENT AS IDENTIFIED ON THESE DRAWINGS. 20. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO CONFIRM THAT PROPOSED NEW EQUIPMENT IDENTIFIED ON THE CONTRACT DRAWINGS WILL FIT DIMENSIONALLY WITH EQUIPMENT IN LOCATION SHOWN ON DRAWINGS. 21. IN THE EVENT OF A CONFLICT OR INCONSISTENCY BETWEEN ITEMS INDICATED ON THE PLANS AND/OR SPECIFICATIONS, OR WITH CODE REQUIREMENTS, THE NOTE, SPECIFICATION, OR CODE WHICH PRESCRIBES AND ESTABLISHES THE MORE COMPLETE JOB OR HIGHER STANDARD SHALL PREVAIL. 22. ALL ELECTRICAL EQUIPMENT EXPOSED TO THE CLIMATE SHALL BE WEATHERPROOF.		
	CONDUIT STUB WITH CAP (THREADED FOR RIGID.)		UTILITY COMPANY SERVICE METER	ABBREVIATIONS								
	1/2"C. 3#12		VARIABLE FREQUENCY DRIVE									
	3/4"C. 4#12		AUTOMATIC TRANSFER SWITCH									
	3/4"C. 5#12		SOLENOID VALVE									
	3/4"C. 6#12		CIRCUIT BREAKER, AMPERE RATING AND NUMBER OF POLES AS NOTED.									
	3/4"C. 7#12		MOLDED CASE CIRCUIT BREAKER PLUG-IN TYPE, AMPERE RATING AND NUMBER OF POLES AS NOTED.									
	3/4"C. 8#12		COMBINATION MAGNETIC MOTOR STARTER WITH MOLDED CASE CIRCUIT BREAKER: FVNR=FULL VOLTAGE NON-REVERSING (U.N.O.) 2S= TWO SPEED; R=REVERSING; RV=REDUCED VOLTAGE AUTO TRANSFORMER; PW=PART WINDING. ROMAN NUMERAL INDICATES SIZE.									
	3/4"C. 9#12		MAGNETIC MOTOR STARTER: FVNR=FULL VOLTAGE NON-REVERSING (U.N.O.) 2S= TWO SPEED; R=REVERSING; RV=REDUCED VOLTAGE AUTO TRANSFORMER; PW=PART WINDING. ROMAN NUMERAL INDICATES SIZE.									
	PANEL DESIGNATION: FIRST LETTER INDICATES PANEL IDENTIFICATION; SECOND NUMERAL INDICATES VOLTAGE: 1=120/208V. 3ø, 4W.; 2=240V. 3ø, 3W.; 3=120/240V. 1ø, 3W.; 4=277/480V. 3ø, 4W.; 5=120/240V. 3ø, 4W.		FUSED SWITCH, AMPERE RATING AND NUMBER OF POLES AS NOTED									
	BRANCH CIRCUIT PANEL, SURFACE MOUNTED, MOUNT AT +6'-0" TO TOP.		CURRENT LIMITING FUSE, AMPERE RATING AND NUMBER OF POLES AS NOTED.									
	JUNCTION BOX		COPPERWELD GROUND ROD AND WELL, 3/4" x 10'									
	JUNCTION BOX WITH PIGTAIL INDICATING CONNECTION TO EQUIPMENT. SIZES OF CONDUIT AND CONDUCTORS SHALL BE SAME SIZE AS BRANCH CIRCUIT WIRING.		ELECTRICAL EQUIPMENT: CONTROL PANEL, DISTR. PANEL MOTOR CONTROL CENTER, MINI ZONE POWER UNIT, ETC. SEE PLANS FOR EQUIPMENT TYPE AND SPECIFICATIONS.									
	DUPLEX GROUNDING TYPE RECEPTACLE (+18" ABOVE FLOOR UNLESS NOTED OTHERWISE), D=DEDICATED CIRCUIT.		DETAIL									
	DOUBLE DUPLEX GROUNDING TYPE RECEPTACLE (+18" ABOVE FLOOR UNLESS NOTED OTHERWISE), D=DEDICATED CIRCUIT.		DIAGRAM									
	SINGLE POLE 20A. SWITCH, LOWER CASE LETTER AT BOTTOM INDICATES OUTLETS CONTROLLED, SYMBOL AT TOP INDICATES TYPE: K=KEY CONTROLLED; P=PILOT LIGHT; 2=TWO POLE; 3=THREE WAY; 4=FOUR WAY, MOUNT AT +48" TO TOP UNLESS NOTED OTHERWISE.		ELEVATION									
	SINGLE POLE MANUAL MOTOR STARTER SWITCH WITH OVERLOAD ELEMENT(S). 2=TWO POLE, 3=THREE POLE.		ENCLOSURE/ENCLOSED									
	DISCONNECT SWITCH, F=FUSED, RATING AS NOTED, MOUNT AT +4'-6" TO HANDLE UNLESS NOTED OTHERWISE.		EQUIPMENT									
	PUSHBUTTON STATION: LOS=LOCK OUT STOP; ST=START; H=HIGH; L=LOW; PL=PILOT LIGHT; S=STOP.		EXISTING									
	SWITCH FUNCTION AS NOTED: MAS=MECHANICAL ALTERNATOR SWITCH; DS=DOOR SWITCH; FL=FLOAT SWITCH; PES=PNEUMATIC ELECTRIC SWITCH; PS=PRESSURE SWITCH; MC=MENTOMARY CONTACT SWITCH; MOUNTING /S=SURFACE; /R=RECESSED; /P=PANEL.		EXPLOSION PROOF									
	THREE PHASE FRACTIONAL OR INTEGRAL HORSEPOWER MOTOR, NUMBER IN LIEU OF "M" INDICATES HORSEPOWER RATING.		FREQUENCY									
	SINGLE PHASE, FRACTIONAL OR INTEGRAL HORSEPOWER, MOTOR.		FLOW SWITCH									
	TELEPHONE CONDUIT RUN, 3/4"C.O.: T1=1"C.O.; T2=1-1/4"C.O.; T3=1-1/2"C.O.; T4=2"C.O.		FULL VOLTAGE NON REVERSING									
	TELEPHONE OUTLET, (+18" ABOVE FLOOR UNLESS NOTED OTHERWISE.) LETTER(S) INDICATE TYPE: P=PAY STATION; W=WALL MOUNTED (+54" ABOVE FLOOR UNLESS NOTED OTHERWISE); H=HOUSE PHONE.		GROUND FAULT TRIP									
	MOLDED CASE, ENCLOSED, FLUSH MOUNTED CIRCUIT BREAKER, AMPERES & POLES AS NOTED.		GALVANIZED GROUND FAULT INTERRUPTER									
	EXISTING EQUIPMENT TO REMAIN.		GROUND									
	NEW EQUIPMENT.		GROUND									
STAMP				PREPARED BY: W.A.Doby engineering inc. consulting electrical engineers								
Underground Service Alert				35225 Avenue "A", Suite 301 Yucaipa, California 92399 (909) 797-5187 FAX (909) 797-5180 E-MAIL wadoby@EARTHLINK.NET								
Call: TOLL FREE				VENTURA COUNTY WATERWORKS DISTRICT NO. 1								
1-800				SPEC. NO. WW 09-06								
227-2600				PROJ. NO. 31886								
TWO WORKING DAYS BEFORE YOU DIG				ROSELAND BOOSTER PUMP STATION ELECTRICAL GENERAL INFORMATION								
REVISIONS				SHEET REFERENCE NO. E1								
BY				SHEET 7								
DATE				OF 16								
				DRAWING NO. 112467								

SYMBOL	DESCRIPTION	QNTY
1	NEW UTILITY SERVICE POLE, 25FT. TALL WOOD. FURNISH NEW POLE, GROUNDING, AND INSTALLATION PER SCE STANDARD DRAWINGS AND SPECS. VERIFY ALL SERVICE EQUIPMENT AND INSTALLATION WITH LOCAL S.C.E. SERVICE PLANNER PRIOR TO INSTALLATION. FURNISH GUIDE WIRE SUPPORTS AS DIRECTED BY SCE SERVICE DRAWINGS.	1
2	NEW GROUND ROD AND GROUND WELL - TYPICAL FOR 8 3/4"DIA. x 10'L COPPERWELD GROUND ROD SEE DETAIL ON SHEET E10	8
3	NEW 200A., METERED MAIN OVERHEAD SERVICE ENTRANCE PANEL "MSP" 200A., 277/480V., 3PH., 4W. 42KAIC BUSSING, OUTDOOR, NEMA 3R SCE PULL SECTION, METER SOCKET WITH TEST & BYPASS SWITCH, WITH 200A. 3P. MAIN CIRCUIT BREAKER, AND POLE MOUNTING HARDWARE, CONDUIT RISER AND WEATHERHEAD. MOUNT ENCLOSURE ON UTILITY POLE. SEE DETAILS AND ELEVATION ON SHEET E10 FOR ADDITIONAL REQUIREMENTS	1
4	NEW 40HP BOOSTER PUMP - 480V., 3ø, 3W. MOTOR CONNECTION PROVIDE LIQUIDTIGHT FLEX CONDUIT CONNECTIONS TO MOTOR LEAD BOX, WINDING HEATER, AND TEMPERATURE SENSOR CONTROLLER AS INDICATED ON SINGLE LINE AND CONTROL DRAWINGS.	1
5	NEW 7.5HP BOOSTER PUMP - 480V., 3ø, 3W. MOTOR CONNECTION PROVIDE LIQUIDTIGHT FLEX CONDUIT CONNECTIONS TO MOTOR LEAD BOX, WINDING HEATER, AND TEMPERATURE SENSOR CONTROLLER AS INDICATED ON SINGLE LINE AND CONTROL DRAWINGS.	3
6	NEW 200A., AUTOMATIC TRANSFER SWITCH IN OUTDOOR NEMA 3R ENCL. 400A., 277/480V., 3PH., 3 POLE, 42KAIC, WITH GROUND LUG KIT, AND INSTALLED WITHIN NEMA 3R SECTION IN MCC LINE-UP CONCRETE PAD AND 200A. CABLING REQUIRED. SEE EQUIPMENT DETAILS AND ELEVATION ON SHEET E9 FOR ADDITIONAL REQUIREMENTS. SEE SINGLE LINE DIAGRAM ON SHEET E4 FOR ADDITIONAL UNDERCABINET CONDUITS THAT ARE REQUIRED BUT MAY NOT BE SHOWN ON PLAN.	1
7	NEW 200A., 480V., 3PH., 3W. MCC SECTION WITH 200A., 3P. MAIN BREAKER, 50A. 2P. BREAKER FOR 15KVA XFMR IN OUTDOOR STANDING NEMA 3R ENCLOSURE INSTALLED WITHIN MCC LINE-UP. SEE ELEVATION ON SHEET E9 CONCRETE PAD AND GROUNDING REQUIRED. SEE EQUIPMENT DETAILS AND ELEVATION ON SHEET E10 FOR ADDITIONAL REQUIREMENTS.	1
8	NEW 7.5HP 480V. PUMP VFD STARTER ENCLOSURE, OUTDOOR, NEMA 3R ENCLOSURE, COMPLETE WITH 20A. 3P. CIRCUIT BREAKER, 3% LINE REACTORS, INPUT FUSING, BYPASS CONTACTOR, CONTROL RELAYS, SWITCHES, INDICATOR LIGHTS, AND MOTOR PROTECTION MODULE. SEE SINGLE LINE DIAGRAM ON SHEET E4 FOR ADDITIONAL REQUIRED UNDER CABINET CONDUITS THAT MAY NOT BE SHOWN ON PLAN. SEE CONTROL DIAGRAM ON SHEET E6 FOR ADDITIONAL REQUIREMENTS. CONCRETE PAD REQUIRED, SEE SHEET E9 FOR EQUIPMENT ELEVATIONS. SEE SHEET E10 FOR PAD DETAILS.	3
9	NEW 40HP 480V. PUMP SOFT STARTER ENCLOSURE, OUTDOOR, NEMA 3R COMPLETE WITH 90A. 3P. CIRCUIT BREAKER, BYPASS & ISOLATION CONTACTORS, CONTROL RELAYS, SWITCHES, INDICATOR LIGHTS, AND MOTOR PROTECTION MODULE. SEE SINGLE LINE DIAGRAM ON SHEET E4 FOR ADDITIONAL REQUIRED UNDER CABINET CONDUITS THAT MAY NOT BE SHOWN ON PLAN. SEE CONTROL DIAGRAM ON SHEET E6 FOR ADDITIONAL REQUIREMENTS. CONCRETE PAD REQUIRED, SEE DETAILS ON SHEET E10. SEE SHEET E9 FOR EQUIPMENT ELEVATIONS.	1
10	PUMP CONTROL PANEL INSTALLED WITHIN OUTDOOR, NEMA 3R ENCLOSURE IN MCC SECTION LINE-UP. CABINET SECTION TO CONTAIN CONTROL RELAYS, SWITCHES, INDICATOR LIGHTS, AND TERMINAL BLOCKS, AND ASSOCIATED ELECTRICAL CONTROL EQUIPMENT. SEE SINGLE LINE DIAGRAM ON SHEET E4 FOR ADDITIONAL REQUIRED UNDER CABINET CONDUITS THAT MAY NOT BE SHOWN ON PLAN. SEE CONTROL DIAGRAM ON SHEET E7 FOR ADDITIONAL REQUIREMENTS. CONCRETE PAD REQUIRED, SEE DETAILS ON SHEET E10. SEE SHEET E9 FOR EQUIPMENT ELEVATIONS.	1
11	TELEMETRY RTU PANEL INSTALLED WITHIN OUTDOOR, NEMA 3R ENCLOSURE IN MCC SECTION LINE-UP. CABINET SECTION TO CONTAIN PLC, RADIO TRANSCEIVER, POWER SUPPLIES, CONTROL RELAYS, TERMINAL BLOCKS, AND OTHER ASSOCIATED ELECTRICAL CONTROL EQUIPMENT. SEE TELEMETRY PLC CONTROL DIAGRAM ON SHEET E8 FOR ADDITIONAL REQUIRED EQUIPMENT AND SIGNALS. CONCRETE PAD REQUIRED, SEE DETAILS ON SHEET E10. SEE SHEET E9 FOR EQUIPMENT ELEVATIONS.	1
12	NEW 100A., 120/240V., 1PH., 3W., 24 CIRCUIT INTERIOR PANELBOARD SECTION 75A., 2P. MAIN BREAKER AND 15KVA XFMR INSTALLED WITHIN OUTDOOR, FREE STANDING NEMA 3R ENCLOSURE INSTALLED WITHIN MCC LINE-UP CONCRETE PAD AND GROUNDING REQUIRED. SEE EQUIPMENT ELEVATIONS ON SHEET E9. SEE DETAILS ON SHEET E10 FOR ADDITIONAL REQUIREMENTS.	1
13	PUMP HIGH DISCHARGE PRESSURE SWITCH SWITCH HAS NO CONTACT - CONTACT CLOSURES ON PRESSURE INCREASE	4
14	VALVE CLOSED LIMIT SWITCH CONNECTION - SW. HAS NC CONTACT CONTACT TO OPEN WHEN VALVE IS SEATED - W/ ARM PUSHING IN SW.	4
15	MOTOR TEMPERATURE CONTROLLER CONNECTION (120VAC POWER & SIGNAL)	4
16	PUMP LOW SUCTION PRESSURE SWITCH - MOUNTED ON PUMP CAN SWITCH HAS NC CONTACT - CONTACT OPENS ON PRESSURE INCREASE	4
17	MOTOR WINDING HEATER CONNECTION (120VAC).	4
18	DISCHARGE PRESSURE TRANSDUCER (4-20mA OUTPUT)	1
19	GROUND BOND CONNECTION TO METAL WATER PIPE	1
20	STANDBY GENERATOR WITH WEATHERPROOF SOUND ATTENUATED ENCLOSURE, 100KW WITH SUB BASE FUEL TANK & BASE ISOLATORS, EXH. SILENCER, JACKET WATER HEATER, DC BATTERY CHARGER, & LUGGED TERMINAL ENCLOSURE. SITE RATED MAX - 100KW / 125KVA AT 277/480V., 3PH., 3W.	1
21	NEW LIGHTING STANDARD AND CONCRETE FOOTING. SEE DETAIL ON SHEET E10 FOR ADDITIONAL REQUIREMENTS.	3
22	REMOVABLE TRAFFIC PROTECTIVE BARRIER - PIPE BOLLARD SEE DETAIL ON SHEET E10 FOR REQUIREMENTS	14
23	NEW UTILITY POLE SECONDARY (1) 4" SCHED. 80 PVC CONDUIT RISER WITH WEATHERHEAD. SEE DETAIL ON SHEET E10 FOR ADDITIONAL REQUIREMENTS.	1
24	EXISTING PRESSURE TRANSDUCER CONNECTION TRANSDUCER MOUNTED ABOVE GRADE NEAR SIDE OF EXISTING RESERVOIR	1
25	20A., 2P. 250VAC WP LIGHT SWITCH WITH WP CAST DEVICE BACK BOX AND 4" SQ. STRUT SUPPORT MOUNTED VERTICAL WITH POST BASE (LOC. AT +50' ABOVE GRADE)	1
26	NEW 480V. 3PH. VOLT S.C.E. OVERHEAD SECONDARY CONDUCTORS OVER HEAD CONDUCTORS AND INSTALLATION BY SCE	1
27	EXISTING SCE SINGLE PHASE SERVICE PANEL (#8-736-721) AND POLE TO BE REMOVED PANEL SHALL BE REMOVED AFTER BOOSTER STATION SERVICE IS ENERGIZED AND NEW SIGNAL CONNECTIONS ARE MADE TO EXIST. RESERVOIR EQUIPMENT	1
28	FURNISH NEW ANTENNA RISER AND ANTENNA. CONTRACTOR SHALL FURNISH (1) 1-1/2" RGS CONDUIT RISER MOUNTED TO LADDER AND ROUTED UP TANK AND TERMINATING 5FT. ABOVE TOP OF TANK WITH WEATHERHEAD. SEE DETAIL ON SHEET E10	1

STAMP

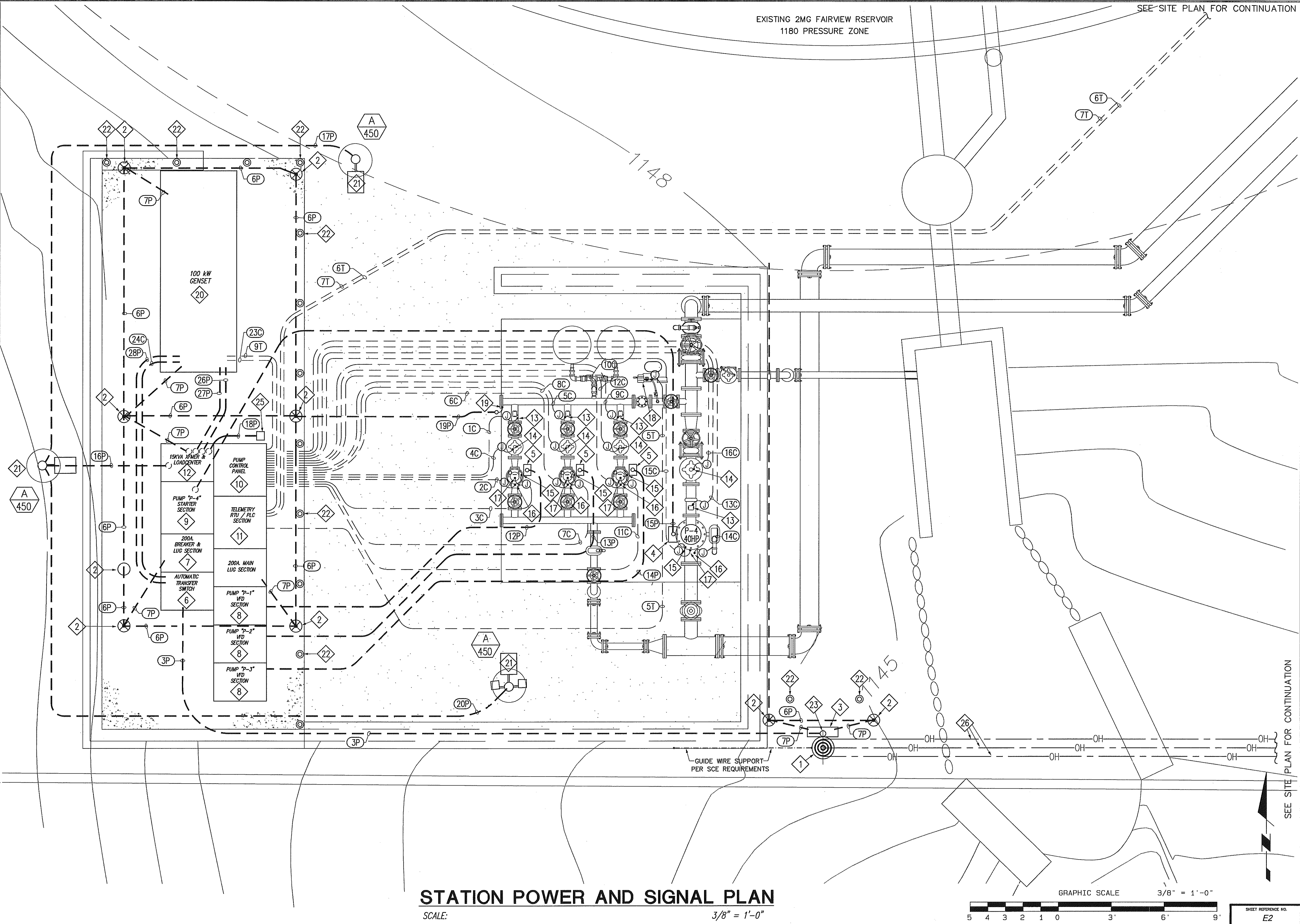
Underground Service Alert

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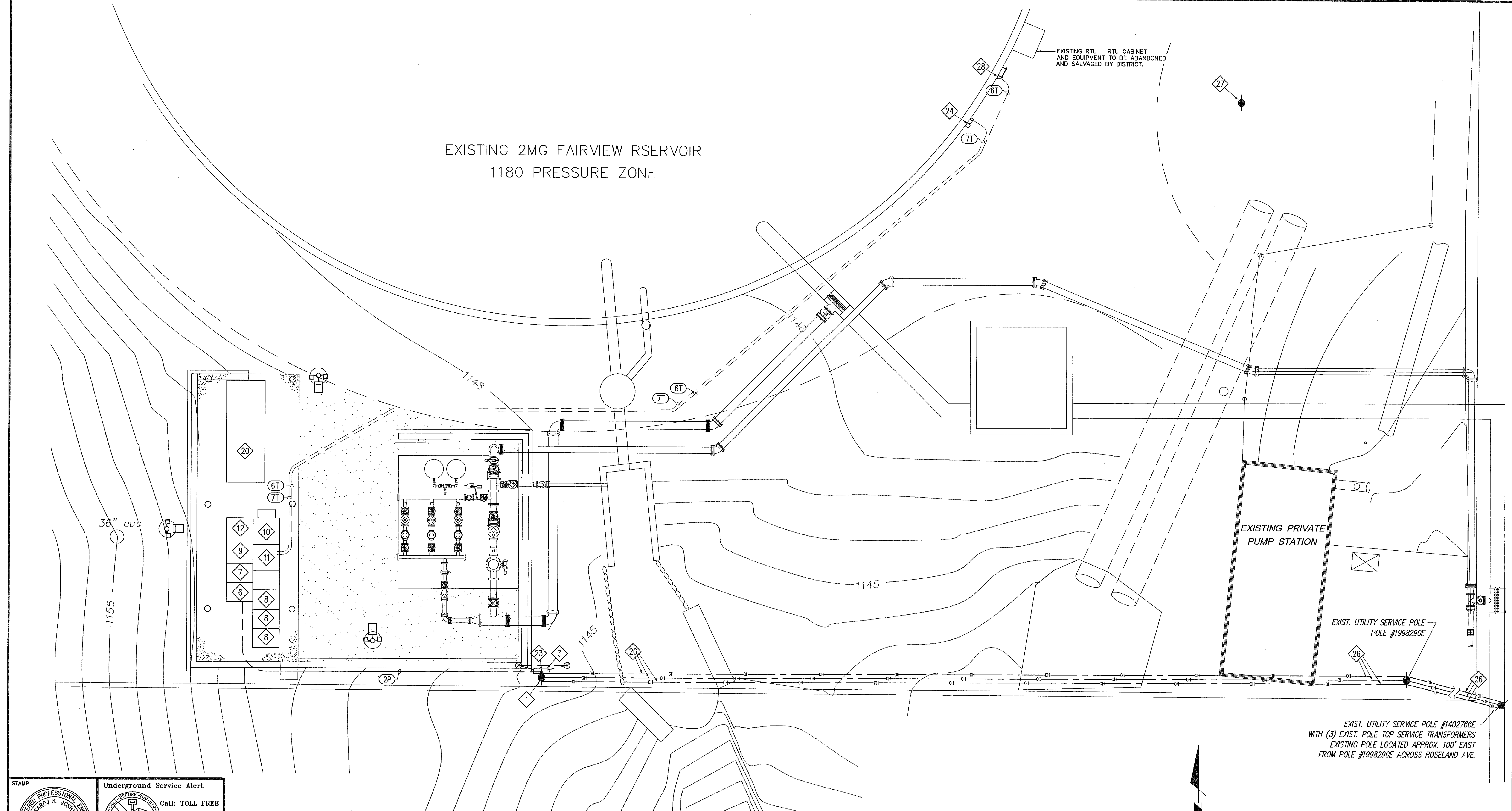
1-800

227-2600

TWO WORKING DAYS BEFORE YOU DIG



REVISIONS	BY	DATE	<div>PREPARED BY: W.A. DOBY engineering inc. consulting electrical engineers</div> <div>SAROJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE</div>	<div>35225 Avenue "A", Suite 301 Yucaipa, California 92399 (909) 797-5187 FAX (909) 797-5180 E-MAIL wadoby@EARTHLINK.NET</div> <div>VENTURA COUNTY WATERWORKS DISTRICT NO. 1</div>	<div>SPEC. NO. <u>WW 09-06</u></div> <div>PROJ. NO. <u>31886</u></div>	<div>ROSELAND BOOSTER PUMP STATION</div> <div>ELECTRICAL STATION POWER AND SIGNAL PLAN</div>	<div>SHEET <u>8</u> OF <u>16</u></div> <div>DRAWING NO. <u>112468</u></div>



STAMP

REGISTERED PROFESSIONAL ENGINEER
SAROJ K. JOSHI
No. E17931
Exp. 9/30/10
ELECTRICAL
STATE OF CALIFORNIA

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227-2600

TWO WORKING DAYS BEFORE YOU DIG

REVISIONS	BY	DATE

ELECTRICAL SITE PLAN

SCALE: 1" = 5'-0"

PREPARED BY: **W.A. DOBY**
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consulting electrical engineers

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FAX (909) 797-5180
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SAROJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE

FOR LEGEND:
REFER TO KEYNOTES
ON SHEET E2

**VENTURA COUNTY
WATERWORKS DISTRICT NO. 1**

SPEC. NO.
WW 09-06

PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION

ELECTRICAL SITE PLAN

SCALE: 1 INCH = 5 FEET

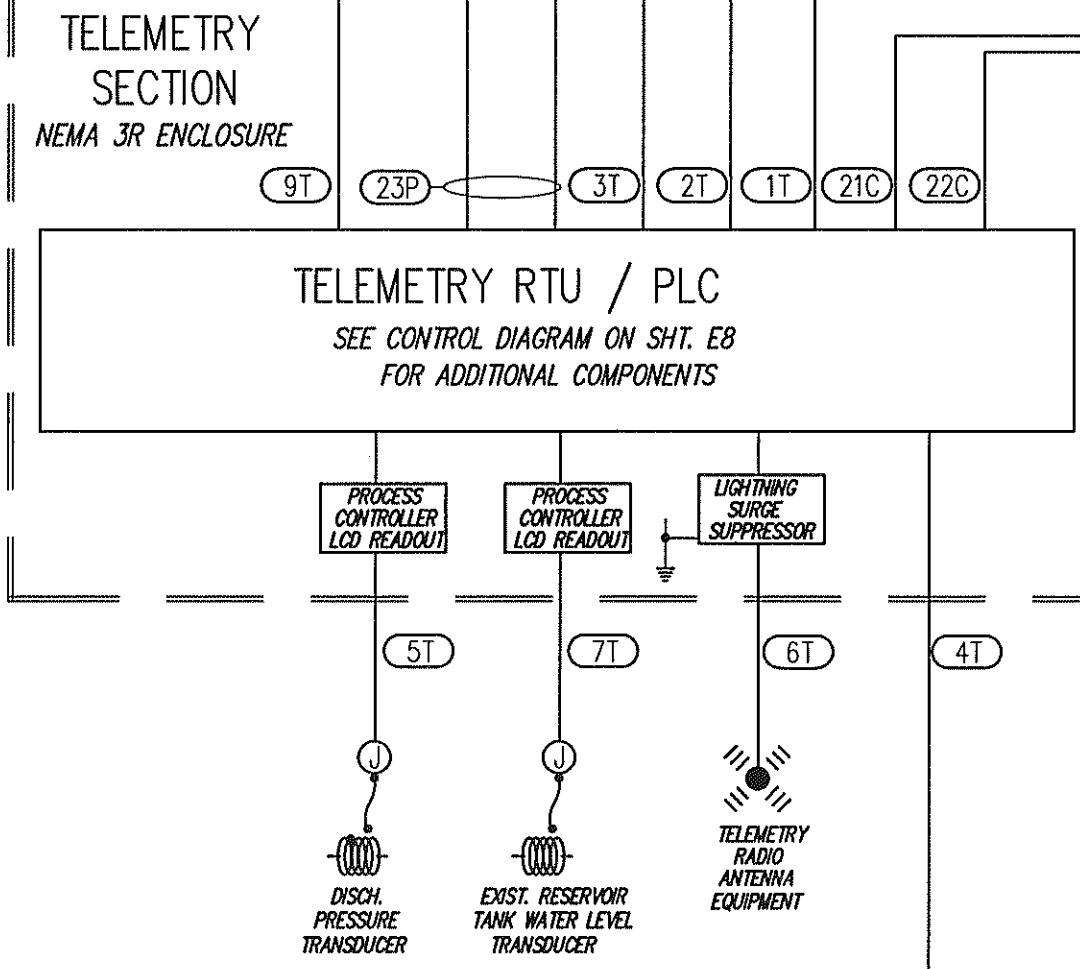
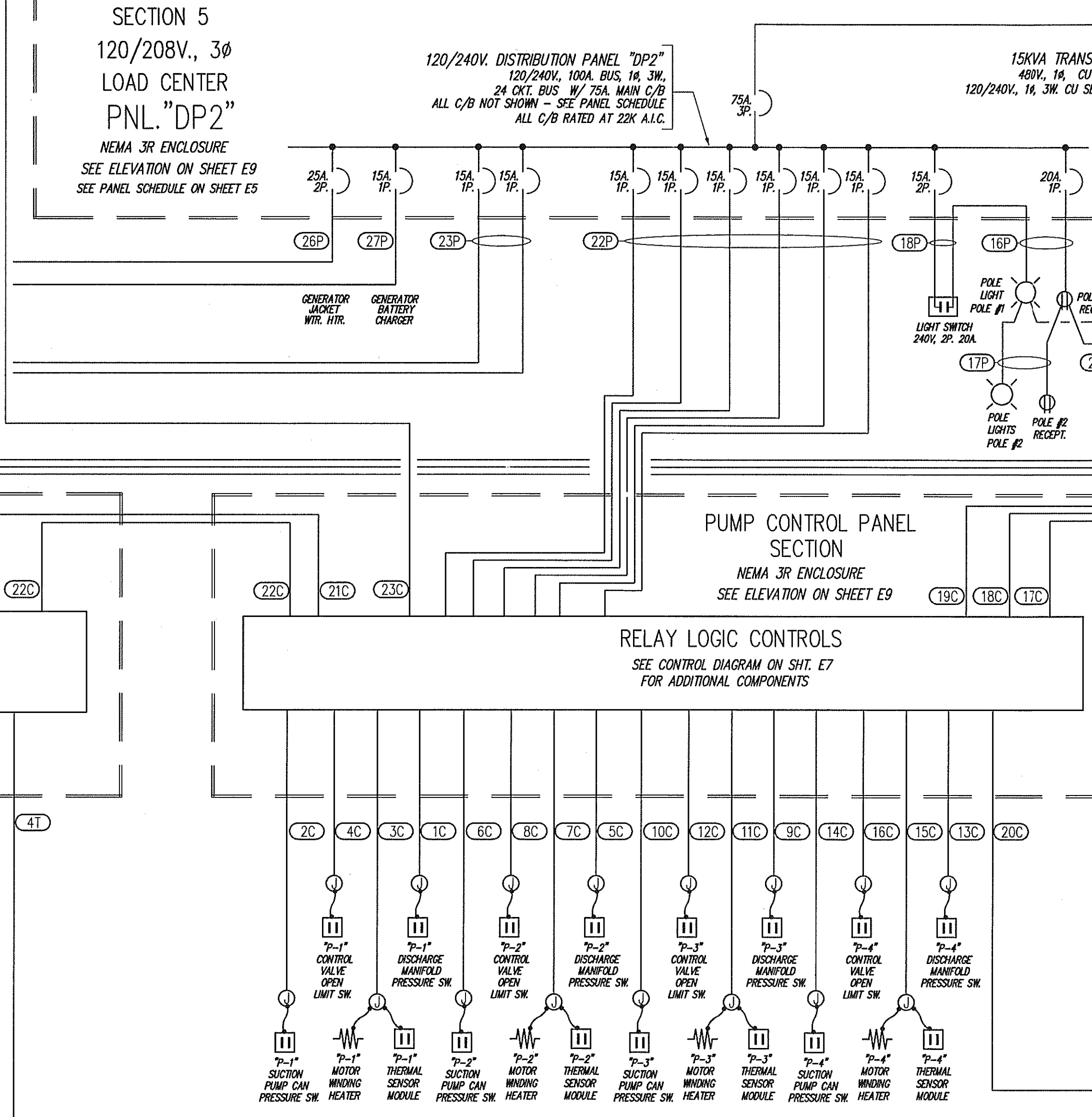
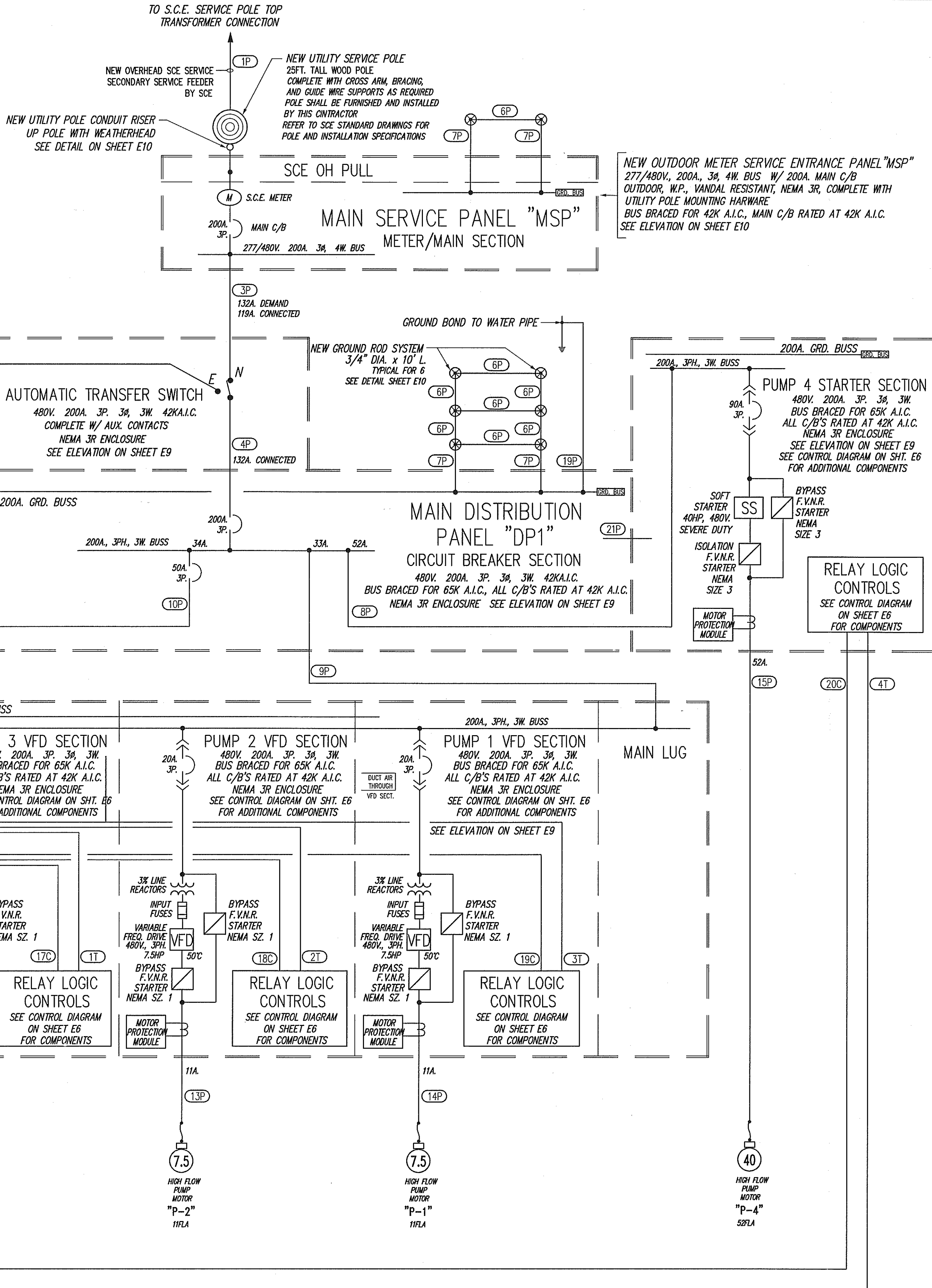
SHEET REFERENCE NO. E3
SHEET 9 OF 16
DRAWING NO. 112469

LOAD SCHEDULE - "DP1"

DISTRIBUTION PANEL "DP1"									
65K.A.I.C.									
VOLTAGE: 480V. 3Ø, 3W. BUS: 200A. 3P.									
CIRCUIT NUMBER	EQUIPMENT	HORSE POWER	K.V.A.	F.L.A.	C/B AMPS	C/B POLES	STARTER SIZE	CONDUIT SIZE	CONDUCTOR SIZE & AMOUNT
DP1-1	PUMP "1"	7.5	9.1	11.0	20	3	7.5HP VFD NEMA 1	1"	3-#12, 1-#12 GRD
DP1-2	PUMP "2"	7.5	9.1	11.0	20	3	7.5HP VFD NEMA 1	1"	3-#12, 1-#12 GRD
DP1-3	PUMP "3"	7.5	9.1	11.0	20	3	7.5HP VFD NEMA 1	1"	3-#12, 1-#12 GRD
DP1-4	PUMP "4"	40	43.2	52.0	90	3	NEMA 3	1-1/4"	3-#4, 1-#8 GRD
DP1-5	15KVA XFMR & PANELBOARD	-	15.0	34.0	50	2	-	1"	3-#8, 1-#10 GRD
TOTAL CONNECTED		62.5	85.5	119.0					
25% LARGEST MOTOR		10	10.8	13.0	-	-	-	-	-
TOTAL DEMAND		72.5	96.3	132					

NOTES:

- MOTOR CONTROL CENTER SHALL BE A PRE-MANUFACTURED. DISTRIBUTION, CONTROL PANEL, AND MOTOR CONTROL CENTERS MANUFACTURERS SHALL SUBMIT DETAILED SHOP DRAWINGS OF PANEL'S EACH PANEL CIRCUITRY FOR ENGINEER'S APPROVAL PRIOR TO ORDERING MANUFACTURED PANELS, OR MOTOR CONTROL CENTERS. ALL CIRCUITRY AND PROGRAMMING OF CONTROL PANELS MUST BE COORDINATED AND APPROVED WITH OTHER EQUIPMENT MANUFACTURER'S TO INSURE INTERFACE AND OPERATION PER DESCRIPTION OF FACILITY'S SEQUENCE OF OPERATION.
- ALL CIRCUIT BREAKERS SHOWN SHALL BE CAPABLE OF BEING LOCKED IN THE OPEN POSITION.
- ALL ELECTRICAL EQUIPMENT SHOWN ON THIS SHEET SHALL BE NEW UNLESS NOTED OTHERWISE.



STAMP

REGISTERED PROFESSIONAL ENGINEER

SAROJ K. JOSHI

No. E17931

Exp. 9/30/10

ELECTRICAL

STATE OF CALIFORNIA

Underground Service Alert

Call: TOLL FREE

1-800

227-2600

TWO WORKING DAYS BEFORE YOU DIG

ELECTRICAL - SINGLE LINE DIAGRAM

CONTROL FEEDER CHART										
PLAN SYMBOL	CONDUIT			CONDUCTOR		INSULATION	LOCATION		REMARKS	
	QTY.	SIZE	TYPE	QTY. & SIZE			FROM	TO		
10C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "IPS-D1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-1" DISCHARGE PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
20C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "IPS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-1" SUCTION PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
30C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - MOTOR SPACE HEATER "1MSH" (2) #14 & (1) #12 GRD., - 100% COPPER (THWN) - TEMP SHSR PWM (2) #14, - 100% COPPER (THWN) - MOTOR TEMP SENSOR "1TSH"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-1" PUMP MOTOR	COMMON CONDUIT TO CONTAIN MULTIPLE 120VAC SIGNAL CIRCUITS SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
40C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "IPS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-1" CHECK VALVE LIMIT SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
50C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "2PS-D1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-2" DISCHARGE PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
60C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "2PS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-2" SUCTION PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
70C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - MOTOR SPACE HEATER "2MSH" (2) #14 & (1) #12 GRD., - 100% COPPER (THWN) - TEMP SHSR PWM (2) #14, - 100% COPPER (THWN) - MOTOR TEMP SENSOR "2TSH"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-2" PUMP MOTOR	COMMON CONDUIT TO CONTAIN MULTIPLE 120VAC SIGNAL CIRCUITS SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
80C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "2PS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-2" CHECK VALVE LIMIT SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
90C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "3PS-D1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-3" DISCHARGE PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
100C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "3PS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-3" SUCTION PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
110C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - MOTOR SPACE HEATER "3MSH" (2) #14 & (1) #12 GRD., - 100% COPPER (THWN) - TEMP SHSR PWM (2) #14, - 100% COPPER (THWN) - MOTOR TEMP SENSOR "3TSH"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-3" PUMP MOTOR	COMMON CONDUIT TO CONTAIN MULTIPLE 120VAC SIGNAL CIRCUITS SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
120C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "3PS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-3" CHECK VALVE LIMIT SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
130C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "4PS-D1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-4" DISCHARGE PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
140C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - PRESSURE SW. "4PS-S1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-4" SUCTION PRESSURE SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
150C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, - 100% COPPER (THWN) - MOTOR SPACE HEATER "4MSH" (2) #14 & (1) #12 GRD., - 100% COPPER (THWN) - TEMP SHSR PWM (2) #14, - 100% COPPER (THWN) - MOTOR TEMP SENSOR "4TSH"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-4" PUMP MOTOR	COMMON CONDUIT TO CONTAIN MULTIPLE 120VAC SIGNAL CIRCUITS SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
160C	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #14, & (1) #14 GRD. - 100% CU (THWN) - LIMIT SW. "4LS-D1"	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	JUNCTION BOX AT "P-4" CHECK VALVE LIMIT SW.	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
170C	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(42) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	BOOSTER PUMP "P-1" STARTER SECTION	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
180C	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(42) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	BOOSTER PUMP "P-2" STARTER SECTION	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
190C	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(42) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	BOOSTER PUMP "P-3" STARTER SECTION	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
200C	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(42) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	BOOSTER PUMP "P-4" STARTER SECTION	SEE MCC SHOP DRAWING CONTROL SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTION	
210C	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(42) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	TELEMETRY PANEL	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTIONS	
220C	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(1) #16 2/C TSP. - 100% COPPER - DISCHARGE PRESSURE (4-20mA)	INSTRUMENT CABLE		BOOSTER PUMP CONTROL PANEL SECTION	TELEMETRY PANEL	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTIONS	
230C	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(16) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		BOOSTER PUMP CONTROL PANEL SECTION	MOTOR CONTROL CENTER - ATS SECTION 2	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS TO AUTOMATIC TRANSFER SWITCH	
240C	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(16) #14, & (1) #14 GRD. - 100% COPPER (THWN)	600V. COLOR CODED		GENERATOR CONTROL PANEL	MOTOR CONTROL CENTER - ATS SECTION 2	SEE GENSET & ATS SHOP DRAWING & SCHEMATIC FOR CONNECTIONS BETWEEN SIGNAL GENSET AND ATS	

TYPE: NQOD MOUNTING: IN MCC	22 K.A.I.C.	PANEL DP2	SCHEDULE	FED FROM 15KVA XFMR	BUS 100 AMPS. MAIN Z5 AMPS. VOLTAGE: 120/240V, 1ø, 3W.
TYPE LOAD & LOCATION	WATTS	LTO	REC	INS	TYPE LOAD & LOCATION
PUMP "P-1" MCC VFD SECTION HEATER	900			1 1 15 1	TELEMETRY SECTION HEATER & RECEPTACLE
PUMP "P-2" MCC VFD SECTION HEATER	900			1 1 15 3	TELEMETRY SECTION PLC & RTU PWR SUPPLY
PUMP "P-3" MCC VFD SECTION HEATER	900			1 1 15 5	HPS AREA LIGHTS
PUMP "P-4" MCC STARTER SECTION HEATER	900			1 1 15 7	HPS AREA LIGHTS
SPARE	0			1 1 20 9	POLE RECEPTACLES
SPARE	0			1 1 20 11	SPARE
GENERATOR WATER JACKET HEATER	1250			1 2 25 13	SPARE
GENERATOR WATER JACKET HEATER	1250			1 2 25 15	SPARE
GENERATOR BATTERY CHARGER	250			1 1 15 17	SPACE
MCC SECTION LIGHTING	300			1 1 15 19	SPACE
SPACE	-			21	INTRUSION ALARM MOTION DETECTORS
SPACE	-			23	SPACE
SPACE	-			24	SPACE
SPACE	3300	3350			3220 3100
CONNECTED LOAD = 12970W. L.C.L. = 7600W. TOTAL = 14870W. FEEDER AMPS = 62.0A HIGH LEG = 62.0A SPARE = 3000W.					

PANEL SCHEDULE "DP2"

POWER FEEDER CHART										
PLAN SYMBOL	CONDUIT			CONDUCTOR		INSULATION	LOCATION		REMARKS	
	QTY.	SIZE	TYPE	QTY. & SIZE			FROM	TO		
1P	1	4"	SCHED. 80 PVC	CONDUITS ONLY - CONDUCTORS BY SCE			S.C.E. H.V. SERVICE VAULT	S.C.E. SERVICE TRANSFORMER PAD	VERIFY CONDUIT DUCT BANK REQUIREMENTS WITH SCE SERVICE PLANS FOR EXACT ROUTING AND ADDITIONAL REQUIREMENTS	
2P	1	4"	SCHED. 80 PVC	CONDUITS ONLY - CONDUCTORS BY SCE			S.C.E. SERVICE TRANSFORMER	NEW 400A S.C.E. METERED SERVICE PULL SECTION	VERIFY CONDUIT DUCT BANK REQUIREMENTS WITH SCE SERVICE PLANS FOR EXACT ROUTING AND ADDITIONAL REQUIREMENTS	
3P	1	4"	SCHED. 80 PVC	(3) #3/0, (1) #2GRD. - 100% COPPER (XHHW2)	600V. XLP		200A S.C.E. METERED SERVICE MAIN BKR SECTION	MOTOR CONTROL CENTER - ATS SECTION 2		
4P	1	4"	SCHED. 80 PVC	(3) #3/0, (1) #2GRD. - 100% COPPER (XHHW2)	600V. XLP		MOTOR CONTROL CENTER - ATS SECTION 2	200A MCC BREAKER SECTION 3		
5P	-	-		NOT USED						
6P	-	-	DIRECT BURIAL	(1) #2 GRD. (BARE CONDUCTOR) - 100% COPPER			GROUND ROD SYSTEM	GROUND ROD SYSTEM	TYPICAL FOR GROUND RING	
7P	1	1"	SCHED. 40 PVC	(1) #2 GRD. (BARE CONDUCTOR) - 100% COPPER			200A S.C.E. METERED SERVICE MAIN SECTION 1B GROUND BUS	GROUND ROD SYSTEM	TYPICAL FOR GROUND ROD BONDS EQUIPMENT	
8P	1	2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #3/0, (1) #2 GRD. - 100% COPPER (XHHW2)	600V. XLP		200A MCC BREAKER SECTION 3	BOOSTER PUMP "P-4" STARTER SECTION		
9P	1	2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #3/0, (1) #2 GRD. - 100% COPPER (XHHW2)	600V. XLP		200A MCC BREAKER SECTION 3	MAIN LUG SECTION BUSSING - CONTROL SIDE		
10P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #3, (1) #10 GRD. - 100% COPPER (XHHW2)	600V. XLP		200A MCC BREAKER SECTION 3	MCC XFMR & PANELBOARD SECTION	XFMR PRIMARY FEEDER	
11P	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #4, (1) #8 GRD. - 100% COPPER (XHHW2)	600V. XLP		15KVA XFMR SECONDARY	100A 120/240V. PANELBOARD "DP2" MAIN BKR		
12P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #12, (1) #12 GRD. - 100% COPPER (XHHW2)	600V. XLP		BOOSTER PUMP "P-1" STARTER SECTION	BOOSTER PUMP "P-1" MOTOR CONNECTION BOX		
13P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #12, (1) #12 GRD. - 100% COPPER (XHHW2)	600V. XLP		BOOSTER PUMP "P-2" STARTER SECTION	BOOSTER PUMP "P-2" MOTOR CONNECTION BOX		
14P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #12, (1) #12 GRD. - 100% COPPER (XHHW2)	600V. XLP		BOOSTER PUMP "P-3" STARTER SECTION	BOOSTER PUMP "P-3" MOTOR CONNECTION BOX	(4) #14 FOR PHOTOCELL / (4) #14 FOR MOTION DETECTOR (2) #12 & (1) #12 GRD. FOR CANOPY LIGHTS	
15P	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #4, (1) #8 GRD. - 100% COPPER (XHHW2)	600V. XLP		BOOSTER PUMP "P-4" STARTER SECTION	BOOSTER PUMP "P-4" MOTOR CONNECTION BOX		
16P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(5) #10, & (1) #12 GRD. - 100% COPPER (THWN)	600V.		BOOSTER PUMP CONTROL PANEL SECTION	LIGHT POLE #1		
17P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(5) #10, & (1) #12 GRD. - 100% COPPER (THWN)	600V.		LIGHT POLE #1	LIGHT POLE #2		
18P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(4) #10, & (1) #12 GRD. - 100% COPPER (THWN)	600V.		LIGHT SWITCH - 240VAC, 2P.	LIGHT POLE #2		
19P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(1) #2 GRD. (BARE CONDUCTOR) - 100% COPPER			200A METERED SERVICE PANEL "DP1" GROUND BUS	DISCHARGE PIPING GROUND BOND		
20P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(5) #10, & (1) #12 GRD. - 100% COPPER (THWN)	600V.		LIGHT POLE #1	LIGHT POLE #3		
21P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #12, (1) #12 GRD. - 100% COPPER (XHHW2)	600V.		200A MCC BREAKER SECTION 3	MAIN LUG SECTION BUSSING - CONTROL SIDE	MCC LIGHTING POWER	
22P	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(14) #10, (3) #12 GRDS. - 100% COPPER (THWN)	600V.		100A 120/240V. PANELBOARD "DP2" CKT BKRS	BOOSTER PUMP CONTROL PANEL SECTION	CIRCUIT THROUGH LIGHTING CONTROL CONTACTORS	
23P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #10, (1) #12 GRD. - 100% COPPER (THWN)	600V.		100A 120/240V. PANELBOARD "DP2" CKT BKRS	TELEMETRY SECTION		
24P	-	-		NOT USED						
25P	-	-		NOT USED						
26P	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #3, (1) #10 GRD. - 100% COPPER (THWN)	600V.		100A 120/240V. PANELBOARD "DP2" CKT BKR	GENERATOR WATER JACKET HEATER	240VAC, 1PH, 3000W. UNIT MOUNTED WITHIN GENSET VERIFY POINT OF CONNECTION WITH GENSET SHOP DRAWINGS	
27P	1	3/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) #12, (1) #12 GRD. - 100% COPPER (THWN)	600V.		100A 120/240V. PANELBOARD "DP2" CKT BKR	GENERATOR BATTERY CHARGER	120VAC, 1PH, 2A. UNIT MOUNTED WITHIN GENSET VERIFY POINT OF CONNECTION WITH GENSET SHOP DRAWINGS	
28P	1	4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #3/0, (1) #2 GRD. - 100% COPPER (XHHW2)	600V. XLP		MOTOR CONTROL CENTER - ATS SECTION 2	100KW GENERATOR 480V. GENERATOR MAIN BKR		

TELEMETRY FEEDER CHART										
PLAN SYMBOL	CONDUIT			CONDUCTOR		INSULATION	LOCATION		REMARKS	
	QTY.	SIZE	TYPE	QTY. & SIZE			FROM	TO		
1T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) CAT. 5E ETHERNET JUMPER CABLES (1) #16 2/C TSP. - 100% COPPER - VFD SPEED CONTROL (4-20mA)	INSTRUMENT CABLE		TELEMETRY SECTION	BOOSTER PUMP "P-1" STARTER SECTION	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS TO STARTER SECTION SIGNALS	
2T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(30) #14, & (1) #14 GRD. - 100% COPPER (THWN)	COLOR CODED		TELEMETRY SECTION	BOOSTER PUMP "P-2" STARTER SECTION	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS TO STARTER SECTION SIGNALS	
3T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(2) CAT. 5E ETHERNET JUMPER CABLES (1) #16 2/C TSP. - 100% COPPER - VFD SPEED CONTROL (4-20mA)	INSTRUMENT CABLE		TELEMETRY SECTION	BOOSTER PUMP "P-3" STARTER SECTION	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS TO STARTER SECTION SIGNALS	
4T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(30) #14, & (1) #14 GRD. - 100% COPPER (THWN)	COLOR CODED		TELEMETRY SECTION	BOOSTER PUMP "P-4" STARTER SECTION	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS TO STARTER SECTION SIGNALS	
5T	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(1) #16 2/C TSP. - 100% COPPER - DISCHARGE PRESSURE (4-20mA)	INSTRUMENT CABLE		BOOSTER PUMP CONTROL PANEL SECTION	TELEMETRY PANEL	SEE PLC/RTU SHOP DRAWING & SCHEMATIC FOR CONNECTIONS WITHIN MOTOR CONTROL CENTER CONTROL SECTIONS	
6T	1	1-1/2"	U.G. SCHED. 40 PVC EXP. R.G.S.	(30) #14, & (1) #14 GRD. - 100% COPPER (THWN)	COLOR CODED		TELEMETRY SECTION	ROUTED UP EXIST RES LADDER FOR ANTENNA		
7T	1	1"	U.G. SCHED. 40 PVC EXP. R.G.S.	(1) #16 2/C TSP. - 100% COPPER - DISCHARGE PRESSURE (4-20mA)	INSTRUMENT CABLE		TELEMETRY SECTION	EXIST. RESERVOIR LEVEL TRANSDUCER		
8T	-	-		NOT USED						
9T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(3) #16 2/C TSP. - 100% COPPER - VFD SPEED CONTROL (4-20mA)	INSTRUMENT CABLE		TELEMETRY SECTION	GENERATOR CONTROL PANEL	SEE GENSET & RTU SHOP DRAWING & SCHEMATIC FOR SIGNAL CONNECTIONS BETWEEN SIGNAL GENSET AND RTU / PLC	
10T	1	1-1/4"	U.G. SCHED. 40 PVC EXP. R.G.S.	(12) #14, & (1) #14 GRD. - 100% COPPER (THWN)	COLOR CODED					
11T	-	-								
	-	-								

STAMP

REGISTERED PROFESSIONAL ENGINEER

SAROJ K. JOSHI

No. E17931

Exp. 9/30/10

ELECTRICAL

STATE OF CALIFORNIA

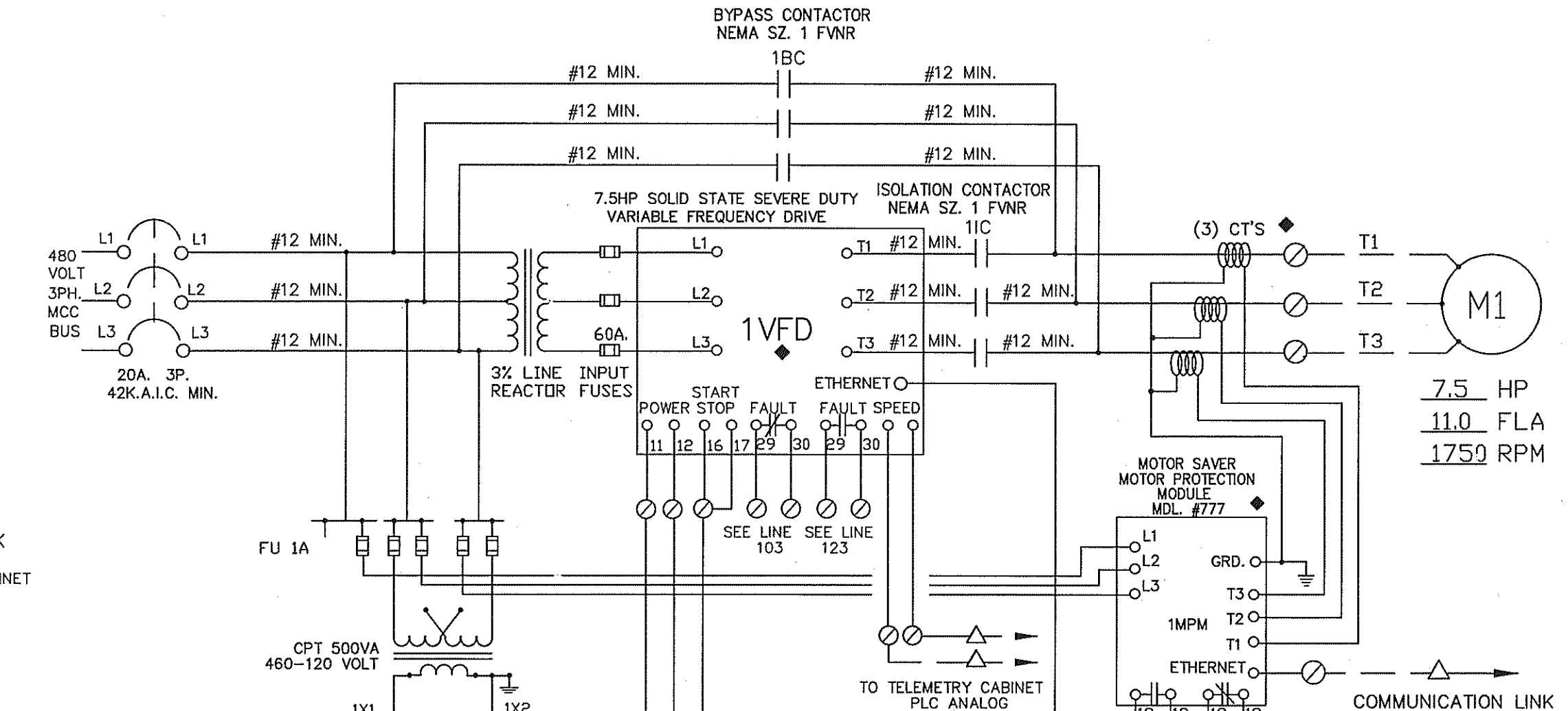
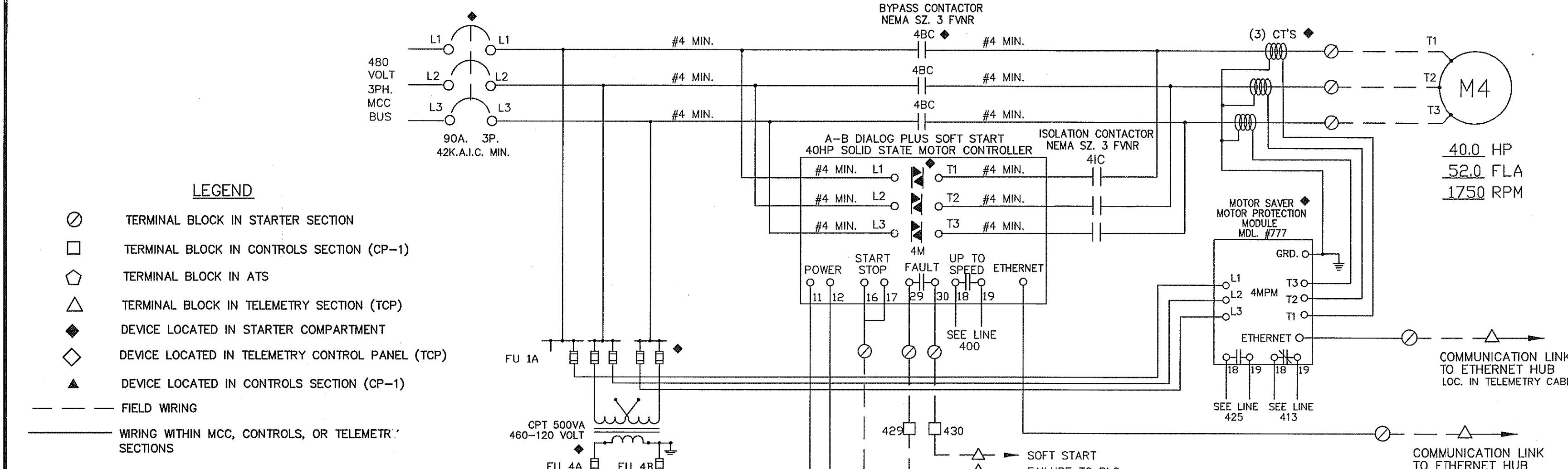
Underground Service Alert

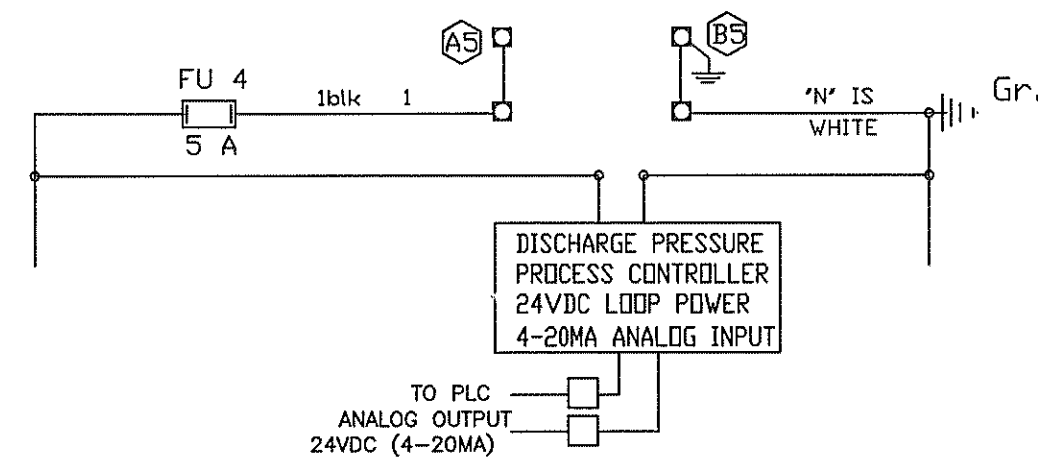
Call: TOLL FREE

1-800

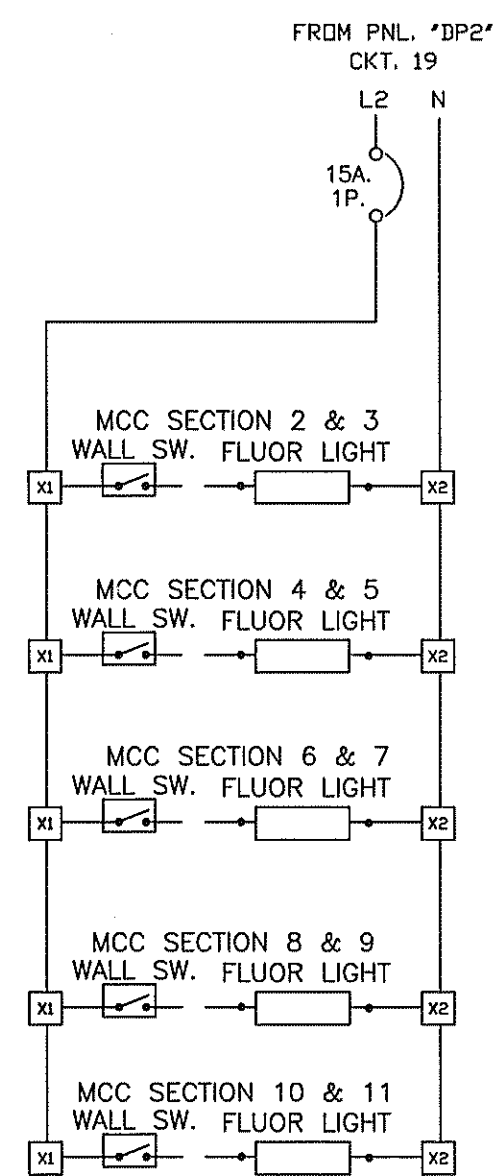
227-2600

TWO WORKING DAYS BEFORE YOU DIG

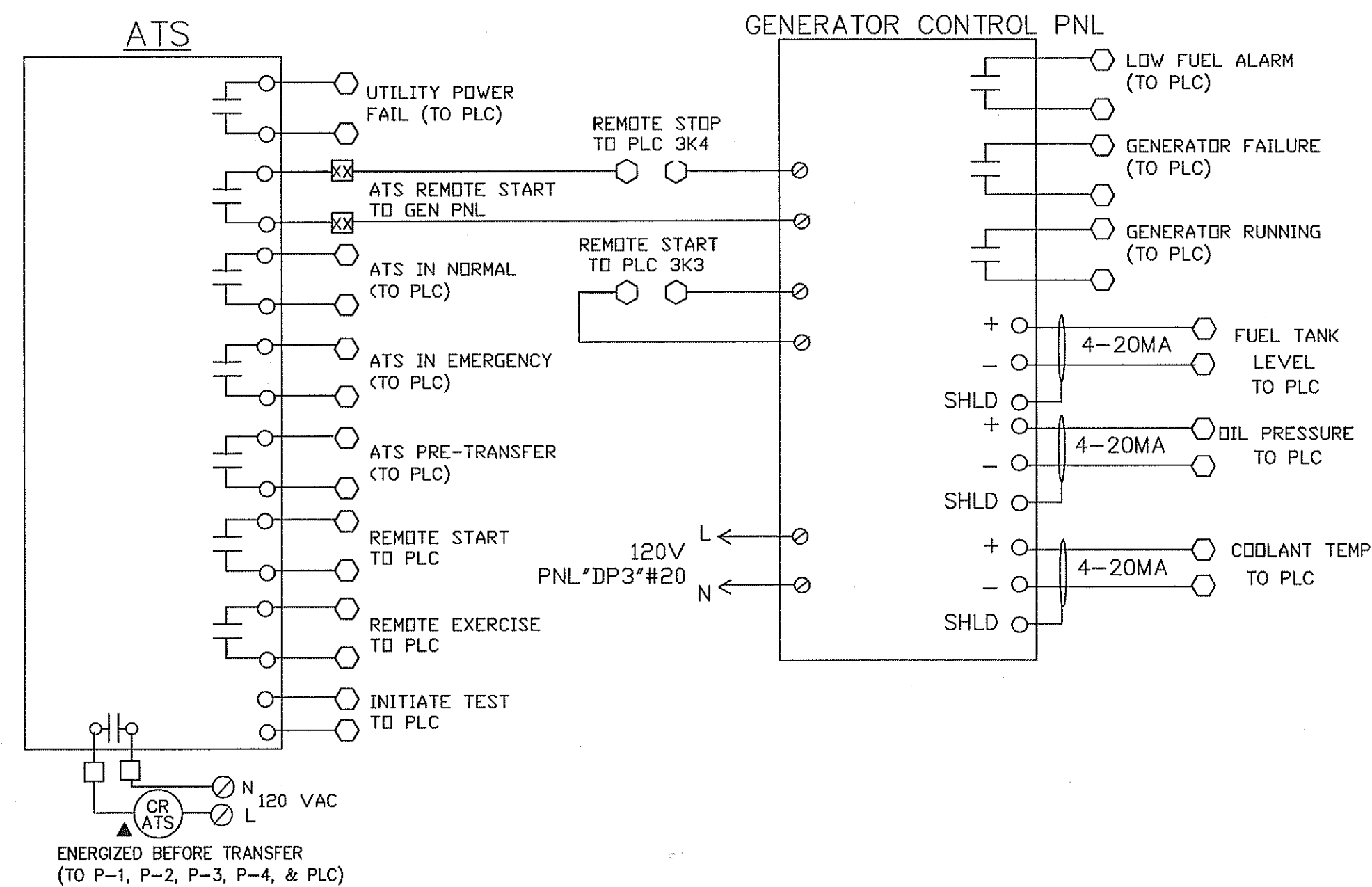




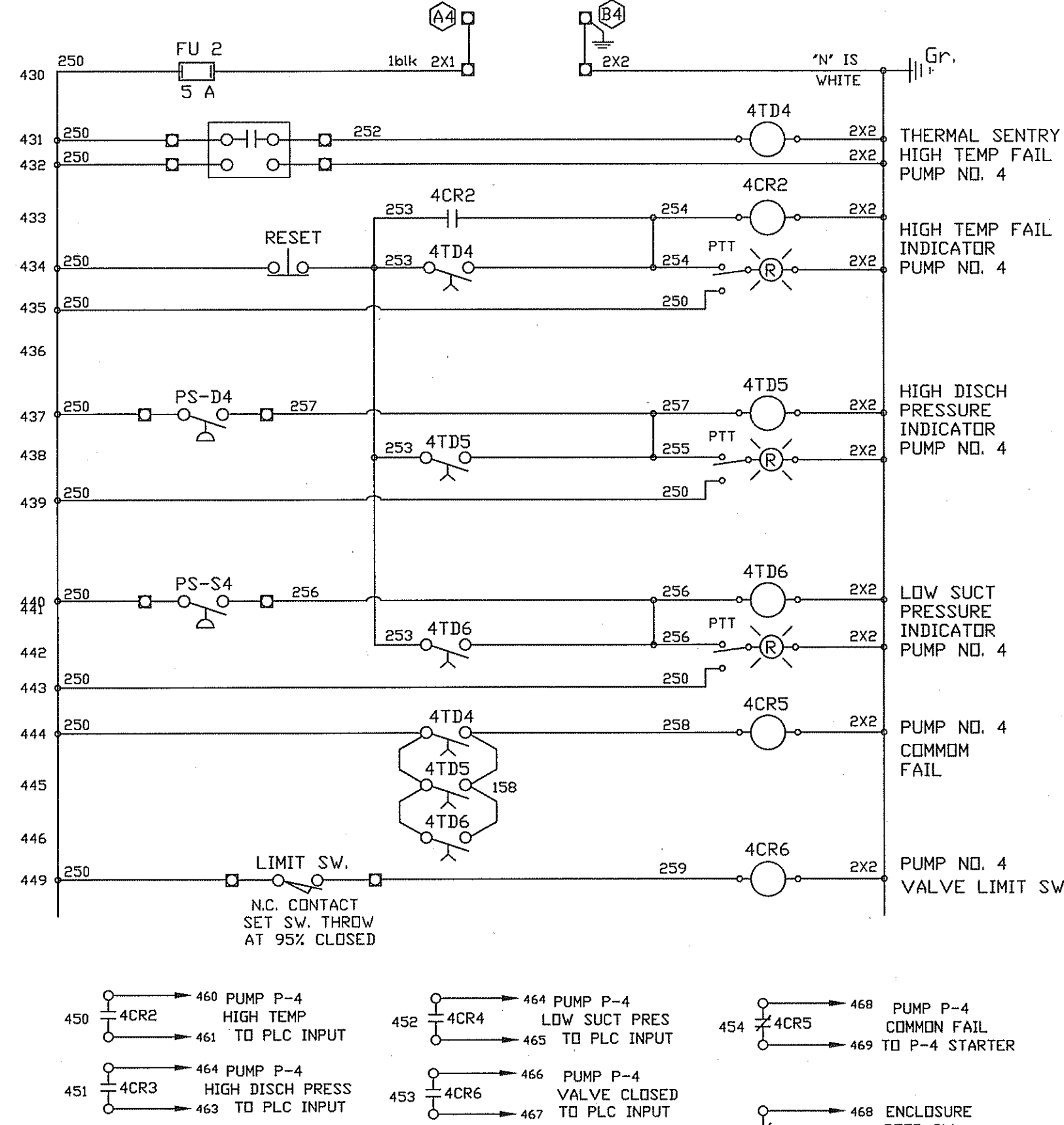
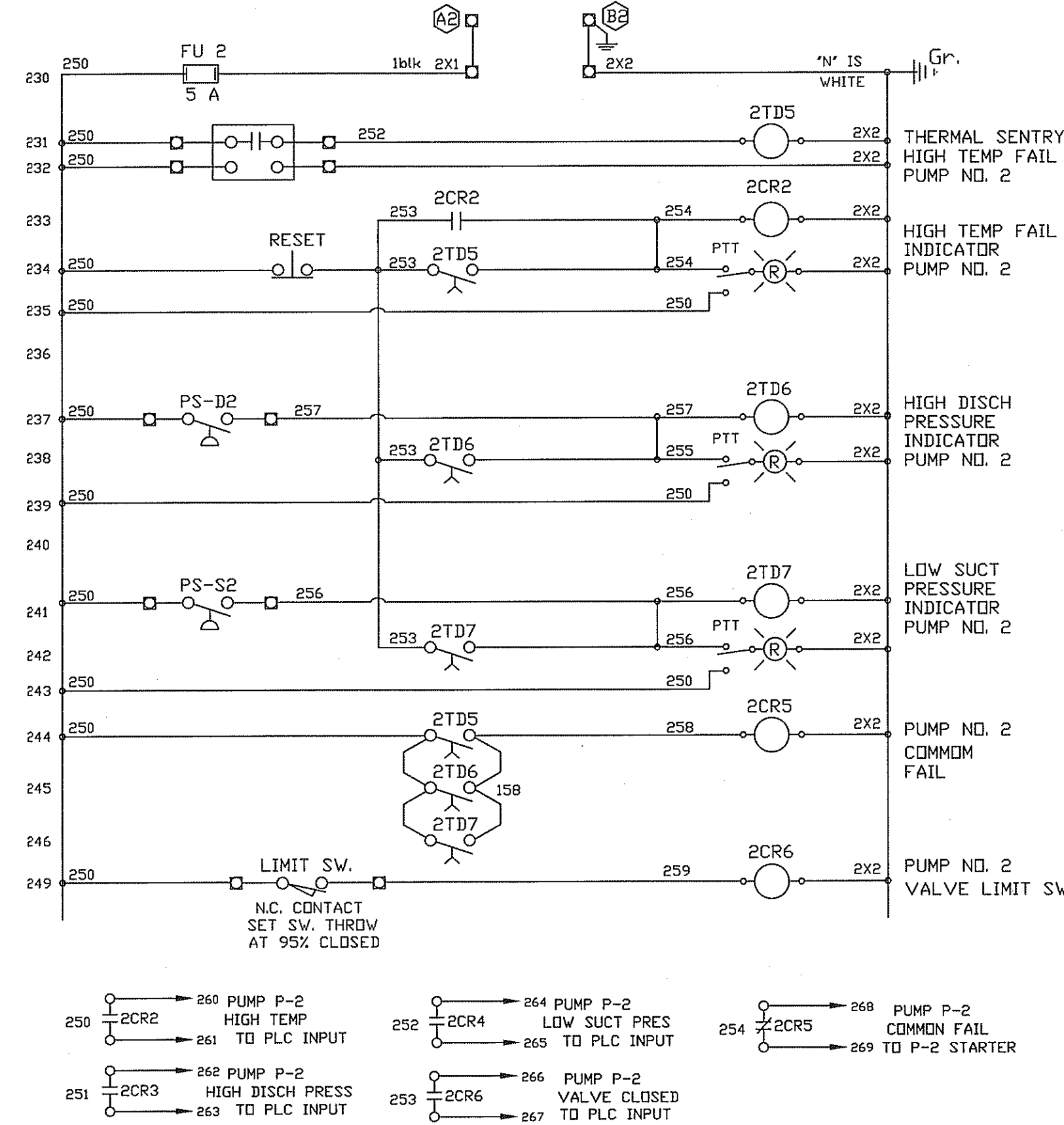
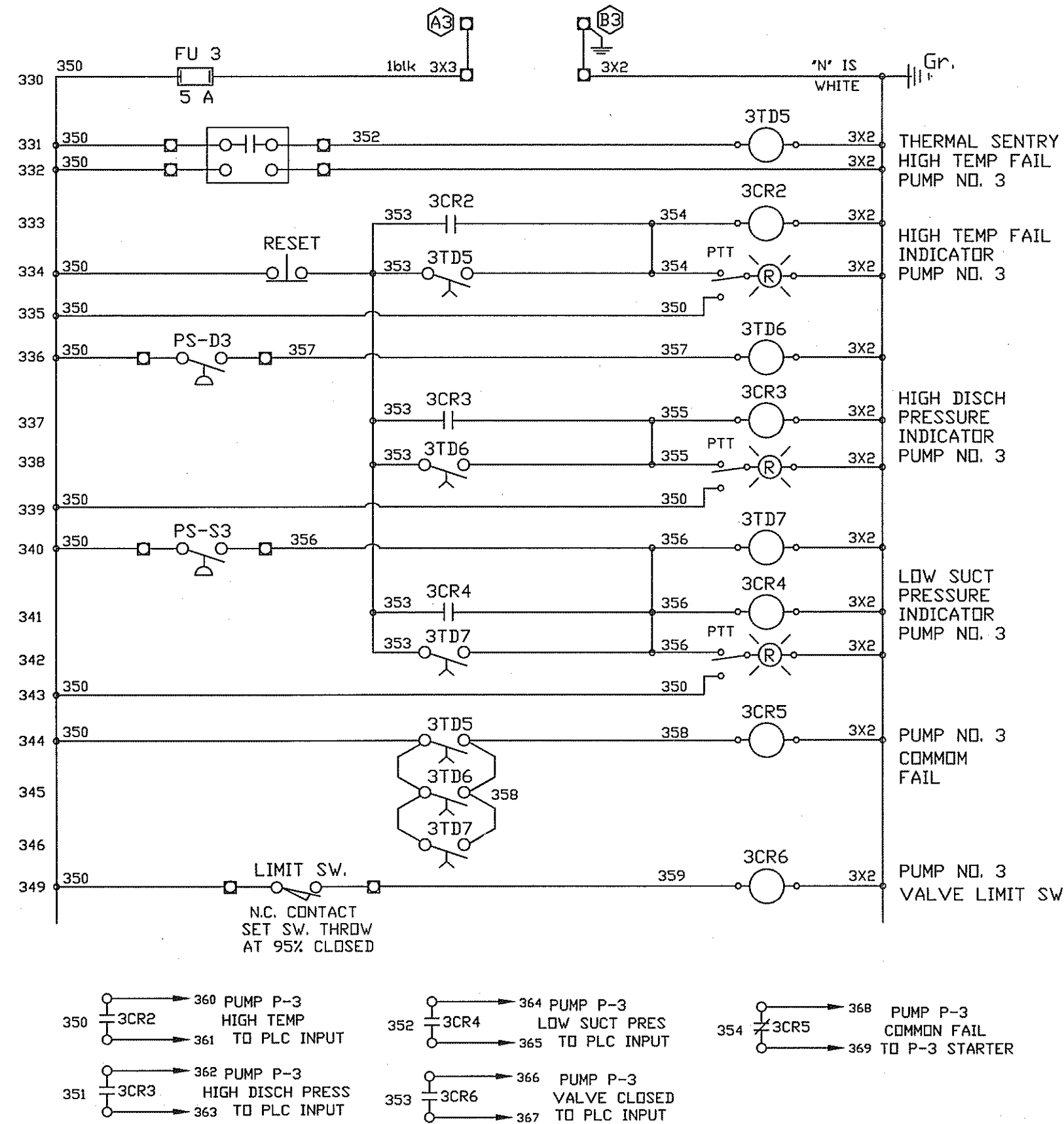
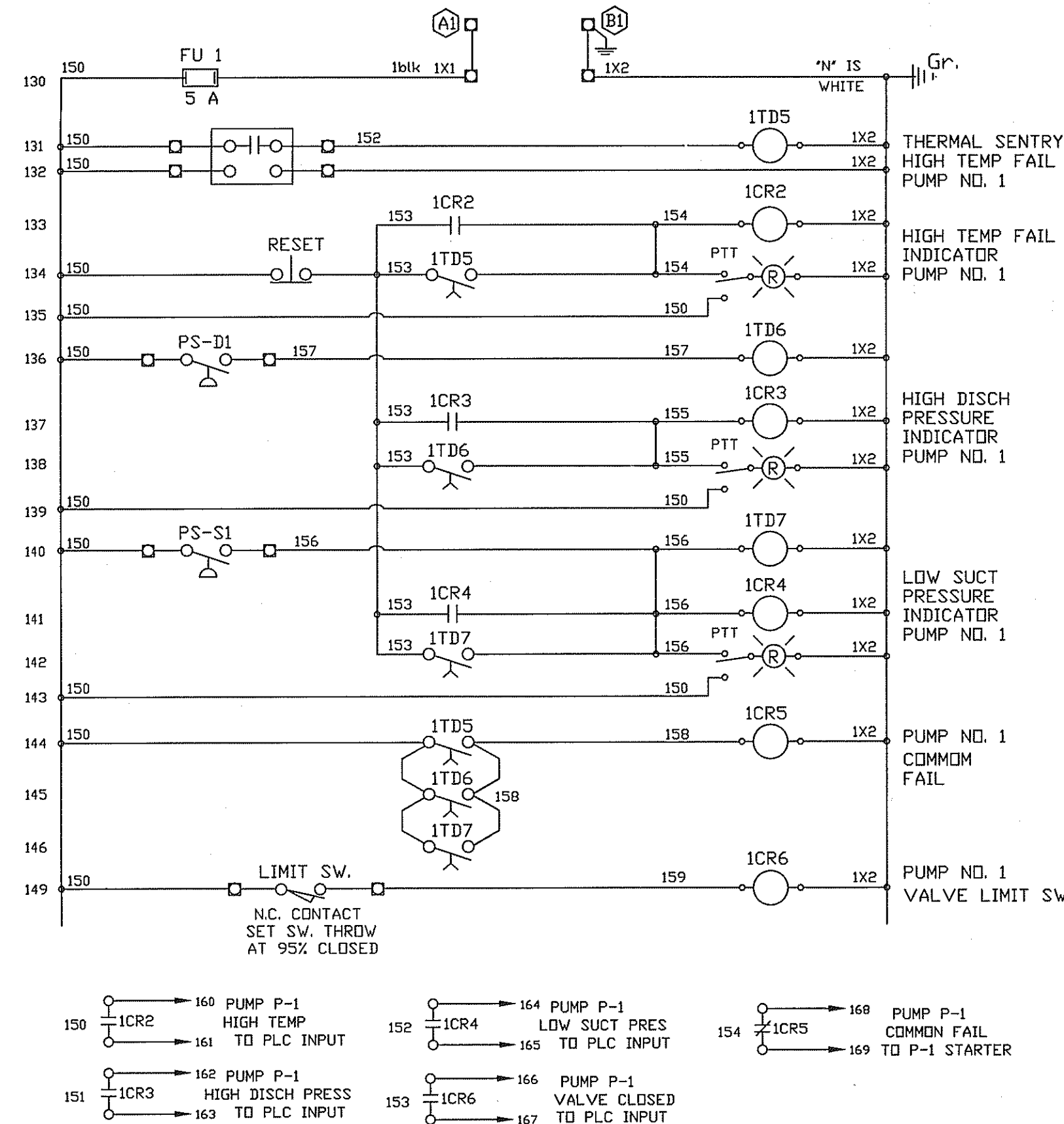
PROCESS CONTROLLER CONNECTION DIAGRAM



MCC LIGHT FIXTURE CONNECTION DIAGRAM



ATS / GENERATOR SIGNAL CONNECTION DIAGRAM



PUMP CONTROL PANEL SECTION - CONTROL SCHEMATIC

STAMP

REGISTERED PROFESSIONAL ENGINEER
SARAJ K. JOSHI
No. E17931
Exp. 9/30/10
ELECTRICAL
STATE OF CALIFORNIA

Underground Service Alert

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1-800
227-2600

TWO WORKING DAYS BEFORE YOU DIG

REVISIONS	BY	DATE

PREPARED BY: **W.A. DOBY**
engineering inc.
consulting electrical engineers

35225 Avenue "A", Suite 301
Yucaipa, California 92399
(909) 797-5187
FAX (909) 797-5180
E-MAIL wadoby@EARTHLINK.NET

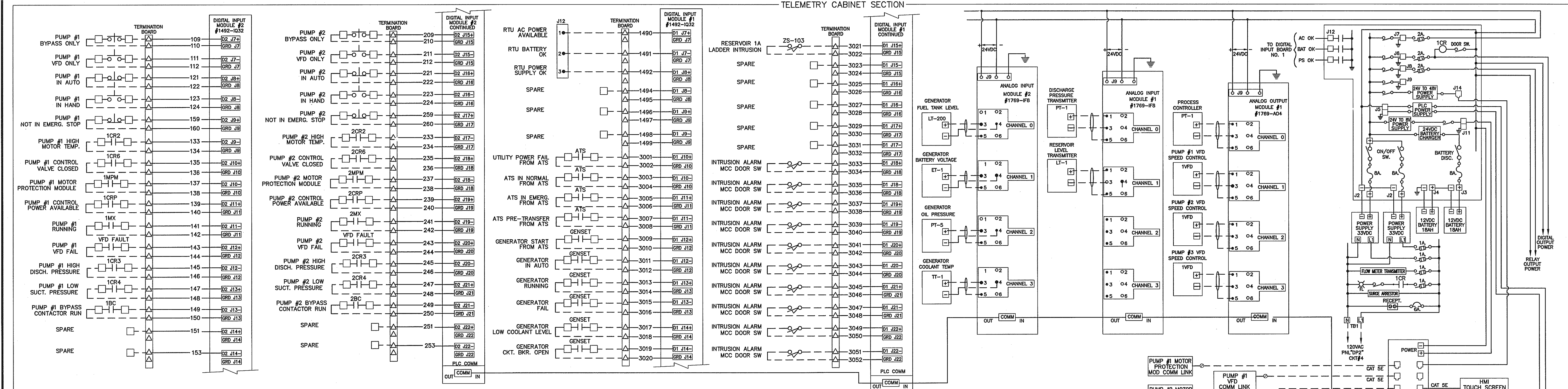
SARAJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE

**VENTURA COUNTY
WATERWORKS DISTRICT NO. 1**

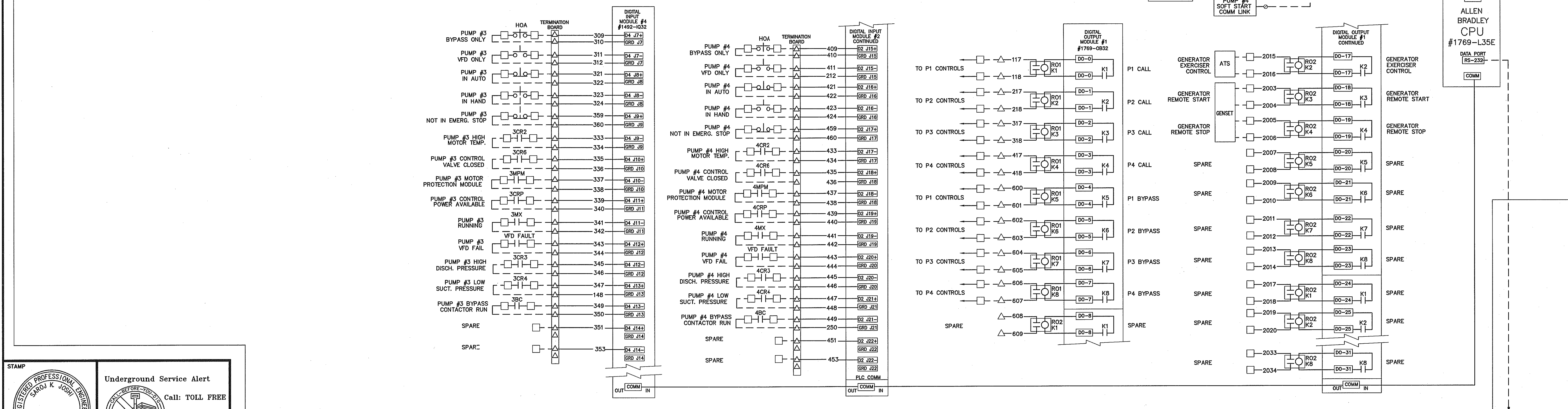
SPEC. NO.
WWW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION
ELECTRICAL CONTROL DIAGRAMS

SHEET REFERENCE NO. E7
SHEET 13 OF 16
DRAWING NO. 112473



NOTES:
ALL EQUIPMENT SHOW ON THIS SHEET SHALL BE FURNISHED AND INSTALLED BY THE DISTRICT APPROVED TELEMETRY CONTRACTOR.



STAMP

REGISTERED PROFESSIONAL ENGINEER

SARAJ K. JOSHI

No. E17931

Exp. 9/30/10

ELECTRICAL

STATE OF CALIFORNIA

Underground Service Alert

Call: TOLL FREE

1-800

227-2600

REVISIONS	TWO WORKING DAYS BEFORE YOU DIG	BY	DATE

PREPARED BY: **W.A. DOBY**
engineering inc.
consulting electrical engineers

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SARAJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

SPEC. NO.

WW 09-06

PROD. NO.

31886

ROSELAND BOOSTER PUMP STATION
TELEMETRY CONTROL SCHEMATIC

SHEET REFERENCE NO.

E8

SHEET

14

OF

16

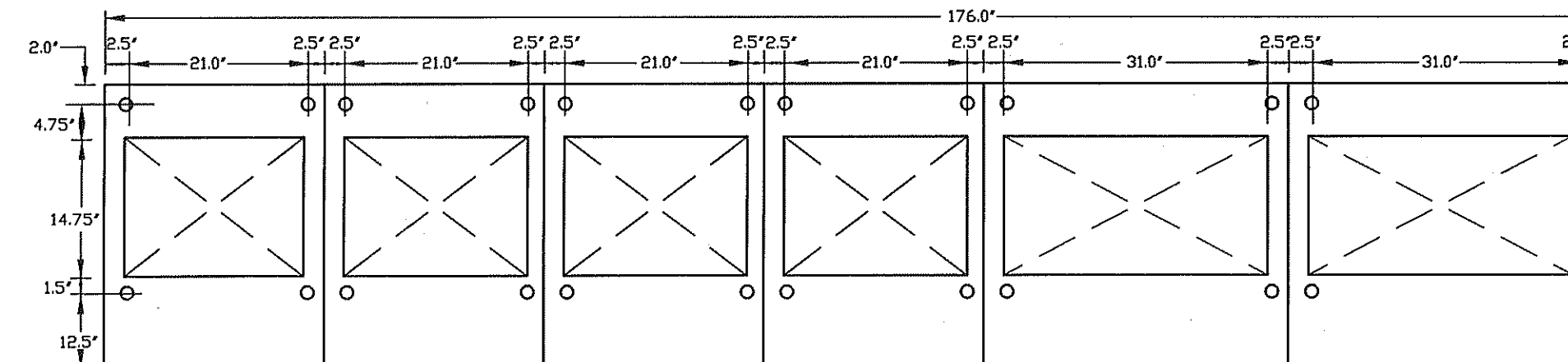
DRAWING NO.

112474

IMPORTANT NOTES:

1. ALL EQUIPMENT AND PANEL DIMENSIONS, AND LAYOUT ARE SHOWN FOR BID PURPOSES ONLY. DIMENSIONS AND SECTION LAYOUT TO BE DETERMINED FROM MANUFACTURER'S SHOP DRAWINGS. CONTRACTOR TO SIZE PAD AND DETERMINE CONDUIT TERMINATIONS PER SHOP DRAWINGS.

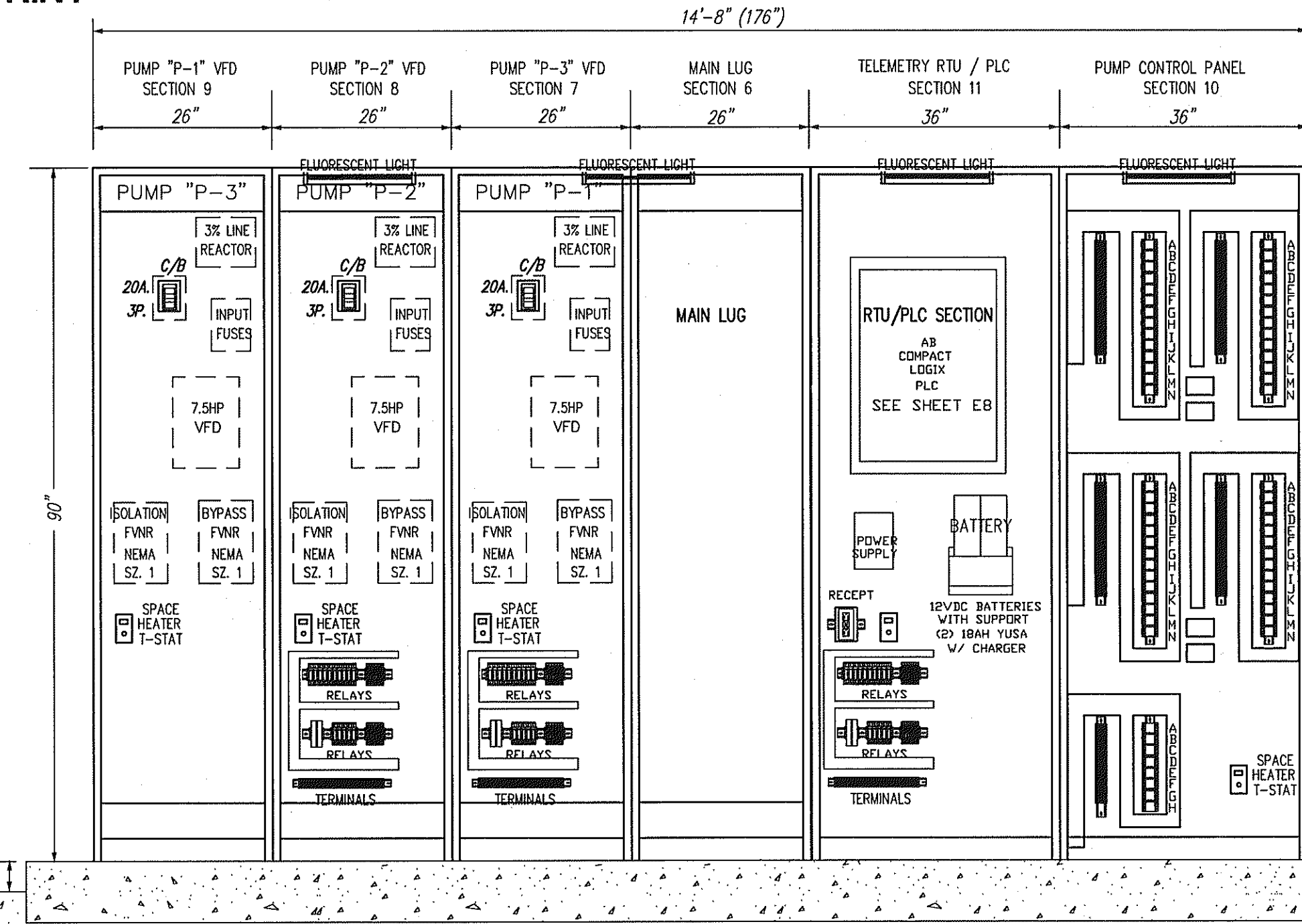
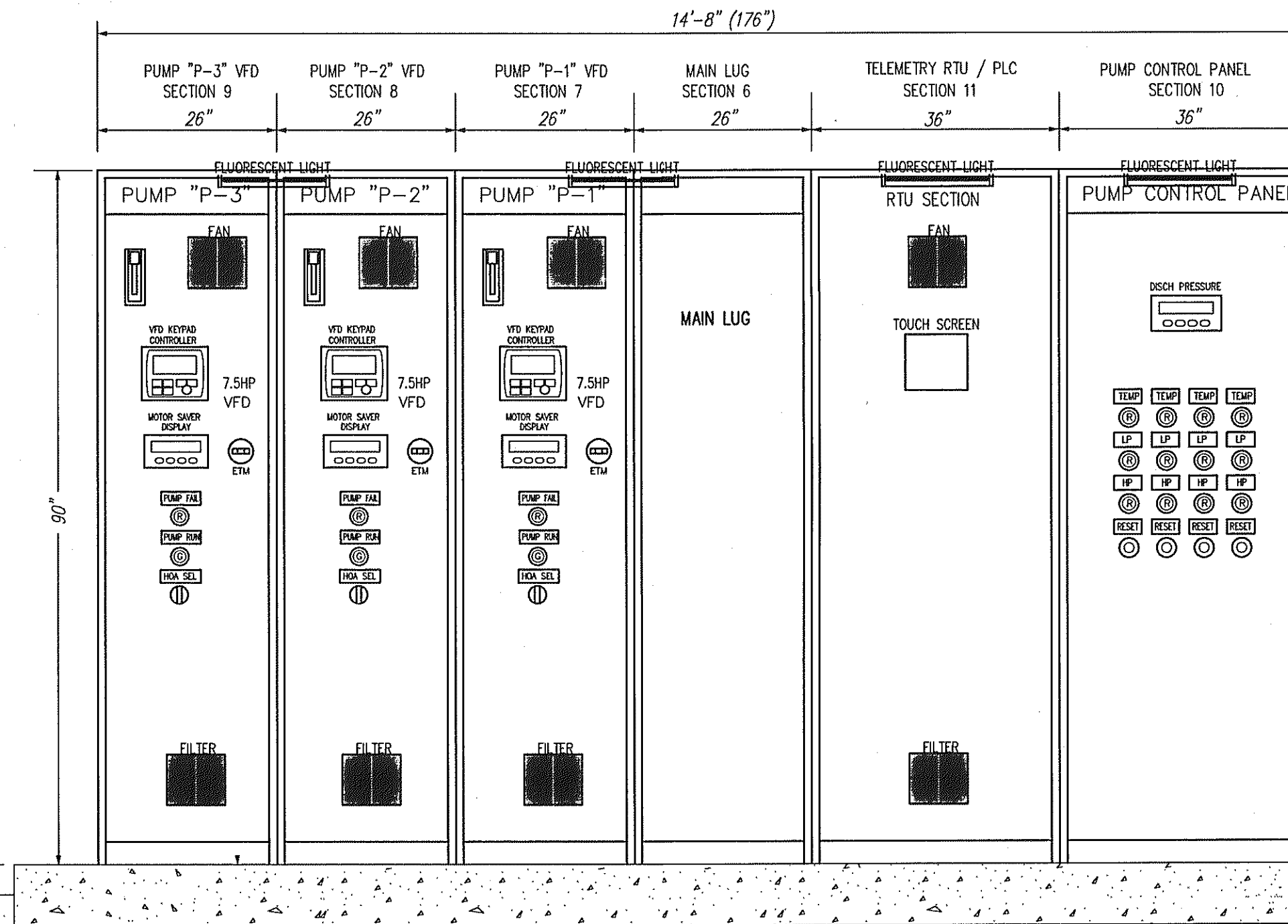
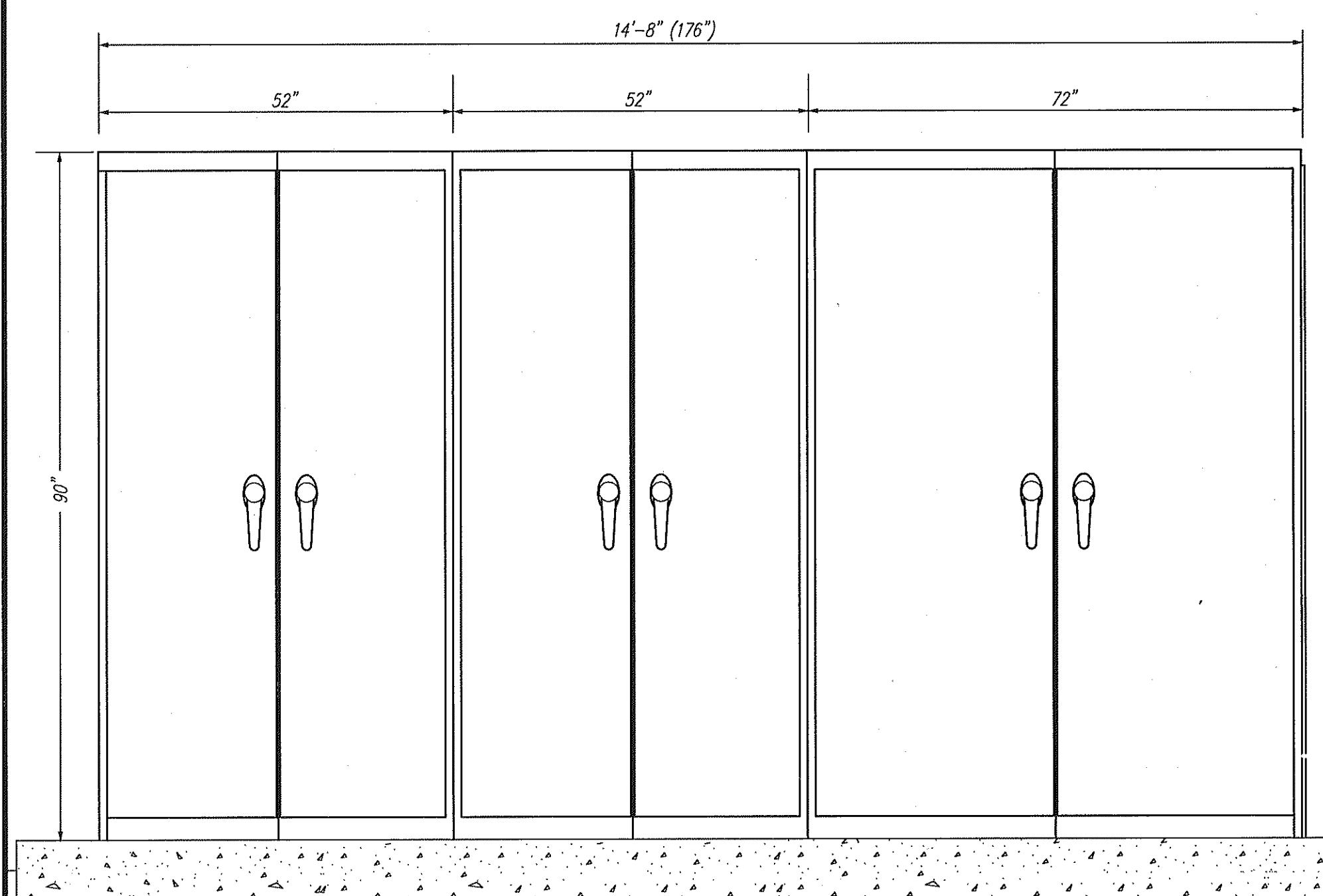
2. FURNISH DOOR SWITCHES ON ALL ENCLOSURE EXTERIOR DOORS. CIRCUIT TO INTRUSION ALARM COMPARTMENT. SEE SCHEMATIC ON SHT. E-5.
3. FURNISH 150W. SPACE HEATERS IN INTERIOR OF SECTIONS 5, 6A, 6B, 7, & 10. CIRCUIT TO LOADCENTER COMPARTMENT T-STAT. SEE SCHEMATIC ON SHT. E-5.



FOOTPRINT

AIR CONDITIONING UNIT NOTE

FURNISH ENCLOSURE INTERIOR AC SUPPLY DUCTING AND RETURN VENTS BETWEEN PUMP STARTER AND CONTROL SECTIONS. AC UNIT TO OPERATE VIA PARALLEL CONNECTION OF PUMP RUN SIGNALS.



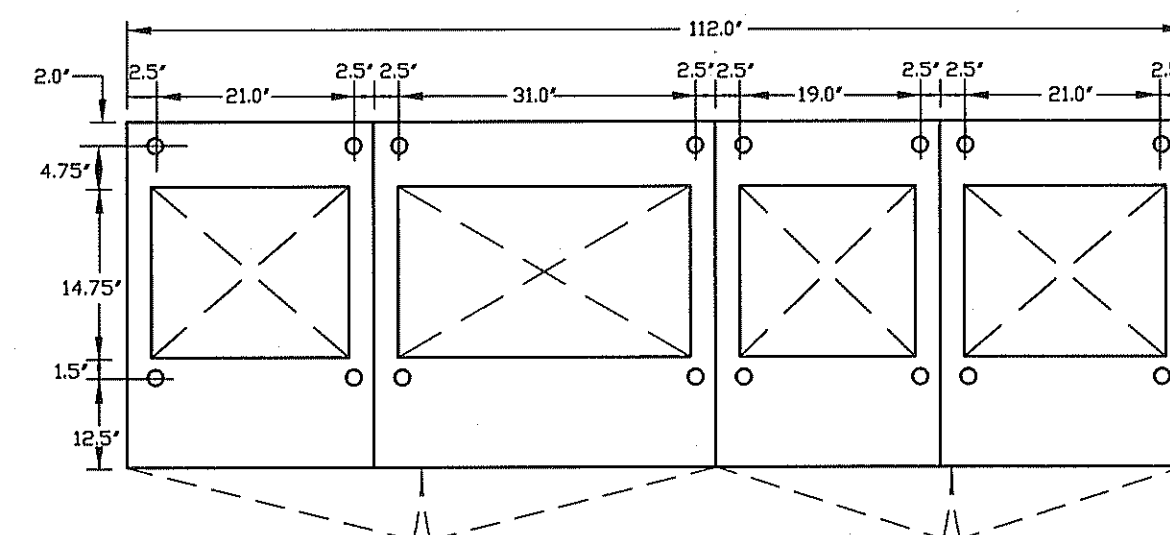
SERVICE METER / MAIN BREAKER INTERIOR AND INNER DOOR ELEVATION

SCALE:

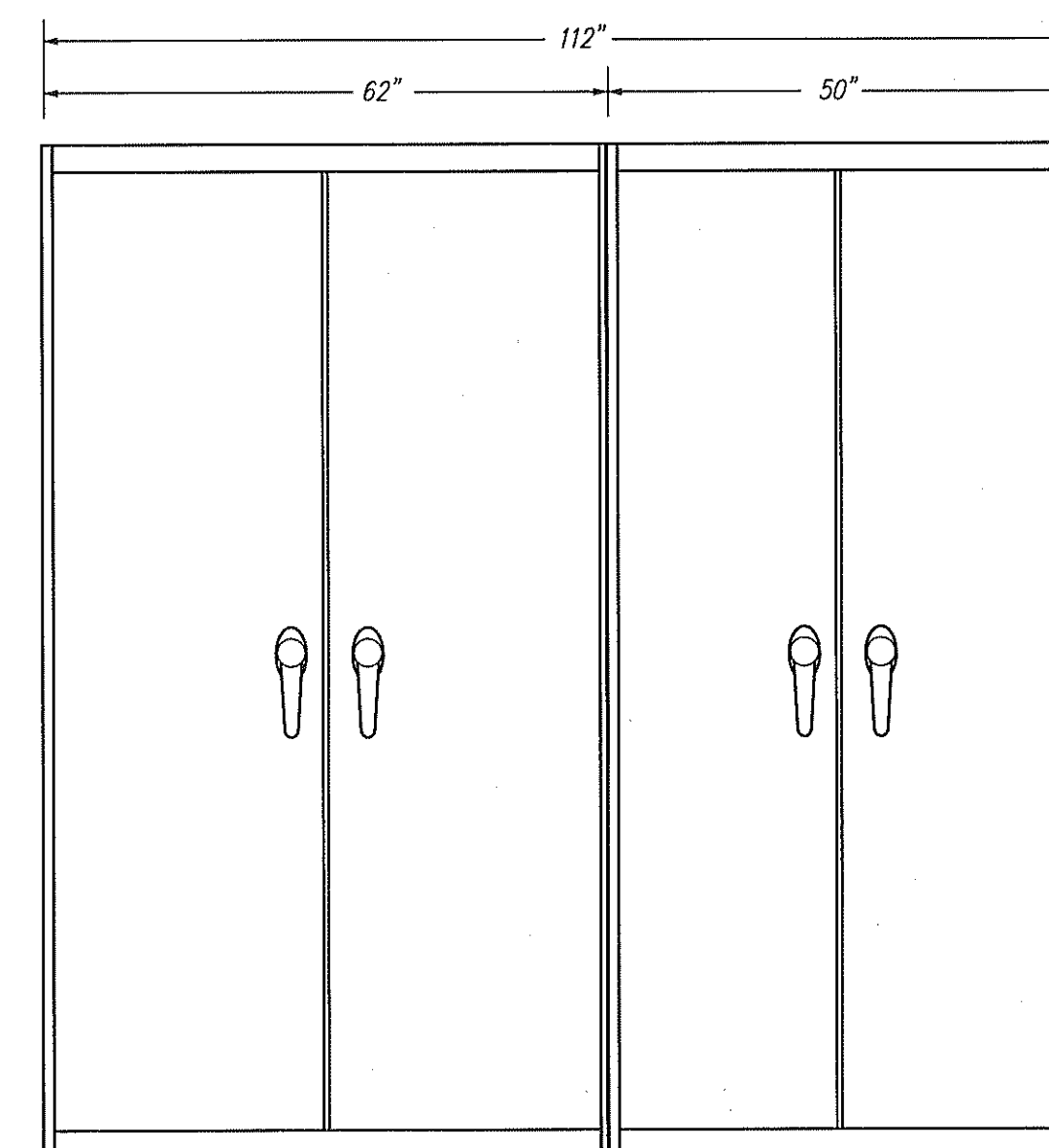
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IMPORTANT NOTE:

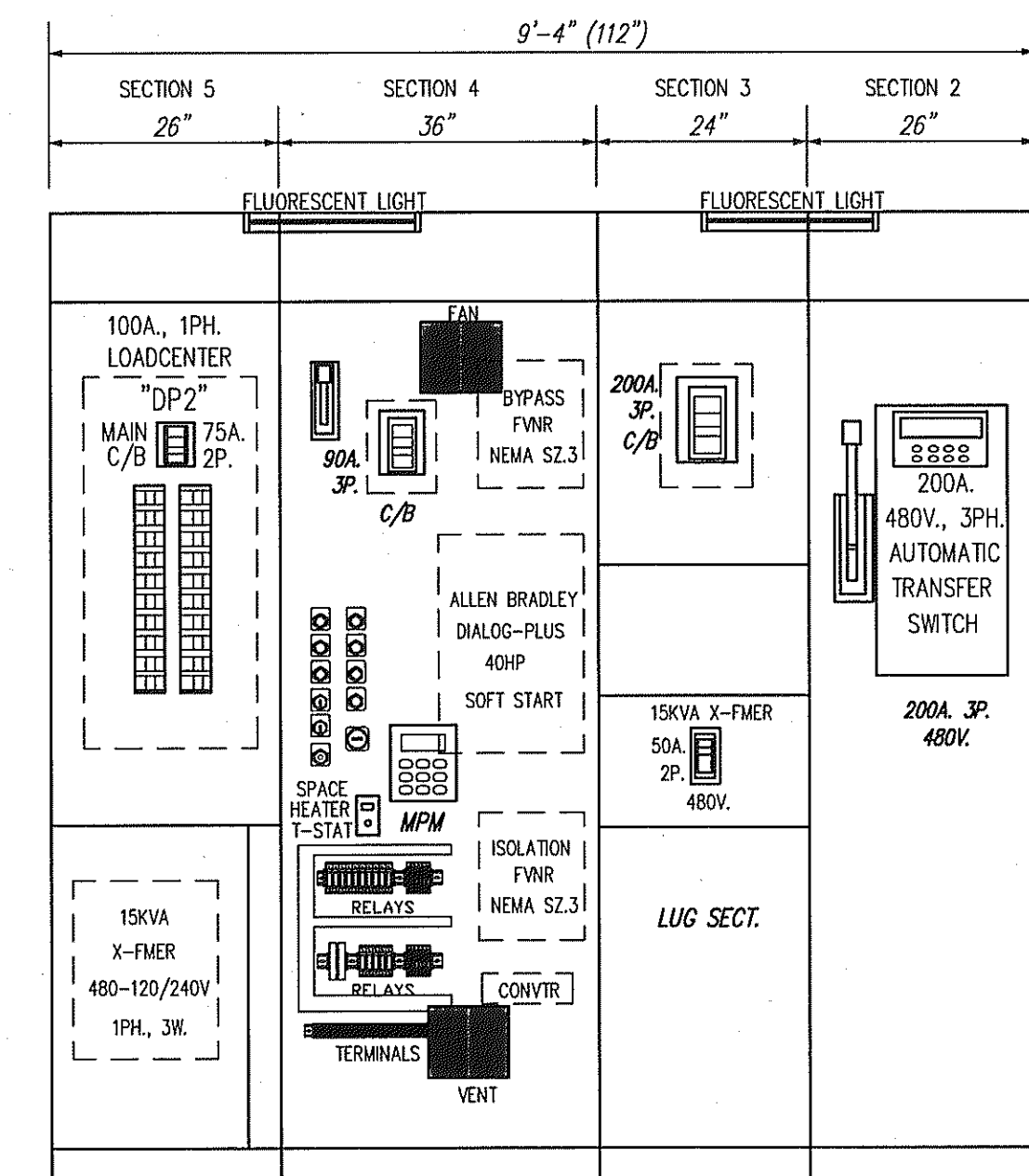
1. ALL EQUIPMENT AND PANEL DIMENSIONS, AND LAYOUT ARE SHOWN FOR BID PURPOSES ONLY. DIMENSIONS AND SECTION LAYOUT TO BE DETERMINED FROM MANUFACTURER'S SHOP DRAWINGS. CONTRACTOR TO SIZE PAD AND DETERMINE CONDUIT TERMINATIONS PER SHOP DRAWINGS.



FOOTPRINT



EXTERIOR DOOR ELEVATION



INTERIOR DOOR ELEVATION

SERVICE METER / MAIN BREAKER INTERIOR AND INNER DOOR ELEVATION

SCALE:

N.T.S.

STAMP

Underground Service Alert

Call: TOLL FREE

1-800

227-2600

TWO WORKING DAYS BEFORE YOU DIG

MCC - SERVICE METER / MAIN SIDE

SCALE:

N.T.S.

REVISIONS	BY	DATE

PREPARED BY: **W.A. DOBY** engineering inc. consulting electrical engineers

35225 Avenue "A", Suite 301
Yucaipa, California 92399
(909) 797-5187
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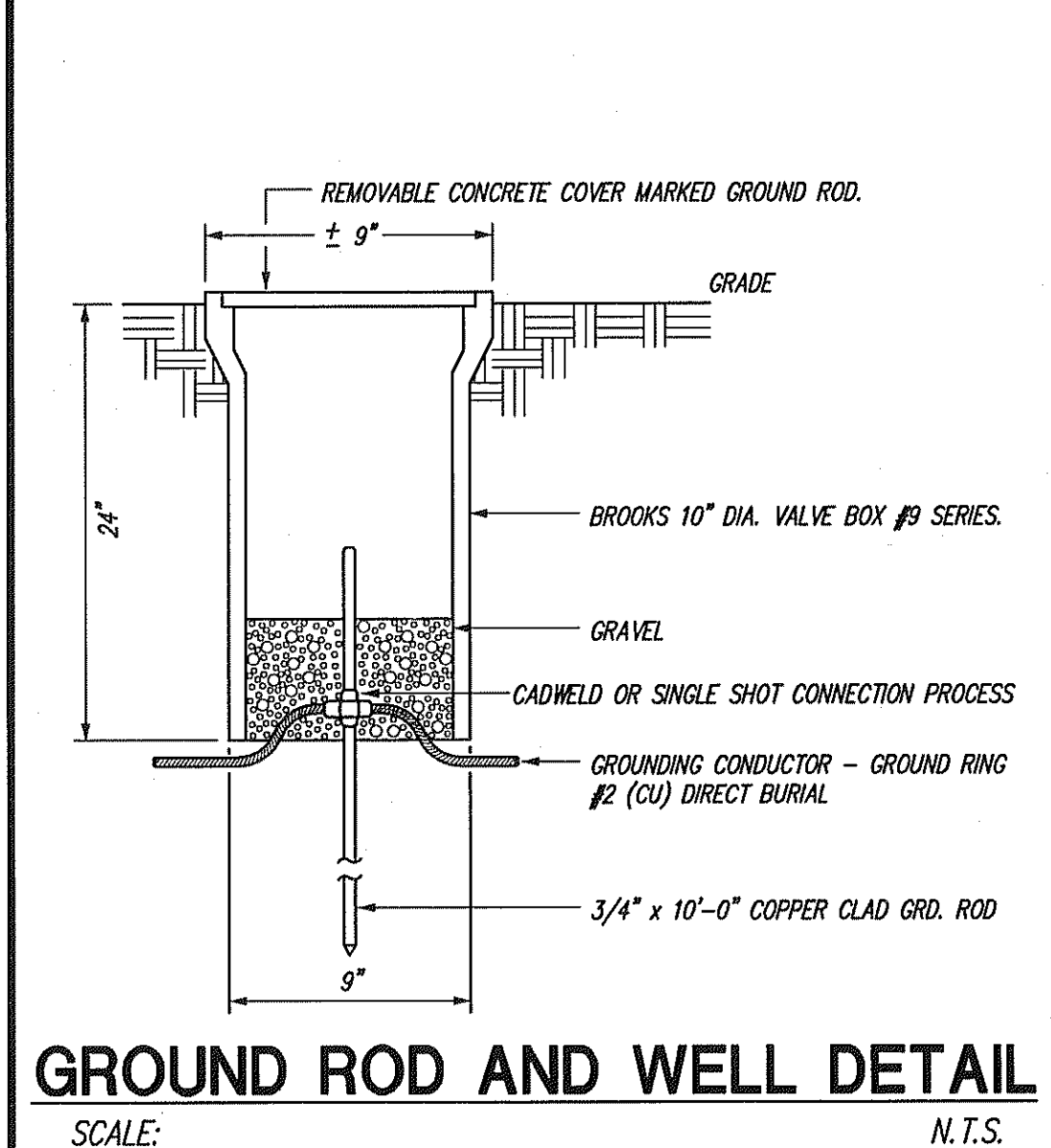
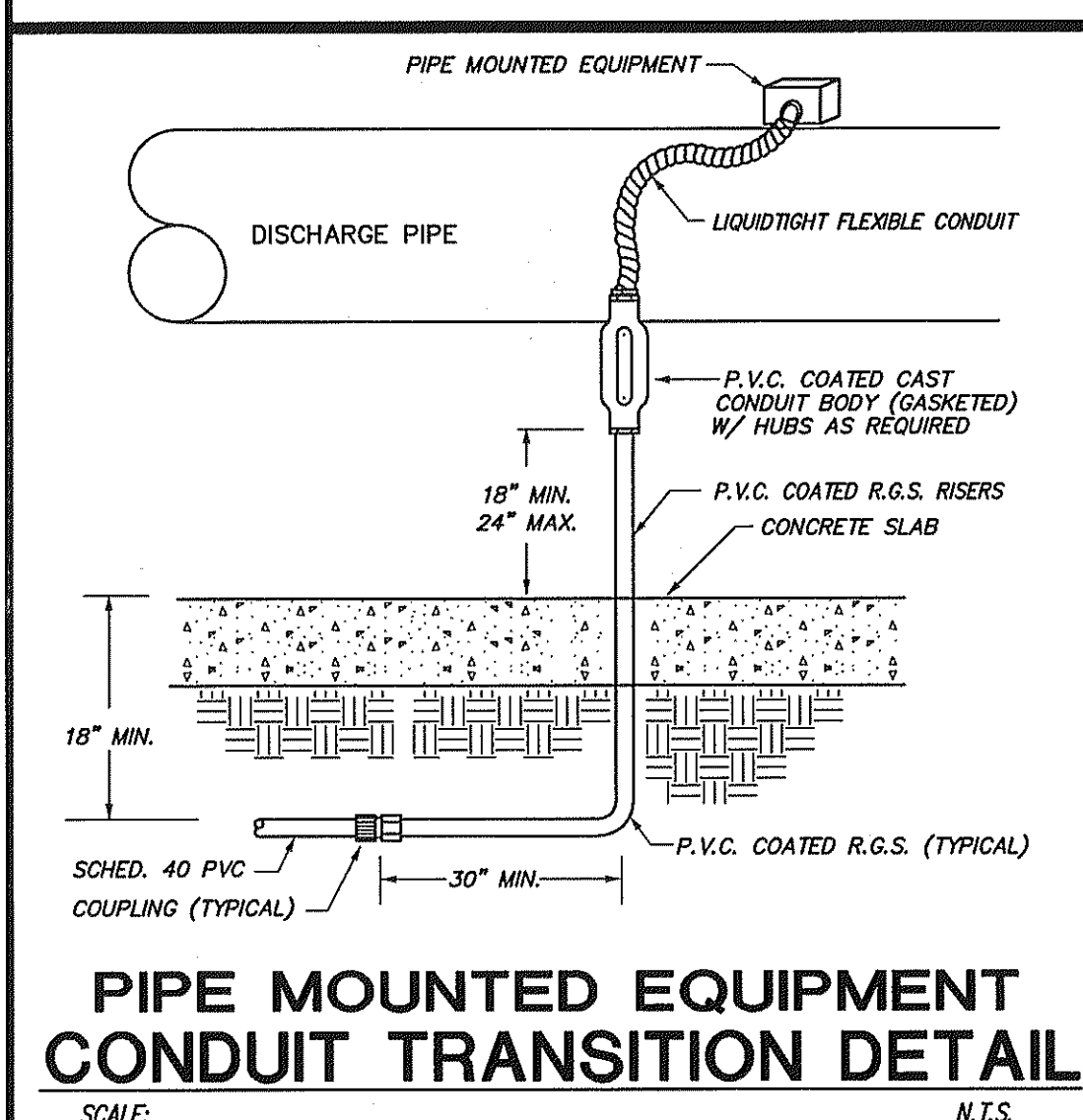
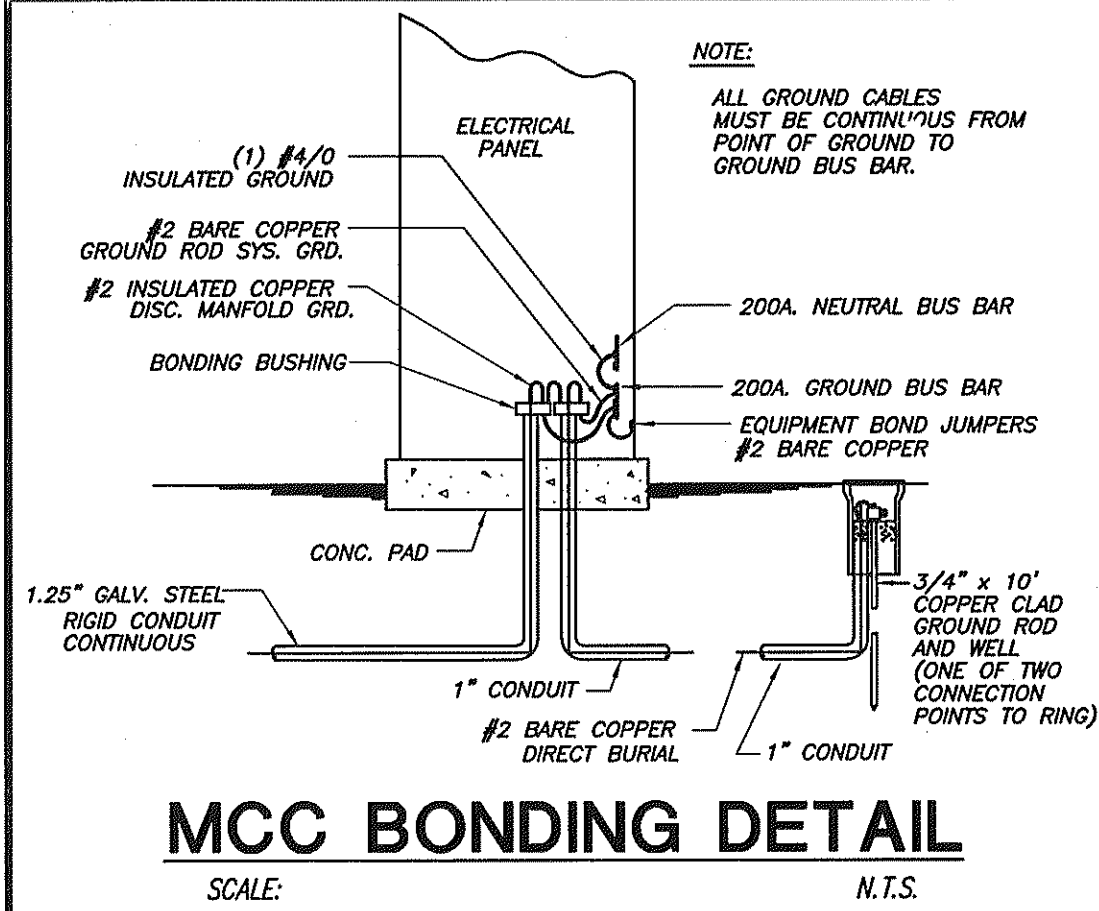
SAROJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE

VENTURA COUNTY
WATERWORKS DISTRICT NO. 1

SPEC. NO.
WW 09-06
PROJ. NO.
31886

ROSELAND BOOSTER PUMP STATION
ELECTRICAL MCC ELEVATIONS AND DETAILS

SHEET REFERENCE NO.	E9
SHEET	15
OF	16
DRAWING NO.	112475



STAMP

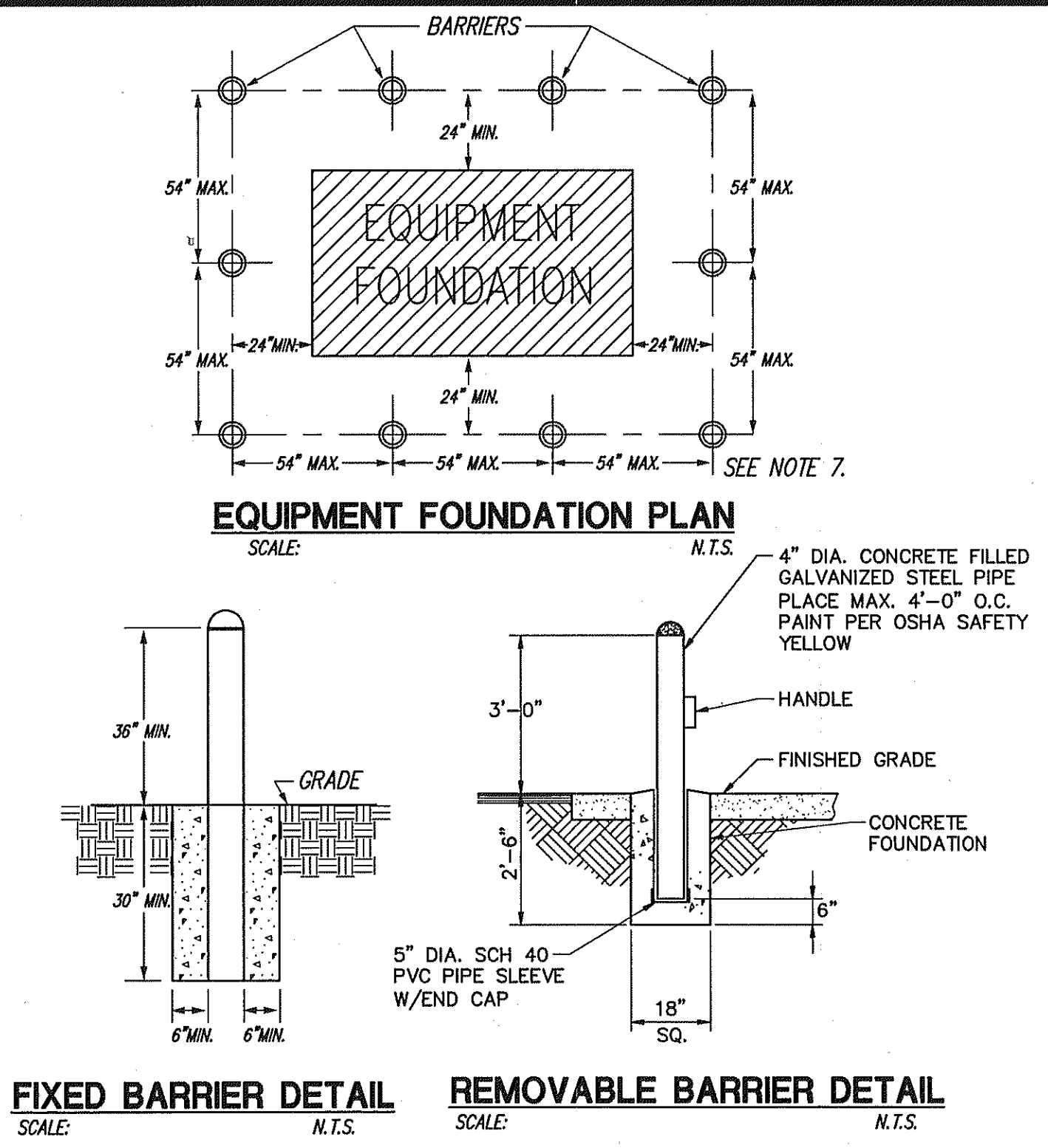
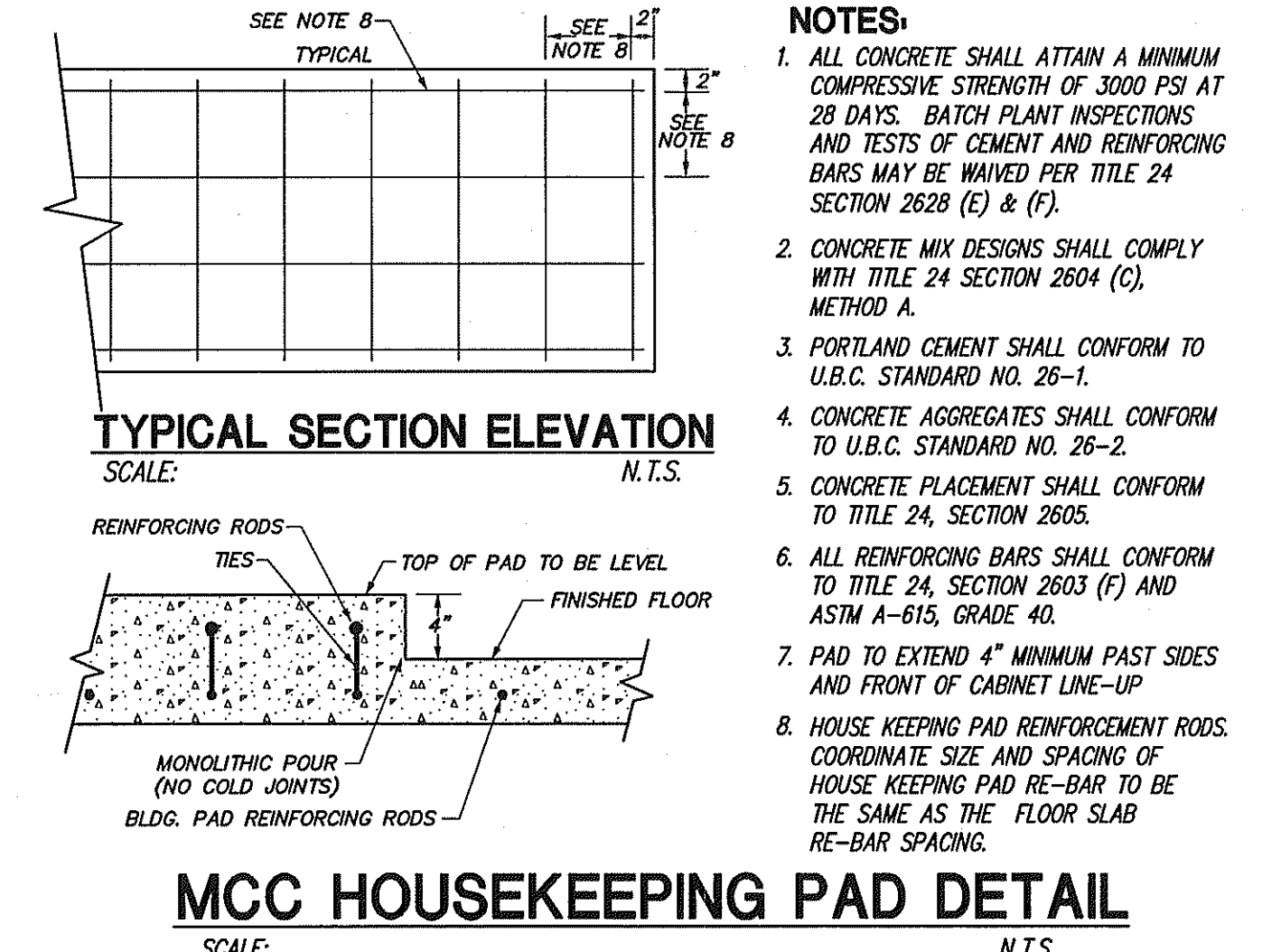
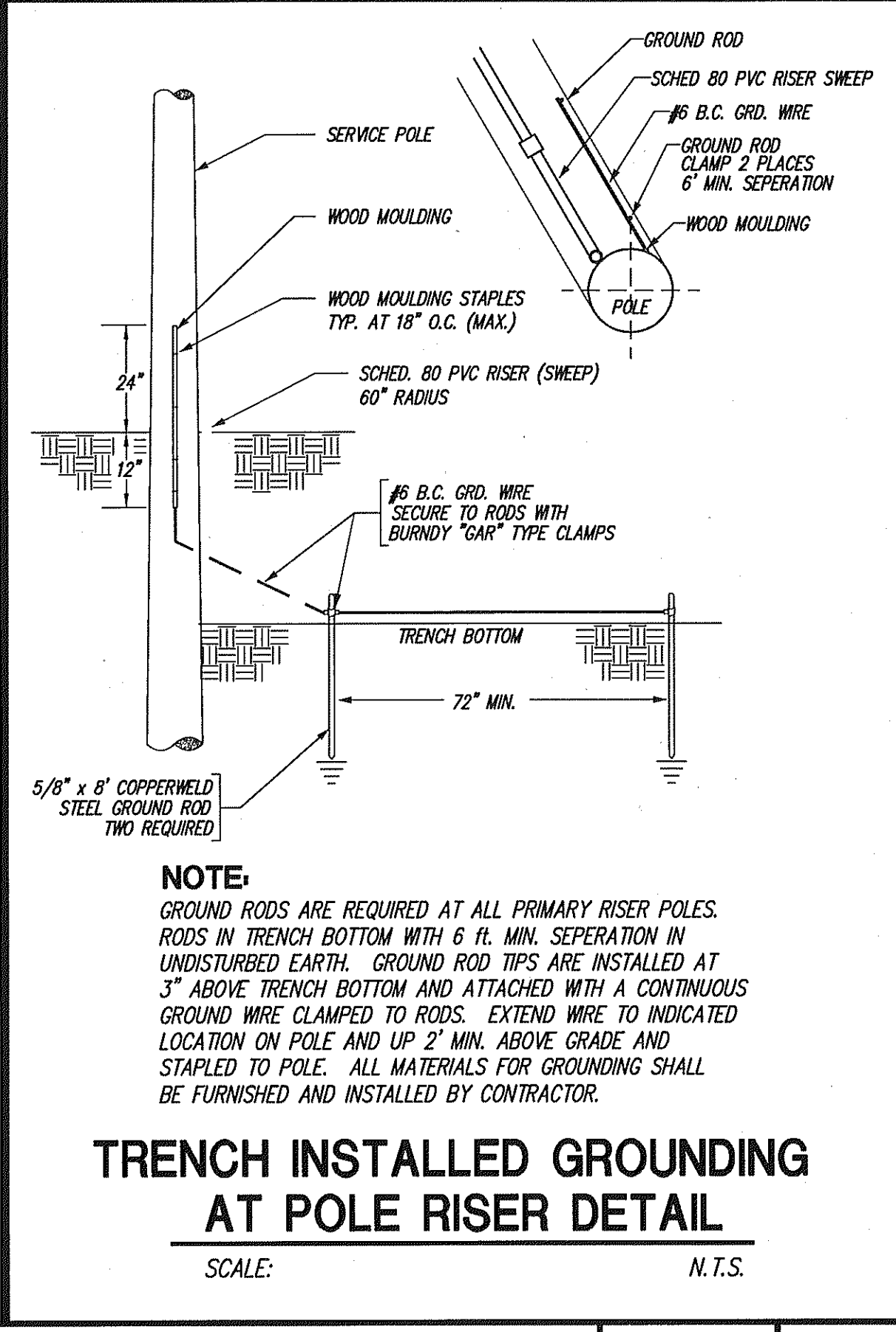
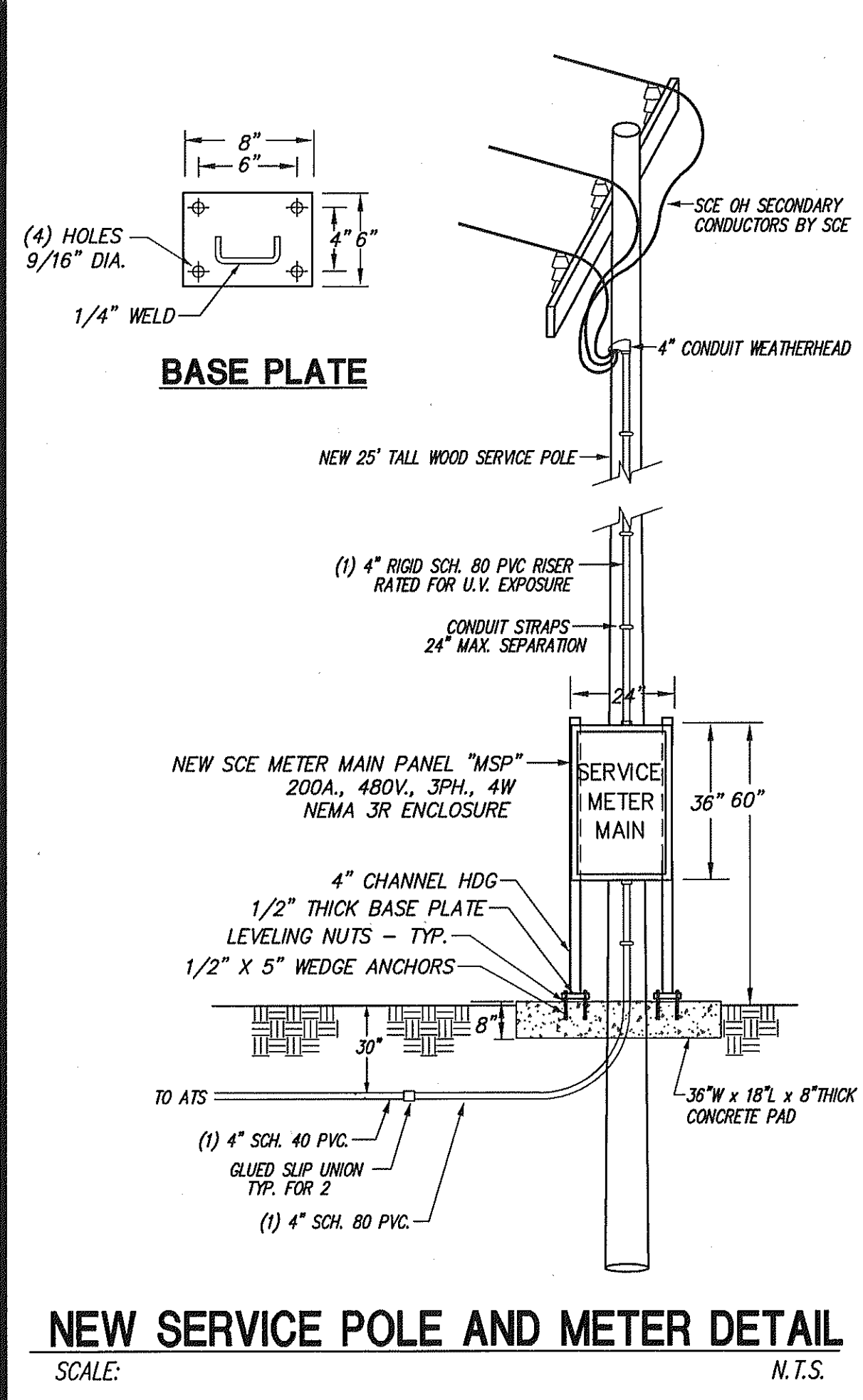
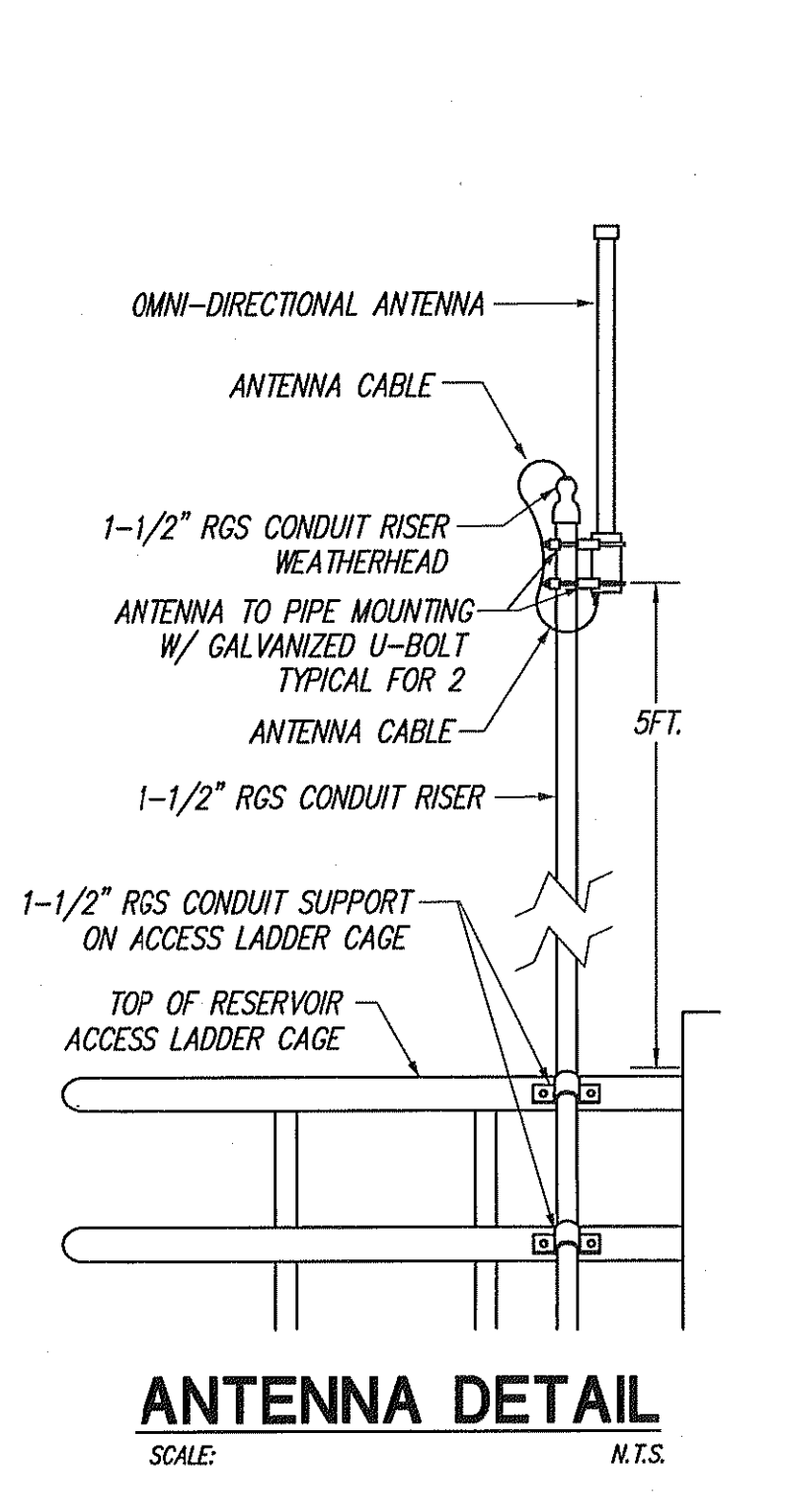
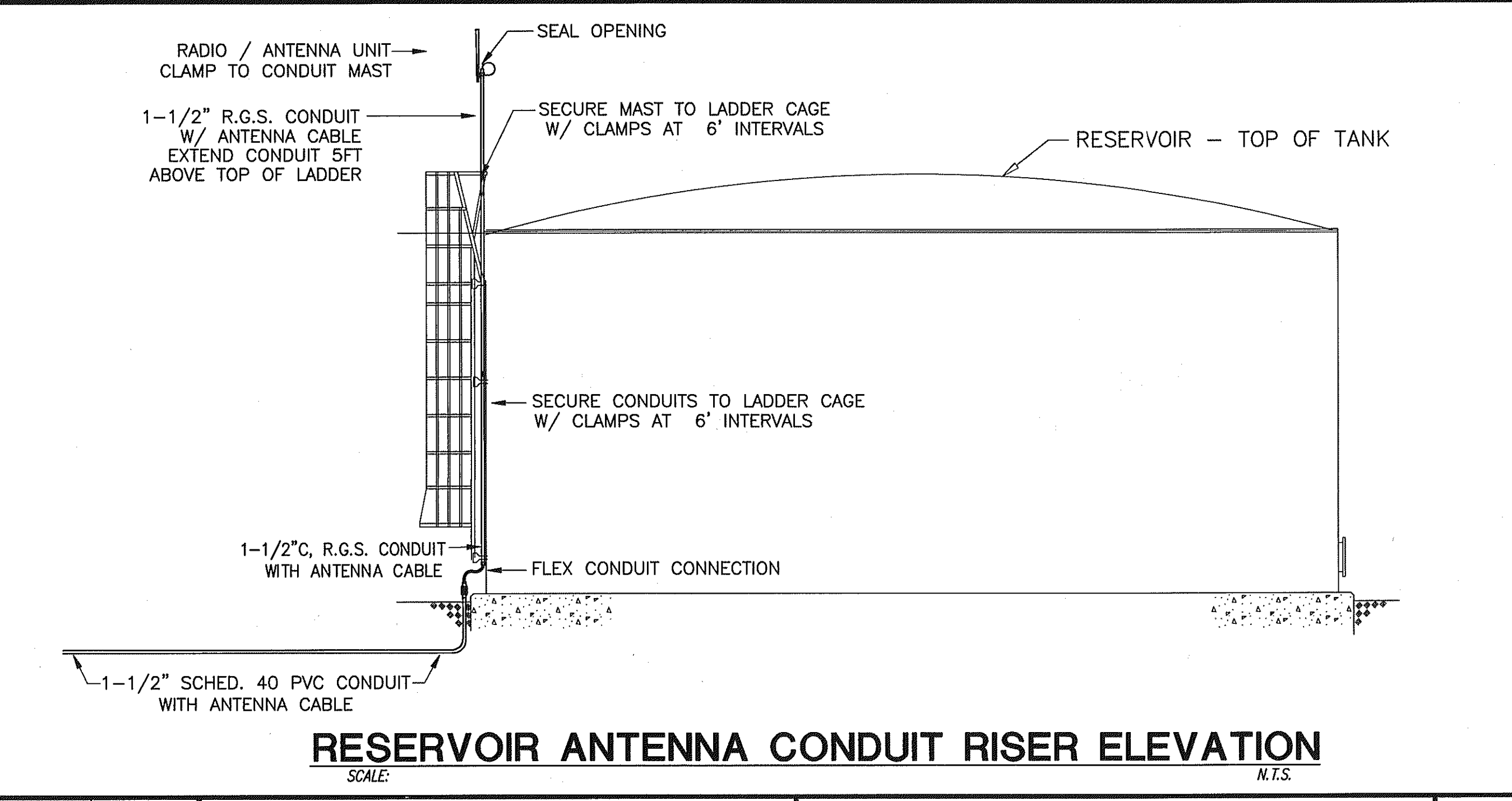
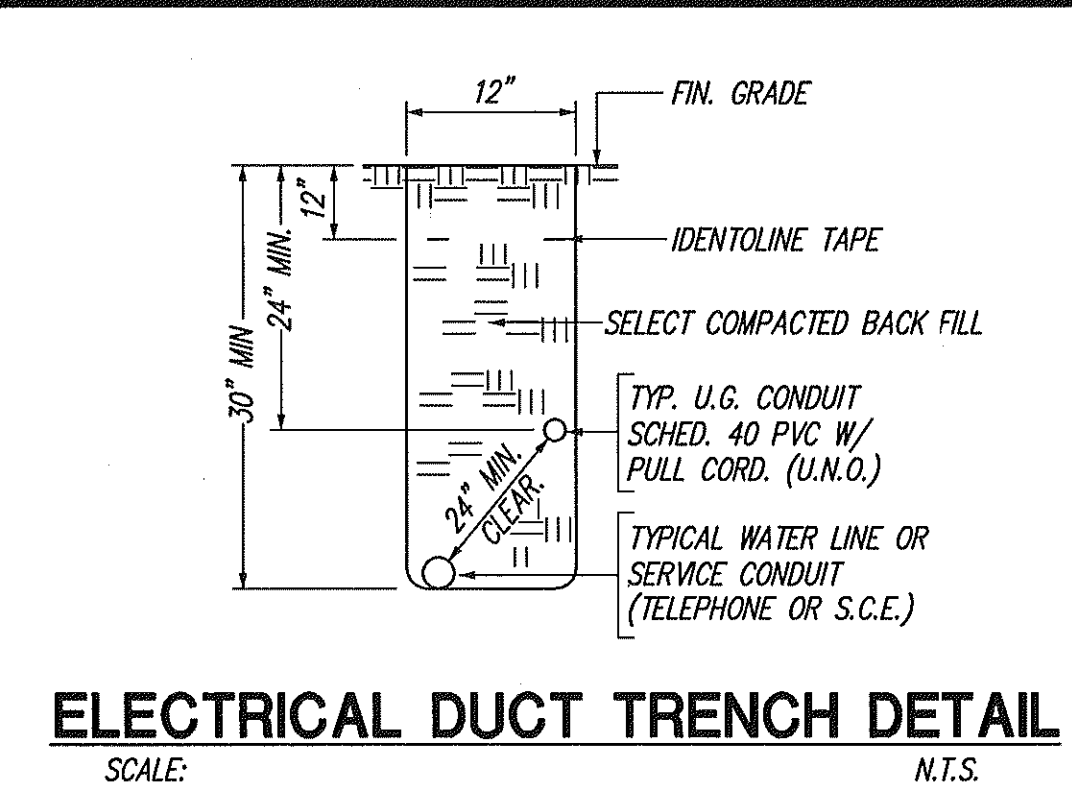
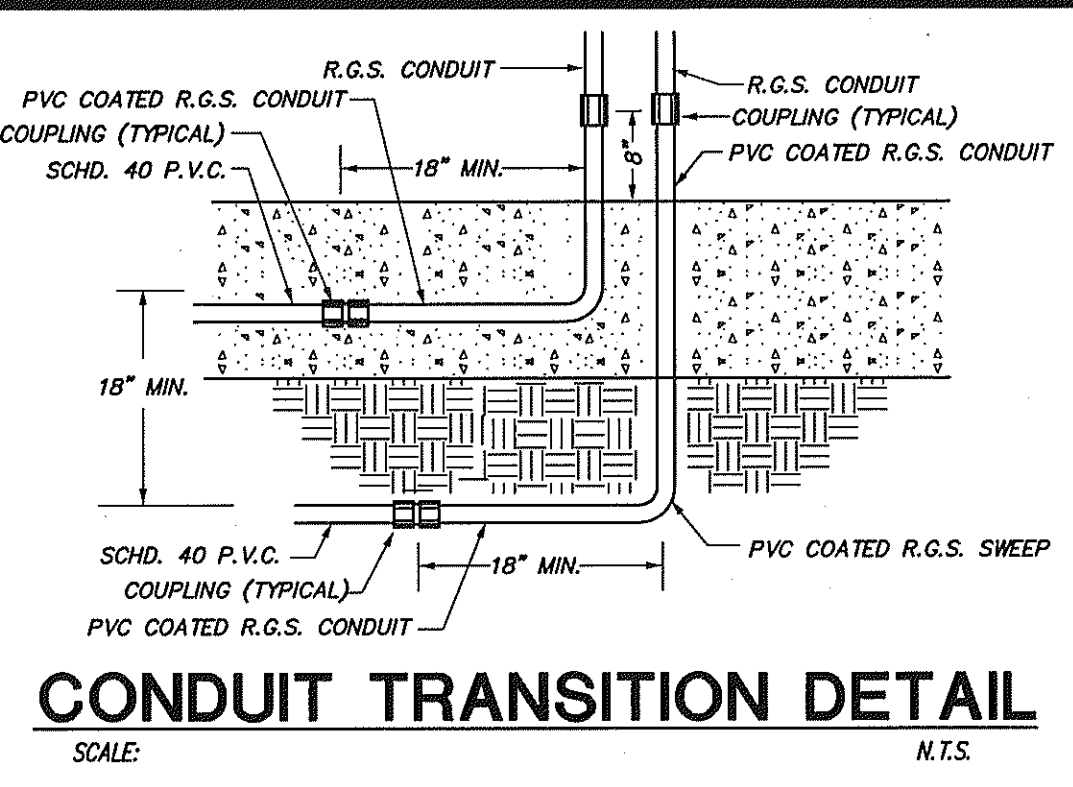
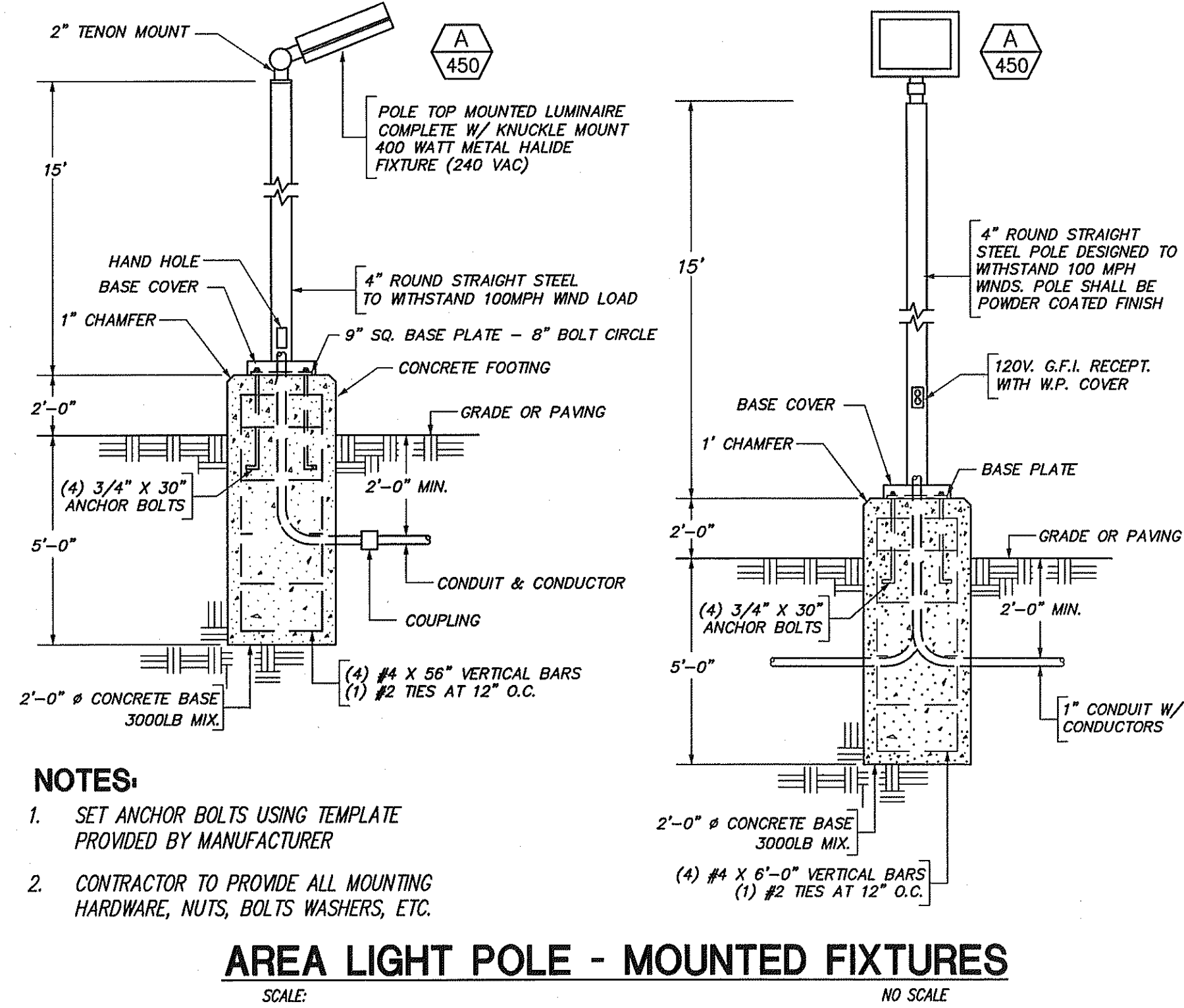
Underground Service Alert

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1-800-227-2600

TWO WORKING DAYS BEFORE YOU DIG

REVISIONS	BY	DATE



NOTES:

- STRUCTURES WILL NORMALLY BE INSTALLED ONLY IN NON-TRAFFIC AREAS. BARRIERS TO BE USED WHERE CONSTRUCTION HAS EXPOSED EQUIPMENT TO TRAFFIC.
- TOP OF BARRIERS TO BE SMOOTH CUT AND TOP EDGES TO BE ROUNDED.
- BARRIERS TO BE REMOVABLE WHEN OVERHEAD OBSTACLES PREVENT EQUIPMENT REMOVAL BY CRANE. PROVIDE REMOVABLE BARRIERS ON FRONT (DOOR SIDE) OF TRANSFORMER PADS.
- ADEQUATE CLEARANCE MUST BE PROVIDED FOR DOORS, COOLING COILS, ETC.
- BARRICADES, AS SHOWN, INDICATE TYPICAL REQUIREMENTS. FIELD CONDITIONS WILL NECESSITATE CHANGES FOR ADEQUATE EQUIPMENT PROTECTION. APPROVAL IN THE FIELD FROM UNDERGROUND INSPECTOR IS REQUIRED FOR ALL BARRICADE INSTALLATIONS.
- WHEN SPECIFIED ON WORKING DRAWINGS, A 6" (MINIMUM HEIGHT) CURB MAY BE INSTALLED IN PLACE OF BARRIERS. THIS CURB MUST BE AT LEAST 6" THICK AND ITS FRONT FACE (LOCATED 36" MINIMUM OR SPECIFIED ON DRAWING) FROM THE EQUIPMENT FOUNDATION.
- MINIMUM DOOR SIDE WALK/WORKING CLEARANCE SHALL BE 24" FROM DOOR EDGE MEASURED WITH DOOR OPEN AT 90°

'PARKING BOLLARD' PROTECTIVE BARRIER FOR UNDERGROUND DISTRIBUTION STRUCTURES
SCALE: N.T.S.

PREPARED BY: **W.A. DOBY engineering inc.**
consulting electrical engineers

35225 Avenue "A", Suite 301
Yucaipa, California 92399
(909) 797-5187
FAX (909) 797-5180
E-MAIL wadoby@EARTHINK.NET

SAROJ K. JOSHI R.E.E. NO. E17931 EXP. 9-30-10 DATE

VENTURA COUNTY WATERWORKS DISTRICT NO. 1

SPEC. NO. **WW 09-06**
PROJ. NO. **31886**

ROSELAND BOOSTER PUMP STATION

ELECTRICAL DETAILS

NO SCALE

SHEET REFERENCE NO. **E10**

SHEET **16** OF **16**

DRAWING NO. **112476**

**COUNTY OF VENTURA
PUBLIC WORKS AGENCY**

May 19, 2009

To: All Prospective Bidders **Addendum No. 1**
From: Jeff Pratt, Director Public Works Agency
Subject: ROSELAND BOOSTER PUMP STATION
Specification No: WW09-06 Project No: 31886
Bids to be opened: Thursday, May 28, 2009 at 2:00 p.m.

Make the following modifications to the bidding documents for subject project:

Add to the Notice Inviting Formal Bids the following paragraph:

“Ventura County Waterworks District No. 1 has made the finding that the designation of the Systems Integrated to provide the materials, products and services needed for telemetry work on this project is necessary in order to match the existing SCADA system currently in use.”

Acknowledgment of this addendum by inserting the addendum No. on page 7 of the Proposal is required. Failure to do so may result in the disqualification of your bid.

Approved: _____


Jeff Pratt, Director Public Works Agency

5/19/09
Date Approved

ADDENDUM NO. 1

SPEC. NO. WW09-06

PAGE 1 OF 1

**COUNTY OF VENTURA
PUBLIC WORKS AGENCY**

May 27, 2009

To: All Prospective Bidders **Addendum No. 2**
From: Jeff Pratt, Director Public Works Agency
Subject: ROSELAND BOOSTER PUMP STATION
Specification No: WW09-06 Project No: 31886

Original Bid date: Thursday, May 28, 2009 at 2:00 p.m. is changed to:

Bids to be Opened: Wednesday, June 3, 2009 at 2:00 p.m.

Make the following modifications to the bidding documents for subject project:

1. The date for opening bids is changed from Thursday, May 28, 2009 at 2:00 p.m. to Wednesday June 3, 2009 at 2:00 p.m.

2. SPECIAL PROVISIONS:

SECTION 1002 PUMPS, MOTORS, AND APPURTENANCES

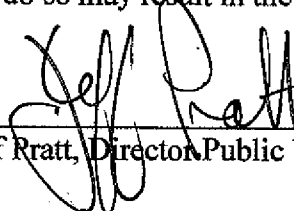
Paragraph 1.6, B-2 Vertical Turbine, (High-Flow) Pump:

Regarding Pump Can diameter, Replace "16-inches" with "18-inches".

3. PLANS:

- A. Sheet 3: "SHEET 3 AND 4 PARTS LIST", Item 3: *Replace with: "18-inch diameter x 3/8-inch standard steel pump can assembly, 10-ft total length from adaptor flange, and leave 12-inch clearance from pump to bottom of can."*
- B. Sheet 3: "SHEET 3 AND 4 PARTS LIST", Item 15: *Replace with: "10-inch Resilient Wedge Flange Gate Valve."*
- C. Sheet 3: "SHEET 3 AND 4 PARTS LIST", Item 79: *Replace with: "10-inch x 10-inch Flange Tee per D-6."*
- D. Sheet 3: "SHEET 3 AND 4 PARTS LIST", Item 80: *Replace with: "10-inch DI Flange Spool per AWWA C104 and C105."*
- E. Sheet 4: Elevation "A" Call-out: *Replace with: "8-inch Concrete Encasement around Pump Can with 26-inch Diameter #4 Bar Cage (Typ.)."*

Acknowledgment of this addendum by inserting the addendum No. on page 7 of the Proposal is required. Failure to do so may result in the disqualification of your bid.

Approved: 
Jeff Pratt, Director Public Works Agency

5/27/09
Date Approved