

CITY OF CARLSBAD

San Diego County

California

**CONTRACT DOCUMENTS,
GENERAL PROVISIONS AND
TECHNICAL SPECIFICATIONS**

FOR

**POINSETTIA LIFT
STATION HYDRAULIC
SURGE PROTECTON**

CONTRACT NO. 5503-14

BID NO. PWS20-1137UTIL (RE-BID)



TABLE OF CONTENTS

<u>Item</u>	<u>Page</u>
Notice Inviting Bids	7
Contractor's Proposal.....	14
Major Equipment List	19
Bid Security Form	20
Bidder's Bond to Accompany Proposal	21
Guide for Completing the "Designation of Subcontractors" Form	22
Designation of Subcontractor and Amount of Subcontractor's Bid Items	24
Bidder's Statement of Technical Ability and Experience	25
Bidder's Certificate of Insurance for General Liability, Employers' Liability, Automotive Liability and Workers' Compensation	26
Bidder's Statement Re Debarment.....	27
Bidder's Disclosure of Discipline Record	28
Noncollusion Declaration to Be Executed by Bidder and Submitted with Bid.....	30
Contract Public Works.....	31
Labor and Materials Bond	38
Faithful Performance/Warranty Bond	40
Optional Escrow Agreement for Surety Deposits in Lieu of Retention	42



GENERAL PROVISIONS

Section 1	Terms, Definitions Abbreviations and Symbols	
1-1	Terms	45
1-2	Definitions	45
1-3	Abbreviations	49
1-4	Units of Measure	52
1-5	Symbols	53
Section 2	Scope and Control of The Work	
2-1	Award and Execution of Contract	54
2-2	Assignment	54
2-3	Subcontracts	54
2-4	Contract Bonds	55
2-5	Plans and Specifications	56
2-6	Work to be Done	60
2-7	Subsurface Data	60
2-8	Right-of-Way	60
2-9	Surveying	60
2-10	Authority of Board and Engineer	64
2-11	Inspection	65
Section 3	Changes in Work	
3-1	Changes Requested by the Contractor	66
3-2	Changes Initiated by the Agency	66
3-3	Extra Work	67
3-4	Changed Conditions	70
3-5	Disputed Work	71
Section 4	Control of Materials	
4-1	Materials and Workmanship	77
4-2	Materials Transportation, Handling and Storage	81
Section 5	Utilities	
5-1	Location	82
5-2	Protection	82
5-3	Removal	83
5-4	Relocation	83
5-5	Delays	84
5-6	Cooperation	84
Section 6	Prosecution, Progress and Acceptance of the Work	
6-1	Construction Schedule and Commencement of Work	85
6-2	Prosecution of Work	89
6-3	Suspension of Work	93
6-4	Default by Contractor	93
6-5	Termination of Contract	94
6-6	Delays and Extensions of Time	94
6-7	Time of Completion	95
6-8	Completion, Acceptance, and Warranty	96



6-9	Liquidated Damages	96
6-10	Use of Improvement During Construction	96
Section 7	Responsibilities of the Contractor	
7-1	Contractor's Equipment and Facilities	98
7-2	Labor	98
7-3	Liability Insurance	98
7-4	Workers' Compensation Insurance	98
7-5	Permits	99
7-6	The Contractor's Representative.....	99
7-7	Cooperation and Collateral Work	99
7-8	Project Site Maintenance	100
7-9	Protection and Restoration of Existing Improvements	102
7-10	Public Convenience and Safety	102
7-11	Patent Fees or Royalties.....	109
7-12	Advertising	109
7-13	Laws to be Observed	109
7-14	Antitrust Claims.....	109
Section 8	Facilities for Agency Personnel (Not Used) .	110
Section 9	Measurement and Payment	
9-1	Measurement of Quantities for Unit Price Work	111
9-2	Lump Sum Work	111
9-3	Payment	111
9-4	Bid Items.....	115



TECHNICAL SPECIFICATIONS

DIVISION 01 – GENERAL REQUIREMENTS

01010	Summary of Work and Contract Considerations
01040	Coordination and Project Requirements
01190	Seismic Requirements for Contractor Furnished/Installed Items
01300	Submittals
01650	Facility Startup
01700	Contract Closeout

DIVISION 02 – SITE WORK

02050	Demolition
02302	Earthwork
02303	Bypass Pumping
02705	Paving and Resurfacing

DIVISION 03 – CONCRETE (NOT USED)

DIVISION 04 – MASONRY (NOT USED)

DIVISION 05 – METALS (NOT USED)

DIVISION 06 – WOOD AND PLASTICS (NOT USED)

DIVISION 07 – THERMAL AND MOISTURE PROTECTION (NOT USED)

DIVISION 08 – DOORS AND WINDOWS (NOT USED)

DIVISION 09 – FINISHES

09960	High Performance Coatings
-------	---------------------------

DIVISION 10 – SPECIALTIES (NOT USED)

DIVISION 11 – EQUIPMENT

11001	General Equipment and Mechanical Requirements
11372	Compressed Air System

DIVISION 12 – FURNISHINGS (NOT USED)

DIVISION 13 – SPECIAL CONSTRUCTION

13210	Surge Tank
-------	------------

DIVISION 14 – CONVEYING SYSTEMS

15050	Piping, Valves and Accessories
15060	Pipe Supports

DIVISION 16: ELECTRICAL

16010	General Electrical Requirements
16110	Electrical Raceway Systems
16120	Low Voltage Wire and Cable

DIVISION 17 – INSTRUMENTATION AND CONTROL

17010	General Instrumentation, Controls Requirements
17150	Pressure Measurement



APPENDICIES

Appendix 1, Tier 1 SWPPP Reference

Appendix 2, Geotech Report

Appendix 3, Record Drawing, Dwg No. 331-1F, sheets 3-7, Poinsettia Lift Station

Appendix 4 Record Drawing, Dwg No. 451-2, sheets 1-16, Pump Upgrade

Appendix 5, Record Dwg 486-6 Poinsettia Lift Station Bypass Pump, total



CITY OF CARLSBAD NOTICE INVITING BIDS

Until 11 a.m. on July 22, 2020, the City shall accept bids via electronic format via the City of Carlsbad Electronic Bidding Site, PlanetBids, which may be accessed at <https://www.carlsbadca.gov/services/depts/finance/contracting/default.asp>, for performing the work as follows: Installation of hydraulic surge protection equipment including a pneumatic surge tank system at the Poinsettia Lift Station.

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14 BID NO. PWS20-1137UTIL (RE-BID)

ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS: Bids will be received in electronic format (eBids) **EXCLUSIVELY** at the City of Carlsbad's electronic bidding (eBidding) site, at: <https://www.carlsbadca.gov/services/depts/finance/contracting/default.asp> and are due by the date and time shown on the cover of this solicitation.

BIDDERS MUST BE PRE-REGISTERED with the City's bidding system and possess a system-assigned Digital ID in order to submit an electronic bid.

The City's electronic bidding (eBidding) system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Bidders who disable their browsers' cookies will not be able to log in and use the City's bidding system.

The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. The system will not accept a bid for which any required information is missing. This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.

BIDS REMAIN SEALED UNTIL DUE DATE AND TIME.

eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256-bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the Due Date and Time are not available for review by anyone other than the submitter, who will have until the Due Date and Time to change, rescind or retrieve its bid should they desire to do so.

BIDS MUST BE SUBMITTED BY DUE DATE AND TIME.

Once the deadline is reached, no further submissions are accepted into the system. Once the Due Date and Time has passed, bidders, proposers, the general public, and City staff are able to immediately see the results online. City staff may then begin reviewing the submissions for responsiveness, compliance and other issues.



RECAPITULATION OF THE WORK.

Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.

BIDS MAY BE WITHDRAWN by the Bidder prior to, but not after, the time set as Due Date and Time.

Important Note: Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of Carlsbad is not responsible for bids that do not arrive by the Due Date and Time.

ELECTRONIC SUBMISSIONS CARRY FULL FORCE AND EFFECT.

The Bidder, by submitting their electronic proposal, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this proposal are true and correct. The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature. By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.

BIDS ARE PUBLIC RECORDS

Upon receipt by the City, bids shall become public records subject to public disclosure. It is the responsibility of the Bidder to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the proposal's General references to sections of the California Public Records Act (PRA) will not suffice. If the Bidder does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Bidder agrees to hold the City harmless for any such release of this information.

INSTRUCTIONS TO BIDDERS AND BID REQUIREMENTS

This bid and the terms of the Contract Documents and General Provisions constitute an irrevocable offer that shall remain valid and in full force for a period of 90 days and such additional time as may be mutually agreed upon by the City of Carlsbad and the Bidder.

No bid will be received unless it is made on a proposal form furnished by the Purchasing Department. Each bid must be accompanied by security in a form and amount required by law. The bidder's security of the second through fifth next lowest responsive bidders may be withheld until the Contract has been fully executed. The security submitted by all other unsuccessful bidders shall be returned to them, or deemed void, within ten (10) days after the Contract is awarded. Pursuant to the provisions of law (Public Contract Code section 10263), appropriate securities may be substituted for any obligation required by this notice or for any monies withheld by the City to ensure performance under this Contract. Section 10263 of the Public Contract Code requires monies or securities to be deposited with the City or a state or federally chartered bank in



California as the escrow agent. The escrow agent shall maintain insurance to cover negligent acts and omissions of the agent in connection with the handling of retentions under this section in an amount not less than \$100,000 per contract.

The City of Carlsbad may disqualify a contractor or subcontractor from participating in bidding when a contractor or subcontractor has been debarred by the City of Carlsbad or another jurisdiction in the State of California as an irresponsible bidder.

The work shall be performed in strict conformity with the plans, provisions, and specifications as approved by the City Council of the City of Carlsbad on file with the City Clerk's Office. The specifications for the work include City of Carlsbad Technical Specifications and General Provisions. Specification Reference is hereby made to the plans and specifications for full particulars and description of the work. The General Provisions (Part 1) to the SSPWC do not apply.

The City of Carlsbad encourages the participation of minority and women-owned businesses.

The City of Carlsbad encourages all bidders, suppliers, manufacturers, fabricators and contractors to utilize recycled and recyclable materials when available, appropriate and approved by the Engineer.

SUMMARY OF BIDDING SCHEDULE

An overview of the bidding schedule is included in the following table. Details for each activity can be found in relevant section.

ACTIVITY	SCHEDULE	TIME
Released for bid	July 16, 2020	
Reserve pre-bid site visit time	June 29, 2020	4 p.m.
Mandatory pre-bid meeting and site visit	June 30, 2020	9 a.m.-2 p.m.
Deadline for questions	July 7, 2020	
Final addendum/Q&A posted	July 14, 2020	
Bids due	July 22, 2020	11 a.m.

BID DOCUMENTS

The bid documents comprise the following documents which must be completed and properly executed including notarization, where indicated at time of Bid.

1. Contractor's Proposal
2. Bidder's Bond (At Time of Bid Submit PDF Copy via PlanetBids / All Bidders). Bid Bond (Original) Due By 5 PM Next Business Day After Bid Opening/ 5 Apparent Low Bidders.
3. Noncollusion Declaration
4. Designation of Subcontractor and Amount of Subcontractor's Bid
5. Bidder's Statement of Technical Ability and Experience
6. Acknowledgement of Addendum(a)
7. Certificate of Insurance. The riders covering the City, its officials, employees and volunteers may be omitted at the time of bid submittal but shall be provided by the Bidder prior to award of this contract.
8. Bidder's Statement Re Debarment
9. Bidder's Disclosure Of Discipline Record



10. Escrow Agreement for Security Deposits - (optional, must be completed if the Bidder wishes to use the Escrow Agreement for Security)
11. Major Equipment List

BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY)

At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of Carlsbad, the bid security must be uploaded to the City's eBidding system. By 5PM the next business day after the bid opening date, the first five apparent low bidders must provide the City with the original bid security.

Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original by 5PM the next business day after bid opening date shall cause the bid to be rejected and deemed **non-responsive**.

Original Bid Bond shall be submitted to:
Public Works Contract Administration
Attention: Graham Jordan, Contract Administrator
1635 Faraday Avenue
Carlsbad, California, 92008

ENGINEER'S ESTIMATE:

All bids will be compared on the basis of the Engineer's Estimate. The estimated quantities are approximate and serve solely as a basis for the comparison of bids. The Engineer's Estimate is **\$420,000**.

TIME OF COMPLETION:

The contractor shall complete the Work within the time set in the contract as defined in the General Provisions Section 6-7.

SPECIALTY CONTRACTORS: **ACCEPTABLE LICENSE TYPES**

Except as provided herein a bid submitted to the City by a Contractor who is not licensed as a contractor pursuant to the Business and Professions Code shall be considered nonresponsive and shall be rejected by the City. In all contracts where federal funds are involved, no bid submitted shall be invalidated by the failure of the bidder to be licensed in accordance with California law. Where federal funds are involved the contractor shall be properly licensed at the time the contract is awarded. In all other cases the contractor shall state their license number, expiration date and classification in the proposal, under penalty of perjury. This invitation to bid does not involve federal funds. The following classifications are acceptable for this contract: **A - General Engineering**.

ESCROW AGREEMENT

If the Contractor intends to utilize the escrow agreement included in the contract documents in lieu of the usual 5% retention from each payment, these documents must be completed and submitted with the signed contract. The escrow agreement may not be substituted at a later date.

OBTAINING PLANS AND SPECIFICATIONS

Sets of plans, various supplemental provisions, and Contract documents may be obtained from the City's website at <https://www.carlsbadca.gov/services/depts/finance/contracting/default.asp>. Paper copies will not be sold.



INTENT OF PLANS AND SPECIFICATIONS

Any prospective bidder who is in doubt as to the intended meaning of any part of the drawings, specifications or other contract documents, or finds discrepancies in or omissions from the drawings and specifications may submit to the Engineer a written request for clarification or correction. Any response will be made only by a written addendum duly issued by the Engineer a copy of which will be mailed or delivered to each person receiving a set of the contract documents. No oral response will be made to such inquiry. **Prior to the award of the contract, no addition to, modification of or interpretation of any provision in the contract documents will be given by any agent, employee or contractor of the City of Carlsbad except as hereinbefore specified. No bidder may rely on directions given by any agent, employee or contractor of the City of Carlsbad except as hereinbefore specified.**

BIDDER'S INQUIRIES

Questions on the bid documents during the bid period shall be submitted in writing, via email, solely to:

Graham Jordan, Contract Administrator
graham.jordan@carlsbadca.gov

Questions shall be definite and certain and shall reference applicable drawing sheets, notes, details or specification sheets.

The cutoff date to submit questions is identified in the bidding schedule. No questions will be entertained after that date.

The answers to questions submitted during the bidding period will be published in an addendum and provided to those bidding on the project no later than the date specified in the bidding schedule.

REJECTION OF BIDS

The City of Carlsbad reserves the right to reject any or all bids and to waive any minor irregularity or informality in such bids.

PREVAILING WAGE TO BE PAID

The general prevailing rate of wages for each craft or type of worker needed to execute the Contract shall be those as determined by the Director of Industrial Relations pursuant to the sections 1770, 1773, and 1773.1 of the Labor Code. Pursuant to section 1773.2 of the Labor Code, a current copy of applicable wage rates is on file in the Office of the City Engineer. The Contractor to whom the Contract is awarded shall not pay less than the said specified prevailing rates of wages to all workers employed by him or her in the execution of the Contract.

The Prime Contractor shall be responsible for insuring compliance with provisions of section 1777.5 of the Labor Code and section 4100 et seq. of the Public Contracts Code, "Subletting and Subcontracting Fair Practices Act." The City Engineer is the City's "duly authorized officer" for the purposes of section 4107 and 4107.5.

The provisions of Part 7, Chapter 1, of the Labor Code commencing with section 1720 shall apply to the Contract for work.

A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance



of any contract for public work, unless currently registered and qualified to perform public work pursuant to Section 1725.5. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The Prime Contractor and all subcontractors shall comply with Section 1776 of the Labor Code, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require all subcontractors to comply with Section 1776.

MANDATORY PRE-BID MEETING

A mandatory pre-bid meeting and site visit will provide bidding contractors the opportunity to view and inspect the project site/facility prior to bidding. The site visit will be structured in such a way as to comply with current County of San Diego public health orders. The project site will be open to contractors for a 20-minute site visit between the hours of 9:00 am and 2:00 pm on June 30, 2020. All bidding contractors must reserve their 20-minute visitation time slot with the City's Contract Administration Division no later than the time and date specified on the bidding schedule table above. Reservations for time slots will be scheduled on a first come first serve basis. Please contact Graham Jordan, Contract Administrator, in writing, via email, at graham.jordan@carlsbadca.gov to reserve a visitation time slot.

Scheduled visitors shall park on the east entry driveway to the lift station site. All contractors will be required to sign in to verify their attendance. City staff will be available at the site to coordinate access to the facility but will not address questions related to the project at this time. Questions and requests for clarification shall be submitted by the contractors formally as described under Bidder's Inquiries section above.

UNIT PRICES AND COMPUTATION OF BIDS

All bids are to be computed on the basis of the given estimated quantities of work, as indicated in this proposal, times the unit price as submitted by the bidder.

ADDENDA

Bidders are advised to verify the issuance of all addenda and receipt thereof one day prior to bidding. Submission of bids without acknowledgment of addenda may be cause of rejection of bid.

BOND AND INSURANCE REQUIREMENTS

The Contractor shall provide bonds to secure faithful performance and warranty of the work in an amount equal to one hundred percent (100%) of the Contract price on this project. The Contractor shall provide bonds to secure payment of laborers and materials suppliers, in an amount equal to one hundred percent (100%) of the total amount payable by the terms of the contract. These bonds shall be kept in full force and effect during the course of this project and shall extend in full force and effect and be retained by the City until they are released as stated in the General Provisions section of this contract. All bonds are to be placed with a surety insurance carrier admitted and authorized to transact the business of insurance in California and whose assets exceed their liabilities in an amount equal to or in excess of the amount of the bond. The bonds are to be accompanied by the following documents:

1. An original, or a certified copy, of the unrevoked appointment, power of attorney, by laws, or other instrument entitling or authorizing the person who executed the bond to do so.
2. A certified copy of the certificate of authority of the insurer issued by the insurance commissioner.



If the bid is accepted, the City may require copies of the insurer's most recent annual statement and quarterly statement filed with the Department of Insurance pursuant to Article 10 (commencing with section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code, within 10 calendar days of the insurer's receipt of a request to submit the statements.

Insurance is to be placed with insurers that:

1. Have a rating in the most recent Best's Key Rating Guide of at least A-:VII
2. Are admitted and authorized to transact the business of insurance in the State of California by the Insurance Commissioner.

Auto policies offered to meet the specification of this contract must:

1. Meet the conditions stated above for all insurance companies.
2. Cover any vehicle used in the performance of the contract, used onsite or offsite, whether owned, non-owned or hired, and whether scheduled or non-scheduled.

Workers' compensation insurance required under this contract must be offered by a company meeting the above standards with the exception that the Best's rating condition is waived. The City does accept policies issued by the State Compensation Fund meeting the requirement for workers' compensation insurance.

The Contractor shall be required to maintain insurance as specified in the Contract. Any additional cost of said insurance shall be included in the bid price.

The award of the contract by the City Council is contingent upon the Contractor submitting the required bonds and insurance, as described in the contract, within twenty days of bid opening. If the Contractor fails to comply with these requirements, the City may award the contract to the second or third lowest bidder and the bid security of the lowest bidder may be forfeited.

BUSINESS LICENSE

The prime contractor and all subcontractors are required to have and maintain a valid City of Carlsbad Business License for the duration of the contract.

Approved by the City Council of the City of Carlsbad, California, by Resolution No. 2020-047, adopted on the 10th day of March 2020.

June 15, 2020

Date

Graham Jordan, Deputy Clerk



CITY OF CARLSBAD

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

CONTRACTOR'S PROPOSAL

City Council
City of Carlsbad
1200 Carlsbad Village Drive
Carlsbad, California 92008

The undersigned declares he/she has carefully examined the location of the work, read the Notice Inviting Bids, examined the Plans, Specifications, General Provisions, Contract Documents, and addenda thereto, and hereby proposes to furnish all labor, materials, equipment, transportation, and services required to do all the work to complete Contract No.5503-14 accordance with the Plans, Specifications, General Provisions, Contract Documents, and addenda thereto and that he/she will take in full payment therefore the following unit prices for each item complete, to wit:

SCHEDULE "A" POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION

Item No.	Description	Lump Sum Total Amount (Figures)
A-1	Mobilization, bonding, and de-mobilization at (Lump Sum Price in Words - not to exceed 5% of Total Bid)	\$
A-2	Demolition at (Lump Sum Price in Words)	\$
A-3	Installation of a complete surge protection system at (Lump Sum Price in Words)	\$
A-4	Replacement of Four Swing Check Valves (Lump Sum Price in Words)	\$
A-5	Installation of one vacuum relief valve off-site at 	\$



Item No.	Description	Lump Sum Total Amount (Figures)
	(Lump Sum Price in Words)	
A-6	Installation of 12" ductile iron pipe, fittings, and accessories at _____	\$_____
	(Lump Sum Price in Words)	
A-7	Bypass Pumping _____	\$_____
	(Lump Sum Price in Words)	

Total amount of bid in words for Schedule "A": _____

Total amount of bid in numbers for Schedule "A": \$_____

The City shall determine the low bid based on Schedule "A".

Price(s) given above are firm for 90 days after date of bid opening.

Price(s) given above are firm for 90 days after date of bid opening.

Addendum(a) No(s)._____ has/have been received and is/are included in this proposal.

The Undersigned has carefully checked all of the above figures and understands that the City will not be responsible for any error or omission on the part of the Undersigned in preparing this bid.

The Undersigned agrees that in case of default in executing the required Contract with necessary bonds and insurance policies within twenty (20) days from the date of award of Contract by the City Council of the City of Carlsbad, the City may administratively authorize award of the contract to the second or third lowest bidder and the bid security of the lowest bidder may be forfeited.

The Undersigned bidder declares, under penalty of perjury, that the undersigned is licensed to do business or act in the capacity of a contractor within the State of California, validly licensed under license number _____, classification _____ which expires on _____, and Department of Industrial Relations PWC registration number _____ which expires on _____, and that this statement is true and correct and has the legal effect of an affidavit.

A bid submitted to the City by a Contractor who is not licensed as a contractor pursuant to the Business and Professions Code shall be considered nonresponsive and shall be rejected by the City § 7028.15(e). In all contracts where federal funds are involved, no bid submitted shall be invalidated by the failure of the bidder to be licensed in accordance with California law. However, at the time the contract is awarded, the contractor shall be properly licensed.



The Undersigned bidder hereby represents as follows:

1. That no Council member, officer agent, or employee of the City of Carlsbad is personally interested, directly or indirectly, in this Contract, or the compensation to be paid hereunder; that no representation, oral or in writing, of the City Council, its officers, agents, or employees has inducted him/her to enter into this Contract, excepting only those contained in this form of Contract and the papers made a part hereof by its terms; and
2. That this bid is made without connection with any person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.

Accompanying this proposal is _____(Cash, Certified Check, Bond or Cashier's Check) for ten percent (10%) of the amount bid.

The Undersigned is aware of the provisions of section 3700 of the Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and agrees to comply with such provisions before commencing the performance of the work of this Contract and continue to comply until the contract is complete.

The Undersigned is aware of the provisions of the Labor Code, Part 7, Chapter 1, Article 2, relative to the general prevailing rate of wages for each craft or type of worker needed to execute the Contract and agrees to comply with its provisions.



IF A SOLE OWNER OR SOLE CONTRACTOR SIGN HERE:

- (1) Name under which business is conducted _____
- (2) Signature (given and surname) of proprietor _____
- (3) Place of Business _____
(Street and Number)
City and State _____
- (4) Zip Code _____ Telephone No. _____
- (5) E-Mail _____

IF A PARTNERSHIP, SIGN HERE:

- (1) Name under which business is conducted _____
- (2) Signature (given and surname and character of partner) (Note: Signature must be made by a general partner)

- (3) Place of Business _____
(Street and Number)
City and State _____
- (4) Zip Code _____ Telephone No. _____
- (5) E-Mail _____



IF A CORPORATION, SIGN HERE:

(1) Name under which business is conducted _____

(2) _____
(Signature)

(Title)

Impress Corporate Seal here

(3) Incorporated under the laws of the State of _____

(4) Place of Business _____
(Street and Number)
City and State _____

(5) Zip Code _____ Telephone No. _____

(6) E-Mail _____

NOTARIAL ACKNOWLEDGMENT OF EXECUTION BY ALL SIGNATORIES MUST BE ATTACHED

List below names of president, vice president, secretary and assistant secretary, if a corporation; if a partnership, list names of all general partners, and managing partners:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____



MAJOR EQUIPMENT LIST

(Check to Accompany Bid)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

The Equipment List below identifies the major equipment associated with the Poinsettia Lift Station Hydraulic Surge Protection. Bidders shall provide detailed information for each equipment in the table below. The information provided below will be part of the bid evaluation process by the City of Carlsbad.

Equipment	Manufacturer Name, Address, Phone Number	Equipment Model Number	Meets Specifications, or "Or-Equal"
Surge Tank Section 13210			
Swing Check Valves Section 15050			
Compressed Air System Section 11372			



BID SECURITY FORM

(Check to Accompany Bid)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

(NOTE: The following form shall be used if check accompanies bid.)

Accompanying this proposal is a *Certified *Cashier's check payable to the order of CITY OF CARLSBAD, in the sum of _____

_____ dollars (\$_____),
this amount being ten percent (10%) of the total amount of the bid. The proceeds of this check shall become the property of the City provided this proposal shall be accepted by the City through action of its legally constituted contracting authorities and the undersigned shall fail to execute a contract and furnish the required Performance, Warranty and Payment Bonds and proof of insurance coverage within the stipulated time; otherwise, the check shall be returned to the undersigned. The proceeds of this check shall also become the property of the City if the undersigned shall withdraw his or her bid within the period of fifteen (15) days after the date set for the opening thereof, unless otherwise required by law, and notwithstanding the award of the contract to another bidder.

BIDDER

*Delete the inapplicable word.

(NOTE: If the Bidder desires to use a bond instead of check, the Bid Bond form on the following pages shall be executed--the sum of this bond shall be not less than ten percent (10%) of the total amount of the bid.)



BIDDER'S BOND TO ACCOMPANY PROPOSAL

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

KNOW ALL PERSONS BY THESE PRESENTS:

That we, _____, as Principal, and _____, as Surety are held and firmly bound unto the City of Carlsbad, California, in an amount as follows: (must be at least ten percent (10%) of the bid amount) _____ for which payment, well and truly made, we bind ourselves, our heirs, executors and administrators, successors or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that if the proposal of the above-bounden Principal for:

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

in the City of Carlsbad, is accepted by the City Council, and if the Principal shall duly enter into and execute a Contract including required bonds and insurance policies within twenty (20) days from the date of award of Contract by the City Council of the City of Carlsbad, being duly notified of said award, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect, and the amount specified herein shall be forfeited to the said City.

In the event Principal executed this bond as an individual, it is agreed that the death of Principal shall not exonerate the Surety from its obligations under this bond.

SIGNED AND SEALED, this _____ day of _____, 20____

_____(SEAL) _____(SEAL)
(Principal) (Surety)

By: _____ By: _____
(Signature) (Signature)

_____(Print Name/Title) _____(Print Name/Title)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY – ATTACH ATTORNEY-IN-FACT
CERTIFICATE)

APPROVED AS TO FORM:

CELIA A. BREWER
City Attorney

By: _____
Deputy City Attorney



GUIDE FOR COMPLETING THE “DESIGNATION OF SUBCONTRACTORS” FORM

REFERENCES Prior to preparation of the following “Subcontractor Disclosure Form” Bidders are urged to review the definitions in section 1-2 of the General Provisions to this Contract, especially, “Bid”, “Bidder”, “Contract”, “Contractor”, “Contract Price”, “Contract Unit Price”, “Engineer”, “Own Organization”, “Subcontractor”, and “Work”. Bidders are further urged to review sections 2-3 SUBCONTRACTS of the General Provisions.

CAUTIONS This form will be used by the Agency to determine the percentage of work that the Bidder proposes to perform. Bidders are cautioned that failure to provide complete and correct information may result in rejection of the bid as non-responsive. Any bid that proposes performance of more than 50 percent of the work by subcontractors or otherwise to be performed by forces other than the Bidder’s own organization will be rejected as non-responsive. Specialty items of work that may be so designated by the Engineer on the “Contractor’s Proposal” are not included in computing the percentage of work proposed to be performed by the Bidder.

INSTRUCTIONS The Bidder shall set forth the name and location of business of each and every subcontractor whom the Bidder proposes to perform work or labor or render service in or about the work or improvement, and every subcontractor licensed as a contractor by the State of California whom the Bidder proposes to specially fabricate and install any portion of the work or improvement according to detailed drawings contained in the plans and specifications in excess of one-half of one percent (0.5%) of the Bidder’s total bid or, in the case of bids or offers for the construction of streets and highways, including bridges, in excess of one-half of one percent (0.5%) or ten thousand dollars (\$10,000) whichever is greater. Said name(s) and location(s) of business of subcontractor(s) shall be set forth and included as an integral part of the bid offer.

The Designation of Subcontractors form must be submitted as a part of the Bidder’s sealed bid. Failure to provide complete and correct information may result in rejection of the bid as non-responsive.

Suppliers of materials from sources outside the limits of work are not subcontractors. The value of materials and transport of materials from sources outside the limits of work, as shown on the plans, shall be assigned to the Contractor or the Subcontractor as the case may be, that the Bidder proposes as installer of said materials. The value of material incorporated in any Subcontractor-installed bid item that is supplied by the Bidder shall be included as a part of the work that the Bidder proposes to be performed by the Subcontractor installing said item.

When a Subcontractor has a Carlsbad business license, the number must be entered on the proper form. If the Subcontractor does not have a valid business license, enter “NONE” in the appropriate space.

When the Bidder proposes using a Subcontractor to construct or install less than 100 percent of a bid item, the Bidder shall attach an explanation sheet to the Designation of Subcontractor form. The explanation sheet shall clearly apprise the City of the specific facts that show the Bidder proposes to perform no less than fifty percent (50%) of the work with its own forces.



Determination of the subcontract amounts for purposes of award of the contract shall be determined by the City Council in conformance with the provisions of the contract documents and the various supplemental provisions. The decision of the City Council shall be final.

Contractor is prohibited from performing any work on this project with a subcontractor who is ineligible to perform work on a public works project pursuant to Labor Code Sections 1771.1 or 1777.7.

Bidders shall make any additional copies of the disclosure forms as may be necessary to provide the required information. The page number and total number of additional form pages shall be entered in the location provided on each type of form so duplicated.



(To Accompany Proposal)

The Bidder certifies that it has used the sub-bid of the following listed subcontractors in preparing this bid for the Work and that the listed subcontractors will be used to perform the portions of the Work as designated in this list in accordance with applicable provisions of the specifications and section 4100 et seq. of the Public Contract Code, "Subletting and Subcontracting Fair Practices Act." The Bidder further certifies that no additional subcontractor will be allowed to perform any portion of the Work in excess of one-half of one percent (0.5%) of the Bidder's total bid, or in the case of bids or offers for construction of streets and highways, including bridges, in excess of one-half of one percent (0.5%) or ten thousand dollars (\$10,000), whichever is greater, and that no changes in the subcontractors listed work will be made except upon the prior approval of the Agency.

[illegible]

Page of pages of this Subcontractor Designation form

* Pursuant to section 4104 (a)(3)(A) California Public Contract Code, receipt of the information preceded by an asterisk may be submitted by the Bidder up to 24 hours after the deadline for submitting bids contained in the "Notice Inviting Bids."



BIDDER'S STATEMENT OF TECHNICAL ABILITY AND EXPERIENCE

(To Accompany Proposal)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

The Bidder is required to state what work of a similar character to that included in the proposed Contract he/she has successfully performed and give references, with telephone numbers, which will enable the City to judge his/her responsibility, experience and skill. An attachment can be used.

Date Contract Completed	Name and Address of the Employer	Name and Phone No. of Person to Contract	Type of Work	Amount of Contract



BIDDER'S CERTIFICATE OF INSURANCE FOR GENERAL LIABILITY, EMPLOYERS' LIABILITY, AUTOMOTIVE LIABILITY AND WORKERS' COMPENSATION

(To Accompany Proposal)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

As a required part of the Bidder's proposal the Bidder must attach either of the following to this page.

1. Certificates of insurance showing conformance with the requirements herein for each of:
 - ☐ Comprehensive General Liability
 - ☐ Automobile Liability
 - ☐ Workers Compensation
 - ☐ Employer's Liability
2. Statement with an insurance carrier's notarized signature stating that the carrier can, and upon payment of fees and/or premiums by the Bidder, will issue to the Bidder Policies of insurance for Comprehensive General Liability, Automobile Liability, Workers Compensation and Employer's Liability in conformance with the requirements herein and Certificates of insurance to the Agency showing conformance with the requirements herein.

All certificates of insurance and statements of willingness to issue insurance for auto policies offered to meet the specification of this contract must:

1. Meet the conditions stated in The Notice Inviting Bids and the General Provisions for this project for each insurance company that the Contractor proposes.
2. Cover any vehicle used in the performance of the contract, used onsite or offsite, whether owned, non-owned or hired, and whether scheduled or non-scheduled.



BIDDER'S STATEMENT RE DEBARMENT

(To Accompany Proposal)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

- 1) Have you or any of your subcontractors ever been debarred as an irresponsible bidder by another jurisdiction in the State of California?

 yes

 no

- 2) If yes, what was/were the name(s) of the agency(ies) and what was/were the period(s) of debarment(s)? Attach additional copies of this page to accommodate more than two debarments.

 party debarred

 party debarred

 agency

 agency

 period of debarment

 period of debarment

BY CONTRACTOR:

 (name of Contractor)

By: _____
 (sign here)

 (print name/title)

Page _____ of _____ pages of this Re Debarment form



BIDDER'S DISCLOSURE OF DISCIPLINE RECORD

(To Accompany Proposal)

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

Contractors are required by law to be licensed and regulated by the Contractors' State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four years of the date of the alleged violation. A complaint regarding a latent act or omission pertaining to structural defects must be filed within 10 years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License board, P.O. Box 26000, Sacramento, California 95826.

- 1) Have you ever had your contractor's license suspended or revoked by the California Contractors' State license Board two or more times within an eight year period?

yes

no

- 2) Has the suspension or revocation of your contractor's license ever been stayed?

yes

no

- 3) Have any subcontractors that you propose to perform any portion of the Work ever had their contractor's license suspended or revoked by the California Contractors' State license Board two or more times within an eight year period?

yes

no

- 4) Has the suspension or revocation of the license of any subcontractor's that you propose to perform any portion of the Work ever been stayed?

yes

no

- 5) If the answer to either of 1. or 3. above is yes fully identify, in each and every case, the party disciplined, the date of and violation that the disciplinary action pertain to, describe the nature of the violation and the disciplinary action taken therefore.

(If needed attach additional sheets to provide full disclosure.)

Page ____ of ____ pages of this Disclosure of Discipline form

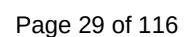


(To Accompany Proposal)

CONTRACT NO. 5503-14

- [illegible]

Page _____ of _____ pages of this Disclosure of Discipline form



**NONCOLLUSION DECLARATION TO BE EXECUTED BY
BIDDER AND SUBMITTED WITH BID
PUBLIC CONTRACT CODE SECTION 7106**

**POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION
CONTRACT NO. 5503-14**

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. 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. All statements contained in the bid are true. 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, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____, 2020 at _____ [city], _____ [state].

Signature of Bidder



CONTRACT PUBLIC WORKS

This agreement is made this _____ day of _____, 2020, by and between the City of Carlsbad, California, a municipal corporation, (hereinafter called "City"), and _____ whose principal place of business is _____ (hereinafter called "Contractor").

City and Contractor agree as follows:

1. Description of Work. Contractor shall perform all work specified in the Contract documents for:

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

(hereinafter called "project")

2. Provisions of Labor and Materials. Contractor shall provide all labor, materials, tools, equipment, and personnel to perform the work specified by the Contract Documents.

3. Contract Documents. The Contract Documents consist of this Contract, Notice Inviting Bids, Contractor's Proposal, Bidder's Bond, Noncollusion Declaration, Designation of Subcontractors, Technical Ability and Experience, Bidder's Statement Re Debarment, Escrow Agreement, Release Form, the Plans and Specifications, the General Provisions, addendum(s) to said Plans and Specifications and General Provisions, and all proper amendments and changes made thereto in accordance with this Contract or the Plans and Specifications, and all bonds for the project; all of which are incorporated herein by this reference.

Contractor, her/his subcontractors, and materials suppliers shall provide and install the work as indicated, specified, and implied by the Contract Documents. Any items of work not indicated or specified, but which are essential to the completion of the work, shall be provided at the Contractor's expense to fulfill the intent of said documents. In all instances through the life of the Contract, the City will be the interpreter of the intent of the Contract Documents, and the City's decision relative to said intent will be final and binding. Failure of the Contractor to apprise subcontractors and materials suppliers of this condition of the Contract will not relieve responsibility of compliance.

4. Payment. For all compensation for Contractor's performance of work under this Contract, City shall make payment to the Contractor per section 9-3 PAYMENT of the General Provisions section of this contract. The Engineer will close the estimate of work completed for progress payments on the last working day of each month. The City shall withhold retention as required by Public Contract Code Section 9203.

5. Independent Investigation. Contractor has made an independent investigation of the jobsite, the soil conditions at the jobsite, and all other conditions that might affect the progress of the work, and is aware of those conditions. The Contract price includes payment for all work that



may be done by Contractor, whether anticipated or not, in order to overcome underground conditions. Any information that may have been furnished to Contractor by City about underground conditions or other job conditions is for Contractor's convenience only, and City does not warrant that the conditions are as thus indicated. Contractor is satisfied with all job conditions, including underground conditions and has not relied on information furnished by City.

6. Hazardous Waste or Other Unusual Conditions. If the contract involves digging trenches or other excavations that extend deeper than four feet below the surface Contractor shall promptly, and before the following conditions are disturbed, notify City, in writing, of any:

A. Hazardous Waste. Material that Contractor believes may be material that is 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.

B. Differing Conditions. Subsurface or latent physical conditions at the site differing from those indicated.

C. Unknown Physical Conditions. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

City shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in contractor's costs of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in this contract.

In the event that a dispute arises between City and Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the contractor's cost of, or time required for, performance of any part of the work, contractor shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract. 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.

7. Immigration Reform and Control Act. Contractor certifies it is aware of the requirements of the Immigration Reform and Control Act of 1986 (8 USC sections 1101-1525) and has complied and will comply with these requirements, including, but not limited to, verifying the eligibility for employment of all agents, employees, subcontractors, and consultants that are included in this Contract.

8. Prevailing Wage. Pursuant to the California Labor Code, the director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with California Labor Code, section 1773 and a copy of a schedule of said general prevailing wage rates is on file in the office of the City Engineer, and is incorporated by reference herein. Pursuant to California Labor Code, section 1775, Contractor shall pay prevailing wages. Contractor shall post copies of all applicable prevailing wages on the job site. Contractor shall comply with California Labor Code, section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require all subcontractors to comply with Section 1776.



9. Indemnification. Contractor shall assume the defense of, pay all expenses of defense, and indemnify and hold harmless the City, and its officers and employees, from all claims, loss, damage, injury and liability of every kind, nature and description, directly or indirectly arising from or in connection with the performance of the Contract or work; or from any failure or alleged failure of Contractor to comply with any applicable law, rules or regulations including those relating to safety and health; and from any and all claims, loss, damages, injury and liability, howsoever the same may be caused, resulting directly or indirectly from the nature of the work covered by the Contract, except for loss or damage caused by the sole or active negligence or willful misconduct of the City. The expenses of defense include all costs and expenses including attorneys' fees for litigation, arbitration, or other dispute resolution method.

Contractor shall also defend and indemnify the City against any challenges to the award of the contract to Contractor, and Contractor will pay all costs, including defense costs for the City. Defense costs include the cost of separate counsel for City, if City requests separate counsel.

Contractor shall also defend and indemnify the City against any challenges to the award of the contract to Contractor, arising in whole or in part from alleged inaccuracies or misrepresentation by the Contractor, whether intentional or otherwise, and Contractor will pay all costs, including defense costs for the City. Defense costs include the cost of separate counsel for City, if City requests separate counsel.

10. Insurance. Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his or her agents, representatives, employees or subcontractors. Said insurance shall meet the City's policy for insurance as stated in City Council Policy # 70.

(A) Coverages And Limits Contractor shall maintain the types of coverages and minimum limits indicated herein:

a. **Commercial General Liability (CGL) Insurance:** Insurance written on an "occurrence" basis, including products-completed operations, personal & advertising injury, with limits no less than **\$2,000,000** per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

b. **Business Automobile Liability Insurance:** \$2,000,000 combined single limit per accident for bodily injury and property damage. In addition, the auto policy must cover any vehicle used in the performance of the contract, used onsite or offsite, whether owned, non-owned or hired, and whether scheduled or non-scheduled.

c. **Workers' Compensation and Employers' Liability Insurance:** Workers' compensation limits as required by the Labor Code of the State of California and Employers' Liability limits of \$1,000,000 per incident. Workers' compensation offered by the State Compensation Insurance Fund is acceptable to the City.

(B) Additional Provisions: Contractor shall ensure that the policies of insurance required under this agreement with the exception of Workers' Compensation and Business Automobile Liability Insurance contain, or are endorsed to contain, the following provisions.



a. The City, its officials, employees and volunteers are to be covered as additional insured as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the contractor; premises owned, leased, hired or borrowed by the contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City, its officials, employees or volunteers. All additional insured endorsements must be evidenced using separate documents attached to the certificate of insurance; one for each company affording general liability, and employers' liability coverage.

b. The Contractor's insurance coverage shall be primary insurance as respects the City, its officials, employees and volunteers. Any insurance or self-insurance maintained by the City, its officials, employees or volunteers shall be in excess of the contractor's insurance and shall not contribute with it.

c. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the City, its officials, employees or volunteers.

d. Coverage shall state that the contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(C) Notice of Cancellation. Each insurance policy required by this agreement shall be endorsed to state that coverage shall not be nonrenewed, suspended, voided, canceled, or reduced in coverage or limits except after ten (10) days' prior written notice has been sent to the City by certified mail, return receipt requested.

(D) Deductibles and Self-Insured Retention (S.I.R.) Levels. Any deductibles or self-insured retention levels must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retention levels as respects the City, its officials and employees; or the contractor shall procure a bond guaranteeing payment of losses and related investigation, claim administration and defense expenses.

(E) Waiver of Subrogation. All policies of insurance required under this agreement shall contain a waiver of all rights of subrogation the insurer may have or may acquire against the City or any of its officials or employees.

(F) Subcontractors. Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. Coverages for subcontractors shall be subject to all of the requirements stated herein.

(G) Acceptability of Insurers. Insurance is to be placed with insurers that have a rating in Best's Key Rating Guide of at least A-:VII. Insurers must also be authorized to transact the business of insurance by the State of California Insurance Commissioner as admitted carriers as evidenced by a listing in the official publication of the Department of Insurance of the State of California and/or under the standards specified by City Council Policy # 70.

(H) Verification of Coverage. Contractor shall furnish the City with certificates of insurance and original endorsements affecting coverage required by this clause. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements are to be in forms approved by the City and are to be received and approved by the City before the Contract is executed by the City.



(I) Cost of Insurance. The Cost of all insurance required under this agreement shall be included in the Contractor's bid.

11. Claims and Lawsuits. All claims by Contractor shall be resolved in accordance with Public Contract Code section 9204, which is incorporated by reference. A copy of Section 9204 is included in Section 3 of the General Provisions. In addition, all claims by Contractor for \$375,000 or less shall be resolved in accordance with the provisions in the Public Contract Code, Division 2, Part 3, Chapter 1, Article 1.5 (commencing with section 20104) which are incorporated by reference. A copy of Article 1.5 is included in Section 3 of the General Provisions. In the event of a conflict between Section 9204 and Article 1.5, Section 9204 shall apply. Notwithstanding the provisions of this section of the contract, all claims shall comply with the Government Tort Claim Act (section 900 et seq., of the California Government Code) for any claim or cause of action for money or damages prior to filing any lawsuit for breach of this agreement.

(A) Assertion of Claims. Contractor hereby agrees that any contract claim submitted to the City must be asserted as part of the contract process as set forth in this agreement and not in anticipation of litigation or in conjunction with litigation.

(B) False Claims. Contractor acknowledges that if a false claim is submitted to the City, it may be considered fraud and the Contractor may be subject to criminal prosecution.

(C) Government Code. Contractor acknowledges that California Government Code sections 12650 et seq., the False Claims Act, provides for civil penalties where a person knowingly submits a false claim to a public entity. These provisions include false claims made with deliberate ignorance of the false information or in reckless disregard of the truth or falsity of the information.

(D) Penalty Recovery. If the City of Carlsbad seeks to recover penalties pursuant to the False Claims Act, it is entitled to recover its litigation costs, including attorney's fees.

(E) Debarment for False Claims. Contractor hereby acknowledges that the filing of a false claim may subject the Contractor to an administrative debarment proceeding wherein the Contractor may be prevented from further bidding on public contracts for a period of up to five years.

(F) Carlsbad Municipal Code. The provisions of Carlsbad Municipal Code sections 3.32.025, 3.32.026, 3.32.027 and 3.32.028 pertaining to false claims are incorporated herein by reference.

(G) Debarment from Other Jurisdictions. Contractor hereby acknowledges that debarment by another jurisdiction is grounds for the City of Carlsbad to disqualify the Contractor or subcontractor from participating in future contract bidding.

(H) Jurisdiction. Contractor agrees and hereby stipulates that the proper venue and jurisdiction for resolution of any disputes between the parties arising out of this agreement is San Diego County, California.

I have read and understand all provisions of Section 11 above. _____ init _____ init

12. Maintenance of Records. Contractor shall maintain and make available at no cost to the City, upon request, records in accordance with sections 1776 and 1812 of Part 7, Chapter 1, Article 2, of the Labor Code. If the Contractor does not maintain the records at Contractor's principal place of business as specified above, Contractor shall so inform the City by certified letter



accompanying the return of this Contract. Contractor shall notify the City by certified mail of any change of address of such records.

13. Labor Code Provisions. The provisions of Part 7, Chapter 1, commencing with section 1720 of the Labor Code are incorporated herein by reference.

14. Security. Securities in the form of cash, cashier's check, or certified check may be substituted for any monies withheld by the City to secure performance of this contract for any obligation established by this contract. Any other security that is mutually agreed to by the Contractor and the City may be substituted for monies withheld to ensure performance under this Contract.

15. Unfair Business Practices. 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 the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties.

16. Provisions Required by Law Deemed Inserted. Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and included herein, and if, through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon application of either party, the Contract shall forthwith be physically amended to make such insertion or correction.

///

///

///

///

///

///

///

///

///

///

///

///

///



17. Additional Provisions. Any additional provisions of this agreement are set forth in the "General Provisions" or "Supplemental Provisions" attached hereto and made a part hereof.

NOTARIAL ACKNOWLEDGMENT OF EXECUTION BY ALL SIGNATORIES MUST BE ATTACHED

(CORPORATE SEAL)

CONTRACTOR:

CITY OF CARLSBAD a municipal corporation
of the State of California

(name of Contractor)

By:

By: _____
(sign here)

MATT HALL, Mayor

ATTEST:

(print name and title)

BARBARA ENGLESON, City Clerk

By: _____
(sign here)

(print name and title)

President or vice-president **and** secretary or assistant secretary must sign for corporations. If only one officer signs, the corporation must attach a resolution certified by the secretary or assistant secretary under the corporate seal empowering that officer to bind the corporation.

APPROVED AS TO FORM:

CELIA A. BREWER
City Attorney

By: _____
Assistant City Attorney



LABOR AND MATERIALS BOND

WHEREAS, the City of Carlsbad, State of California, has awarded to _____
(hereinafter designated as the "Principal"), a Contract for:

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

in the City of Carlsbad, in strict conformity with the drawings and specifications, and other Contract Documents now on file in the Office of the City Clerk of the City of Carlsbad and all of which are incorporated herein by this reference.

WHEREAS, Principal has executed or is about to execute said Contract and the terms thereof require the furnishing of a bond, providing that if Principal or any of their subcontractors shall fail to pay for any materials, provisions, provender or other supplies or teams used in, upon or about the performance of the work agreed to be done, or for any work or labor done thereon of any kind, the Surety on this bond will pay the same to the extent hereinafter set forth.

NOW, THEREFORE, WE, _____,
as Principal, (hereinafter designated as the "Contractor"), and _____ as Surety, are
held firmly bound unto the City of Carlsbad in the sum of _____ Dollars
(\$ _____), said sum being an amount equal to: One hundred percent (100%) of the
total amount payable under the terms of the contract by the City of Carlsbad, and for which pay-
ment well and truly to be made we bind ourselves, our heirs, executors and administrators, suc-
cessors, or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Contractor or his/her subcontractors fail to pay for any materials, provisions, provender, supplies, or teams used in, upon, for, or about the performance of the work contracted to be done, or for any other work or labor thereon of any kind, consistent with California Civil Code section 9100, or for amounts due under the Unemployment Insurance Code with respect to the work or labor performed under this Contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the contractor and subcontractors pursuant to section 13020 of the Unemployment Insurance Code with respect to the work and labor, that the Surety will pay for the same, and, also, in case suit is brought upon the bond, reasonable attorney's fees, to be fixed by the court consistent with California Civil Code section 9554.

This bond shall inure to the benefit of any of the persons named in California Civil Code section 9100, so as to give a right of action to those persons or their assigns in any suit brought upon the bond.

Surety stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to the work to be performed hereunder or the specifications accompanying the same shall affect its obligations on this bond, and it does hereby waive notice of any change, extension of time, alterations or addition to the terms of the contract or to the work or to the specifications.



In the event that Contractor is an individual, it is agreed that the death of any such Contractor shall not exonerate the Surety from its obligations under this bond.

SIGNED AND SEALED, this _____ day of _____, 20____

_____(SEAL)
(Principal)

_____(SEAL)
(Surety)

By: _____
(Signature)

By: _____
(Signature)

(Print Name & Title)

(Print Name & Title)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY – ATTACH ATTORNEY-IN-FACT CERTIFICATE)

APPROVED AS TO FORM:

CELIA A. BREWER
City Attorney

By: _____
Deputy City Attorney



FAITHFUL PERFORMANCE/WARRANTY BOND

WHEREAS, the City Council of the City of Carlsbad, State of California, has awarded to _____,
(hereinafter designated as the "Principal"), a Contract for:

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

in the City of Carlsbad, in strict conformity with the contract, the drawings and specifications, and other Contract Documents now on file in the Office of the City Clerk of the City of Carlsbad, all of which are incorporated herein by this reference.

WHEREAS, Principal has executed or is about to execute said Contract and the terms thereof require the furnishing of a bond for the faithful performance and warranty of said Contract;

NOW, THEREFORE, WE, _____,
as Principal, (hereinafter designated as the "Contractor"), and _____ as Surety, are
held firmly bound unto the City of Carlsbad in the sum of _____ Dollars

(\$ _____), said sum being an amount equal to: One hundred percent (100%) of the total amount payable under the terms of the contract by the City of Carlsbad, and for which payment well and truly to be made we bind ourselves, our heirs, executors and administrators, successors, or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bounden Contractor, their 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 agreements in the Contract and any alteration thereof made as therein provided on their 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 the City of Carlsbad, its officers, employees and agents, as therein stipulated, then this obligation shall become null and void; otherwise it shall remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by the City in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

Surety stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to the work to be performed there under or the specifications accompanying the same shall affect its obligations on this bond, and it does hereby waive notice of any change, extension of time, alterations or addition to the terms of the contract or to the work or to the specifications.



In the event that Contractor is an individual, it is agreed that the death of any such Contractor shall not exonerate the Surety from its obligations under this bond.

SIGNED AND SEALED, this _____ day of _____, 20____

_____(SEAL)
(Principal)

_____(SEAL)
(Surety)

By: _____
(Signature)

By: _____
(Signature)

(Print Name & Title)

(Print Name & Title)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY – ATTACH ATTORNEY-IN-FACT CERTIFICATE)

APPROVED AS TO FORM:

CELIA A. BREWER
City Attorney

By: _____
Deputy City Attorney



OPTIONAL ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the City of Carlsbad whose address is 1200 Carlsbad Village Drive, Carlsbad, California, 92008, hereinafter called "City" and _____ whose address is _____ hereinafter called "Contractor" and _____ whose address is _____ hereinafter called "Escrow Agent."

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

1. Pursuant to section 22300 of the Public Contract Code of the State of California, the Contractor has the option to deposit securities with the Escrow Agent as a substitute for retention earnings required to be withheld by the City pursuant to the Construction Contract entered into between the City and Contractor for

POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION CONTRACT NO. 5503-14

in the amount of _____ dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the City shall make payments of the retention earnings directly to the Escrow Agent. When the Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the City within 10 days of the deposit. The market value of the securities at the time of the substitution shall be a least equal to the cash amount then required to be withheld as retention under the terms of the contract between the City and Contractor. Securities shall be held in the name of the City and shall designate the Contractor as the beneficial owner.

2. The City shall make progress payments to the Contractor for such 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 City makes payment of retentions earned directly to the 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 City pays the Escrow Agent directly.

4. The Contractor shall be responsible for paying all fees for the expenses incurred by the Escrow Agent in administering the Escrow Account and all expenses of the City. These expenses and payment terms shall be determined by the City, 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 City.



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 City to the Escrow Agent that City consents to the withdrawal of the amount sought to be withdrawn by Contractor.

7. The City 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 City of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the City.

8. Upon receipt of written notification from the City 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 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. The Escrow Agent shall rely on the written notifications from the City and the Contractor pursuant to sections (1) to (8), inclusive, of this agreement and the City and Contractor shall hold Escrow Agent harmless from Escrow Agent's release, conversion and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notices or to receive written notice on behalf of the City and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

For City: Title FINANCE DIRECTOR

Name _____

Signature _____

Address 1635 Faraday Avenue, Carlsbad, CA 92008

For Contractor: Title _____

Name _____

Signature _____

Address _____

For Escrow Agent: Title _____

Name _____

Signature _____

Address _____

At the time the Escrow Account is opened, the City 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.

For City:

Title MAYOR

Name _____

Signature _____

Address 1200 Carlsbad Village Drive, Carlsbad, CA
92008

For Contractor:

Title _____

Name _____

Signature _____

Address _____

For Escrow Agent:

Title _____

Name _____

Signature _____

Address _____



GENERAL PROVISIONS FOR POINSETTIA LIFT STATION HYDRAULIC SURGE PROTECTION

CONTRACT NO. 5503-14

**BIDDERS ARE ADVISED THAT THIS SECTION REPLACES PART 1,
GENERAL PROVISIONS, OF THE STANDARD SPECIFICATIONS FOR
PUBLIC WORKS CONSTRUCTION**

SECTION 1 -- TERMS, DEFINITIONS, ABBREVIATIONS, AND SYMBOLS

1-1 TERMS – 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.

1-1.1 Reference to Drawings. Where words "shown", "indicated", "detailed", "noted", "scheduled", or words of similar import are used, it shall be understood that reference is made to the plans accompanying these provisions, unless stated otherwise.

1-1.2 Directions. Where words "directed", "designated", "selected", or words of similar import are used, it shall be understood that the direction, designation or selection of the Engineer is intended, unless stated otherwise. The word "required" and words of similar import shall be understood to mean "as required to properly complete the work as required and as approved by the Engineer," unless stated otherwise.

1-1.3 Equals and Approvals. Where the words "equal", "approved equal", "equivalent", and such words of similar import are used, it shall be understood such words are followed by the expression "in the opinion of the Engineer", unless otherwise stated. Where the words "approved", "approval", "acceptance", or words of similar import are used, it shall be understood that the approval, acceptance, or similar import of the Engineer is intended.

1-1.4 Perform. The word "perform" shall be understood to mean that the Contractor, at its expense, shall perform all operations, labor, tools and equipment, and further, including the furnishing and installing of materials that are indicated, specified or required to mean that the Contractor, at its expense, shall furnish and install the work, complete in place and ready to use, including furnishing of necessary labor, materials, tools, equipment, and transportation.

1-2 DEFINITIONS. The following words, or groups of words, shall be exclusively defined by the definitions assigned to them herein.



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 City of Carlsbad, California.

Agreement – See Contract.

Assessment Act Contract – A Contract financed by special assessments authorized under a State Act or procedural ordinance of a City or County.

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, which is the City Council for the City of Carlsbad or the Board of Directors of Carlsbad Municipal Water District.

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

City Council – the City Council of the City of Carlsbad.

City Manager – the City Manager of the City of Carlsbad or his/her approved representative.

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.

Construction Manager– the Project Inspector's immediate supervisor and first level of appeal for informal dispute resolution.

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, Instructions 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 Provisions, permits from other agencies, the Technical Specifications, the Supplemental 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 constructed 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 stated 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’s days unless otherwise specified.

Deputy City Engineer, Construction Management & Inspection – The Construction Manager’s immediate supervisor and second level of appeal for informal dispute resolution.

Dispute Board – Persons designated by the City Manager of the City of Carlsbad to hear and advise the City Manager on claims submitted by the Contractor. The City Manager for the City of Carlsbad is the last appeal level for informal dispute resolution.

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

Engineer – The City Engineer of the City of Carlsbad or his/her approved representative. The Engineer is the third level of appeal for informal dispute resolution.

Geotextile – Synthetic fiber used in civil engineering applications, serving the primary functions 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 mainline 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).

Luminaire Arm – The structural member, bracket, or mast arm, which, mounted on the standard, supports the luminaire.

Minor Bid Item – A single contract item constituting less than 10 percent (10%) of the original Contract Price bid.

Modification – Includes Change Orders and Supplemental Agreements. A Modification may only be used 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.

Own Organization - When used in Section 2-3.1 – Employees of the Contractor who are hired, directed, supervised and paid by the Contractor to accomplish the completion of the Work. Further, such employees have their employment taxes, State disability insurance payments, State and Federal income taxes paid and administered, as applicable, by the Contractor. When used in Section 2-3.1 "own organization" means construction equipment that the Contractor owns or leases and uses to accomplish the Work. Equipment that is owner operated or leased equipment with an operator is not part of the Contractor's Own Organization and will not be included for the purpose of compliance with Section 2-3.1.

Person – Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.

Plans – The drawings, profiles, cross sections, working 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.

Project Inspector – The Engineer's designated representative for inspection, contract administration and first level for informal dispute resolution.

Proposal – See Bid.

Reference Specifications – Those bulletins, standards, rules, methods of analysis or test, 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 – Service connections are all or any portion of the conduit, cable, or duct, including 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.

Specifications – General Provisions, Standard Specifications, Technical Specifications, Reference Specifications, Supplemental Provisions, and specifications in 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 Specifications by title or number.



Standard Specifications – The Standard Specifications for Public Works Construction (SSPWC), the “Greenbook”.

State – State of California.

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.

Supplemental Provisions – Additions and revisions to the Standard Specifications setting forth conditions and requirements peculiar to the work.

Surety – Any individual, firm, or corporation, bound with and for the Contractor for the acceptable performance, execution, and completion of the Work, and for the satisfaction of all obligations incurred.

Tonne – Also referred to as “metric ton”. Represents a unit of measure in the International System of Units equal to 1,000 kilograms.

Utility – Tracks, overhead or underground wires, pipeline, 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.

1-3 ABBREVIATIONS

1-3.1 General. The abbreviation herein, together with others in general use, are applicable to these Standard Specifications and to project Plans or 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

Abbreviation

ABAN Abandon
 ABAND Abandoned
 ABS Acrylonitrile – butadiene – styrene
 AC Asphalt Concrete
 ACP Asbestos cement pipe
 ACWS Asphalt concrete wearing surface
 ALT Alternate
 APTS Apartment and Apartments
 AMER STD American Standard
 AWG American Wire Gage (nonferrous wire)
 BC Beginning of curve
 BCR Beginning of curb return
 BDRY Boundary
 BF Bottom of footing
 BLDG Building and Buildings
 BM Bench mark
 BVC Beginning of vertical curve
 B/W Back of wall
 C/C Center to center
 CAB Crushed aggregate base
 CAL/OSHA California Occupational Safety and Health Administration
 CalTrans California Department of Transportation
 CAP Corrugated aluminum pipe
 CB Catch Basin
 Cb Curb
 CBP Catch Basin Connection Pipe
 CBR California Bearing Ratio
 CCR California Code of Regulations
 CCTV Closed Circuit TV
 CES Carlsbad Engineering Standards
 CF Curb face
 CF Cubic foot
 C&G Curb and gutter
 CFR Code of Federal Regulations
 CFS Cubic Feet per Second
 CIP Cast iron pipe
 CIPP Cast-in place pipe
 CL Clearance, center line
 CLF Chain link fence
 CMB Crushed miscellaneous base
 CMC Cement mortar-coated
 CML Cement mortar-lined
 CMWD Carlsbad Municipal Water District
 CO Cleanout (Sewer)
 COL Column
 COMM Commercial
 CONC Concrete
 CONN Connection
 CONST Construct, Construction
 COORD Coordinate
 CSP Corrugated steel pipe
 CSD Carlsbad Standard Drawings
 CTB Cement treated base
 CV Check valve
 CY Cubic yard

Word or Words

D Load of pipe
 dB Decibels
 DBL Double
 DF Douglas fir
 DIA Diameter
 DIP Ductile iron pipe
 DL Dead load
 DR Dimension Ratio
 DT Drain Tile
 DWG Drawing
 DWY Driveway
 DWY APPR Driveway approach
 E Electric
 EA Each
 EC End of curve
 ECR End of curb return
 EF Each face
 EG Edge of gutter
 EGL Energy grade line
 EL Elevation
 ELC Electrolier lighting conduit
 ELT Extra long ton
 ENGR Engineer, Engineering
 EP Edge of pavement
 ESMT Easement
 ETB Emulsion-treated base
 EVC End of vertical curb
 EWA Encina Wastewater Authority
 EXC Excavation
 EXP JT Expansion joint
 EXST Existing
 F Fahrenheit
 F&C Frame and cover
 F&I Furnish and install
 FAB Fabricate
 FAS Flashing arrow sign
 FD Floor drain
 FDN Foundation
 FED SPEC Federal Specification
 FG Finished grade
 FH Fire hydrant
 FL Flow line
 FS Finished surface
 FT-LB Foot-pound
 FTG Footing
 FW Face of wall
 G Gas
 GA Gauge
 GAL Gallon and Gallons
 GALV Galvanized
 GAR Garage and Garages
 GIP Galvanized iron pipe
 GL Ground line or grade line
 GM Gas meter
 GNV Ground Not Visible
 GP Guy pole



T.....Telephone
TAN.....Tangent
TC.....Top of curb
TEL.....Telephone
TF.....Top of footing
TOPO.....Topography
TR.....Tract
TRANS.....Transition
TS.....Traffic signal or transition structure
TSC.....Traffic signal conduit
TSS.....Traffic signal standard
TW.....Top of wall
TYP.....Typical
UE.....Underground Electric
USA.....Underground Service Alert

VAR.....Varies, Variable
VB.....Valve box
VC.....Vertical curve
VCP.....Vitrified clay pipe
VERT.....Vertical
VOL.....Volume
VWD.....Vallecitos Water District
W.....Water, Wider or Width, as applicable
WATCH.....Work Area Traffic Control Handbook
WI.....Wrought iron
WM.....Water meter
WPJ.....Weakened plane joint
XCONN.....Cross connection
XSEC.....Cross section

1-3.3 Institutions.

Abbreviation

Word or Words

AASHTO.....American Association of State Highway and Transportation Officials
AISC.....American Institute of Steel Construction
ANSI.....American National Standards Institute
API.....American Petroleum Institute
AREA.....American Railway Engineering Association
ASTM.....American Society for Testing and Materials
AWPA.....American Wood Preservers Association
AWS.....American Welding Society
AWWA.....American Water Works Association
FHWA.....Federal Highway Administration
GRI.....Geosynthetic Research Institute
NEMA.....National Electrical Manufacturers Association
NOAA.....National Oceanic and Atmospheric Administration (Dept. of Commerce)
UL.....Underwriters' Laboratories Inc.
USGS.....United States Geological Survey

1-4 UNITS OF MEASURE.

1-4.1 General. U.S. Standard Measures, also called U.S. Customary System, are the principal measurement system in these specifications. However, certain material specifications and test requirements contained herein use SI units specifically and conversions to U.S. Standard Measures may or may not have been included in these circumstances. When U.S. Standard Measures are not included in parenthesis, then the SI units shall control. S.I. units and U.S. Standard Measures in parenthesis may or may not be exactly equivalent.

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.



1-4.2 Units of Measure and Their Abbreviations.

<u>U.S. Customary Unit</u> <u>(Abbreviations)</u>	(Equal To)	<u>SI Unit</u> <u>(Abbreviations)</u>
1 mil (=0.001 in)		25.4 micrometer (μm)
1 inch (in)		25.4 millimeter (mm)
1 inch (in)		2.54 centimeter (cm)
1 foot (ft)		0.3048 meter (m)
1 yard (yd)		0.9144 meter (m)
1 mile (mi)		1.6093 kilometer (km)
1 square foot (ft^2)		0.0929 square meter (m^2)
1 square yard (yd^2)		0.8361 square meter (m^2)
1 cubic foot (ft^3)		0.0283 cubic meter (m^3)
1 cubic yard (yd^3)		0.7646 cubic meter (m^3)
1 acre		0.4047 hectare (ha)
1 U.S. gallon (gal)		3.7854 Liter (L)
1 fluid ounce (fl. oz.)		29.5735 milliliter (mL)
1-pound mass (lb) (avoirdupois)		0.4536 kilogram (kg)
1-ounce mass (oz)		0.02835 kilogram (kg)
1 Ton (=2000 lb avoirdupois)		0.9072 Tonne (= 907 kg)
1 Poise		0.1 pascal · second ($\text{Pa} \cdot \text{s}$)
1 centistoke (cs)		1 square millimeters per second (mm^2/s)
1-pound force (lbf)		4.4482 Newton (N)
1 pounds per square inch (psi)		6.8948 Kilopascal (kPa)
1-pound force per foot (lbf/ft)		1.4594 Newton per meter (N/m)
1 foot-pound force (ft-lbf)		1.3558 Joules (J)
1 foot-pound force per second (ft-lbf/s)		1.3558 Watt (W)
1 part per million (ppm)		1 milligram/liter (mg/L)

Temperature Units and Abbreviations

Degree Fahrenheit ($^{\circ}\text{F}$):	Degree Celsius ($^{\circ}\text{C}$):
$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$	$^{\circ}\text{C} = (^{\circ}\text{F} - 32)/1.8$

SI Units (abbreviation) Commonly Used in Both Systems

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

Common Metric Prefixes

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

1-5 SYMBOLS

Δ	Delta, the central angle or angle between tangents
$\angle$	Angle
%	Percent
'	Feet or minutes
"	Inches or seconds
1	Number
/	per or (between words)
$^{\circ}$	Degree
PL	Property line
CL	Centerline
SL	Survey line or station line



SECTION 2 – SCOPE AND CONTROL OF WORK

2-1 AWARD AND EXECUTION OF CONTRACT. Award and execution of Contract will be as provided for in the Specifications, Instruction to Bidders, or Notice Inviting Bids.

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. 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 this Chapter are included below for information:

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

“(a) 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 improvements, 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 1 percent of the prime contractor’s total bid or ten thousand dollars (\$10,000), whichever is greater.”

“(b) The portion of the work which will be done by each such subcontractor under this act. The prime contractor shall list only one subcontractor for each such portion as is defined by the prime contractor in his bid.”

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 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.

As provided in Section 4107, no Contractor whose Bid is accepted shall substitute any person as Subcontractor in place of the Subcontractor listed in the original Bid, except for causes and by procedures established in Section 4107.5. This section 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.



Should the Contractor fail to adhere to the provisions requiring the Contractor to complete **50%** of the contract price with its own organization, the Agency may at its sole discretion elect to cancel the contract or deduct an amount equal to 10 percent of the value of the work performed in excess of **50%** of the contract price by other than the Contractor's own organization. The Board shall be the sole body for determination of a violation of these provisions. In any proceedings under this section, the prime contractor shall be entitled to a public hearing before the Board and shall be notified ten (10) days in advance of the time and location of said hearing. The determination of the City Council shall be final.

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

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. Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. When a portion of an item is subcontracted, the value of work subcontracted will be based on the estimated percentage of 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.

2-4 CONTRACT BONDS. Before execution of the Contract, 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 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 Contractor shall provide a faithful performance/warranty bond and payment bond (labor and materials bond) for this contract. The faithful performance/warranty bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of this contract. The Contractor shall provide bonds to secure payment of laborers and materials suppliers in a sum not less than one hundred percent of the total amount payable by the terms of this contract.

Both bonds shall extend in full force and effect and be retained by the Agency during this project until they are released according to the provisions of this section.



The faithful performance/warranty bond will be reduced to 25 percent of the original amount 30 days after recordation of the Notice of Completion and will remain in full force and effect for the one-year warranty period and until all warranty repairs are completed to the satisfaction of the Engineer. The bonds to secure payment of laborers and materials suppliers shall be released six months plus 30 days after recordation of the Notice of Completion if all claims have been paid.

All bonds are to be placed with a surety insurance carrier admitted and authorized to transact the business of insurance in California and whose assets exceed their liabilities in an amount equal to or in excess of the amount of the bond. The bonds are to contain the following documents:

1. An original, or a certified copy, of the un-revoked appointment, power of attorney, by laws, or other instrument entitling or authorizing the person who executed the bond to do so.
2. A certified copy of the certificate of authority of the insurer issued by the insurance commissioner.

If the bid is accepted, the Agency may require a financial statement of the assets and liabilities of the insurer at the end of the quarter calendar year prior to 30 days next preceding the date of the execution of the bond. The financial statement shall be made by an officer's certificate as defined in Section 173 of the Corporations Code. In the case of a foreign insurer, the financial statement may be verified by the oath of the principal officer or manager residing within the United States.

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.

2-5 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 specifications for the work include the General Provisions, project technical specifications, Carlsbad Engineering Standards (CES), and Standard Specifications of Public Works Construction, (SSPWC) Part 2 & 3, and the latest supplements thereto, current edition at the time of bid opening as published by the "Greenbook" Committee of Public Works Standards, Inc., hereinafter designated "SSPWC", as amended.

The construction plans consist of one set of plans, City of Carlsbad Drawing No. 486-6A, which consists of 18 sheets. The standard drawings used for this project are the latest edition of the San Diego Area Regional Standard Drawings, hereinafter designated SDRSD, as issued by the San Diego County Department of Public Works, together with the most recent editions of the City of Carlsbad Engineering Standards and Carlsbad Standard Drawings, as issued by the City of Carlsbad and the Carlsbad Municipal Water District, hereinafter designated as CES and CSD, respectively. Copies of some of the pertinent standard drawings are enclosed as an appendix to these General Provisions.



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 on 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 a 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.

2-5.2 Precedence of Contract Documents. If there is a conflict between Contract Documents, the document highest in precedence shall control. The precedence shall be the most recent edition of the following documents listed in order of highest to lowest precedence:

1. Permits from other agencies as may be required by law.
2. Change orders, whichever occurs last.
3. Contract addenda, whichever occurs last.
4. Contract
5. Technical Specifications,
6. Contract's General Provisions
7. Plans.
8. Standards plans.
 - a. City of Carlsbad Standard Drawings.
 - b. Carlsbad Municipal Water District Standard Drawings.
 - c. City of Carlsbad modifications to the San Diego Area Regional Standard Drawings.
 - d. San Diego Area Regional Standard Drawings.
 - e. Traffic Signal Design Guidelines and Standards.
 - f. State of California Department of Transportation Standard Plans.
 - g. State of California Department of Transportation Standard Specifications.
 - h. California Manual on Uniform Traffic Control Devices (CA MUTCD).
9. Standard Specifications for Public Works Construction, as amended.
10. Reference Specifications.
11. Manufacturer's Installation Recommendations

Detail drawings shall take precedence over general drawings.

Change Orders, Supplemental Agreements and approved revisions to Plans and Specifications will take precedence over items 2) through 9) above. Detailed plans and plan views shall have precedence over general plans.



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.

Each submittal shall be consecutively numbered. Resubmittals shall be labeled with the number of the original submittal followed by an ascending alphabetical designation (e.g. The label '4-C' would indicate the third instance that the fourth submittal had been given to the Engineer). Each sheet of each submittal shall be consecutively numbered. Each set of shop drawings and submittals shall be accompanied by a letter of transmittal on the Contractor's letterhead. The Letter of Transmittal shall contain the following:

- 1) Project title and Agency contract number.
- 2) Number of complete sets.
- 3) Contractor's certification statement.
- 4) Specification section number(s) pertaining to material submitted for review.
- 5) Submittal number (Submittal numbers shall be consecutive including subsequent submittals for the same materials.)
- 6) Description of the contents of the submittal.
- 7) Identification of deviations from the contract documents.

When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that the Contractor has reviewed, checked, and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents. The Contractor shall subscribe to and shall place the following certification on all submittals:

"I hereby certify that the (equipment, material) shown and marked in this submittal is that proposed to be incorporated into this Project, is in compliance with the Contract Documents, can be installed in the allocated spaces, and is submitted for approval."

By: _____ Title: _____

Date: _____

Company Name: _____

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.

The Contractor shall submit working drawings including signed and sealed calculations and detailed drawings for:

TABLE 2-5.3.2 (A)

Submittal	Requirement	Specification/Drawing Reference
Temporary Pipe Restraints and Supports during Demolition	The Contractor shall be responsible for protecting and restraining all existing piping during demolition. The Contractor shall submit signed and sealed calculations and detailed drawings for the temporary pipe restraints and supports.	D-1
Surge Tank Seismic Design and Anchorage	The Contractor shall submit signed and sealed structural calculations and detailed drawings for the attachments and anchorage to the structure of the equipment and appurtenances in this section. Calculations shall conform to the requirements of Section 01190.	01190
Compressed Air System Seismic Design and Anchorage	The Contractor shall submit signed and sealed structural calculations and detailed drawings for the attachments and anchorage to the structure of the equipment and appurtenances in this section. Calculations shall conform to the requirements of Section 01190.	01190
Pipe Supports	The Contractor shall submit signed and sealed structural calculations and detailed drawings for the attachments and anchorage to the structure of the equipment and appurtenances in this section. Calculations shall conform to the requirements of Section 01190.	01190

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 provide and keep up-to-date a complete "as-built" record set of blue-line prints, which shall be corrected in red daily and show every change from the original drawings and specifications and the exact "as-built" locations, sizes and kinds of equipment, underground piping, valves, and all other work not visible at surface grade. Prints for this purpose may be obtained from the Agency at cost. This set of drawings shall be kept on the job and shall be used only as a record set and shall be delivered to the Engineer within ten (10) days of completion of the work. Payment for performing the work required by Section 2-5.4 shall be included in the various bid items and no additional payment will be made therefore.

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

2-7 SUBSURFACE DATA. All soil and test hole data, water table elevations, and soil analyses shown on the drawings or included in the Specifications apply only at the location of the test holes and to the depths indicated. Soil test reports for test holes which have been drilled are available for inspection at the office of the Engineer. Any additional subsurface exploration shall be done by Bidders or the Contractor at their own expense.

The indicated elevation of the water table is that which existed on the date when test hole data was determined. It is the Contractor's responsibility to determine and allow for the elevation of groundwater at the date of project construction. A difference in elevation between groundwater shown in soil boring logs and groundwater actually encountered during construction will not be considered as a basis for extra work.

2-8 RIGHT-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 not cover or disturb permanent survey monuments or benchmarks without the consent of the Engineer. Where the Engineer concurs, in writing, with the Contractor that protecting an existing monument in place is impractical, the Contractor shall employ a licensed land surveyor, or a registered civil engineer authorized to practice land surveying within the State of California, hereinafter Surveyor, to establish the location of the monument before it is disturbed. The Contractor shall have the monument replaced by the Surveyor no later than thirty (30) days after construction at the site of the replacement is completed. The Surveyor shall file corner record(s) as required by §§ 8772 and 8773, et seq. of the California Business and Professions Code.

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 frame and cover to the new grade within 7 days of paving unless the Engineer shall approve otherwise.



Monument frames and covers shall be protected during street sealing or painting projects or be cleaned to the satisfaction of the Engineer.

2-9.2 Survey Service. The Contractor shall hire and pay for the services of a Surveyor, hereinafter Surveyor to perform all work necessary for establishing control, construction staking, records research and all other surveying work necessary to construct the work, provide surveying services as required herein and provide surveying, drafting and other professional services required to satisfy the requirements of the Land Surveyors Act. Surveyor shall be resident on the site during all surveying operations and shall personally supervise and certify the surveying work.

2-9.2.1 Submittal of Surveying Data. All surveying data submittals shall conform to the requirements of Section 2-5.3.3, "Submittals", herein. The Contractor shall submit grade sheets to the Engineer before commencing work in the area affected by the grade sheets. The Contractor shall submit field notes for all surveying required herein to the Engineer within ten days of performing the survey. All surveying field notes, grade sheets and survey calculations shall be submitted in bound form on 215mm by 280 mm (8½" by 11") paper. The field notes, calculations and supporting data shall be clear and complete. Supporting data shall include all maps, affidavits, plats, field notes from earlier surveys and all other evidence used by the Surveyor to determine the location of the monuments set. The field notes and calculations will be labeled with name of the Surveyor, the party chief, the field crewmembers and the author of the field notes or calculations. They shall be annotated with the date of observation or calculation, be numbered with consecutive page numbers and shall be readable without resort to any electronic aid, computer program or documentation for any computer program. The field notes shall be prepared in conformance with the CALTRANS "Surveys Manual". The Contractor shall have a Record of Survey prepared by the Surveyor and file it in conformance with §§ 8700 - 8805 of the State of California Business and Professions Code when the Surveyor performs any surveying that such map is required under §§ 8762 of the State of California Business and Professions Code and whenever the Surveyor shall establish, set or construct any permanent survey monument. SDRS drawing M-10 type monuments, bolts, spikes, leaded tacks and nails (when set in concrete), iron pipes, reinforcing steel and all monuments and marks that are at, or accessory to, property corners and street centerlines are permanent survey monuments. The Record of Survey shall show all monuments set, control monuments used, the basis of bearings and all other data needed to determine the procedure of survey and the degree of accuracy attained by the field surveying including the unadjusted ratio of closure. The unadjusted ratio of closure shall not exceed 1 part in 40,000. The record of survey shall show the location and justification of location of all permanent monuments set and their relation to the street right-of-way. Record(s) of Survey(s) shall be submitted for the Engineer's review and approval before submittal to the County Surveyor and before submittal to the County Recorder.

2-9.2.2 Survey Requirements, Stakes shall be set at offsets approved by the Engineer at no greater intervals than specified in TABLE 2-9.2.2(A) as measured along the project stationing. Stakes shall be set to show the location and grade of future curbs adjacent to traffic signal locations where the curb is not being built as a part of this contract. Staking and marking shall be completed by the Surveyor and inspected and approved by the Engineer before the start of construction in the area marked. Centerline monument shall have the disk stamped with the date the monument was set and the registration number of the Surveyor. Habitat mitigation sites and other areas to be preserved that are shown on the plans shall be staked and flagged prior to the start of any other activities within the limits of the work. When curb and gutter does not exist and is not being installed as a part of the project the location of adjacent facilities being constructed as a part of the contract the Contractor shall place stakes defining the horizontal and vertical location of such adjacent utility vaults, poles or other facilities that are being installed as parts of, or adjunct



to, the project either by the Contractor and/or those noted on the plans as to be installed by others.

TABLE 2-9.2.2(A)
Survey Requirements for Construction Staking

Feature Staked	Stake Description ②	Centerline or Parallel to Centerline Spacing④, ⑥	Lateral Spacing ③, ⑥	Setting Tolerance (Within)
Street Centerline	SDRS M-10 Monument	≤1000', Street Intersections, Begin and end of curves, only when shown on the plans	on street centerline	0.02' Horizontal, also see Section 2-9.2.1 herein
Clearing	Lath in soil, painted line on PCC & AC surfaces	lath - Intervisible, ≤ 50' on tangents & ≤ 25' on curves, Painted line - continuous	at clearing line	1' Horizontal
Slope	RP + Marker Stake	Intervisible and ≤ 50'	Grade Breaks & ≤ 25'	0.1' Vertical & Horizontal
Fence	RP + Marker Stake	≤ 200' on tangents, ≤ 50' on curves when R ≥ 1000' & 25' on curves when R ≤ 1000'	N/A (constant offset)	0.1' Horizontal
Rough Grade Cuts or Fills ≥ 10 m (33')	RP + Marker Stake	≤ 50'	N/A	0.1' Vertical & Horizontal
Final Grade (includes top of: Basement soil, subbase and base)	RP + Marker Stake, Blue-top in grading area	≤ 50' on tangents & curves when R ≥ 1000' & ≤ 25' on curves when R ≤ 1000'	≤ 22'	3/8" Horizontal & 1/4" Vertical
Asphalt Pavement Finish Course	RP, paint on previous course	≤ 25' or as per the intersection grid points shown on the plan whichever provides the denser information	edge of pavement, paving pass width, crown line & grade breaks	3/8" Horizontal & 1/4" Vertical
Drainage Structures, Pipes & similar Facilities①, ⑦	RP + Marker Stake	intervisible & ≤ 25', beginning and end, BC & EC of facilities, Grade breaks, Alignment breaks, Junctions, Inlets & similar facilities, Risers & similar facilities (except plumbing), Skewed cut-off lines	as appropriate	3/8" Horizontal & 1/4" Vertical
Curb	RP + Marker Stake	≤ 25', BC & EC, at 1/4Δ, 1/2Δ & 3/4Δ on curb returns & at beginning & end	(constant offset)	3/8" Horizontal & 1/4" Vertical
Traffic Signal ①		Vertical locations shall be based on the ultimate elevation of curb and sidewalk		
Signal Poles & Controller ①	RP + Marker Stake	at each pole & controller location	as appropriate	3/8" Horizontal & 1/4" Vertical
Junction Box ①	RP + Marker Stake	at each junction box location	as appropriate	3/8" Horizontal & 1/4" Vertical
Conduit ①	RP + Marker Stake	≤ 50' on tangents & curves when R ≥ 1000' & ≤ 25' on curves when R ≤ 1000' or where grade ≤ 0.30%	as appropriate	3/8" Horizontal & when depth cannot be measured from existing pavement 1/4" Vertical
Minor Structure ①	RP + Marker Stake + Line Stake	for catch basins: at centerline of box, ends of box & wings & at each end of the local depression ⑤	as appropriate	3/8" Horizontal & 1/4" Vertical (when vertical data needed)
Abutment Fill	RP + Marker Stake + Line Stake	≤ 50' & along end slopes & conic transitions	as appropriate	0.1' Vertical & Horizontal



Feature Staked	Stake Description ②	Centerline or Parallel to Centerline Spacing ④, ⑥	Lateral Spacing ③, ⑥	Setting Tolerance (Within)
Wall ①	RP + Marker Stake + Line Point + Guard Stake	≤ 50' and at beginning & end of: each wall, BC & EC, layout line angle points, changes in footing dimensions &/or elevation & wall height	as appropriate	1/4" Horizontal & 1/4" Vertical
Major Structure ⑤				
Footings, Bents, Abutments & Wingwalls	RP + Marker Stake + Line Point + Guard Stake	10' to 33' as required by the Engineer, BC & EC, transition points & at beginning & end. Elevation points on footings at bottom of columns	as appropriate	3/8" Horizontal & 1/4" Vertical
Superstructures	RP	10' to 33' sufficient to use string lines, BC & EC, transition points & at beginning & end. Elevation points on footings at bottom of columns	as appropriate	3/8" Horizontal & 1/4" Vertical
Miscellaneous ⑤				
Contour Grading ①	RP + Marker Stake	≤ 50'	along contour line	0.1' Vertical & Horizontal
Utilities ①, ⑦	RP + Marker Stake	≤ 50' on tangents & curves when $R \geq 1000'$ & ≤ 25' on curves when $R \leq 1000'$ or where grade ≤ 0.30%	as appropriate	3/8" Horizontal & 1/4" Vertical
Channels, Dikes & Ditches ①	RP + Marker Stake	intervisible & ≤ 100', BC & EC of facilities, Grade breaks, Alignment breaks, Junctions, Inlets & similar facilities	as appropriate	0.1' Horizontal & 1/4" Vertical
Signs ①	RP + Marker Stake + Line Point + Guard Stake	At sign location	Line point	0.1' Vertical & Horizontal
Subsurface Drains ①	RP + Marker Stake	intervisible & ≤ 50', BC & EC of facilities, Grade breaks, Alignment breaks, Junctions, Inlets & similar facilities, Risers & similar facilities	as appropriate	0.1' Horizontal & 1/4" Vertical
Overside Drains ①	RP + Marker Stake	longitudinal location	At beginning & end	0.1' Horizontal & 1/4" Vertical
Markers ①	RP + Marker Stake	for asphalt street surfacing ≤ 50' on tangents & curves when $R \geq 1000'$ & ≤ 25' on curves when $R \leq 1000'$.	At marker location(s)	1/4" Horizontal
Railings & Barriers ①	RP + Marker Stake	At beginning & end and ≤ 50' on tangents & curves when $R \geq 1000'$ & ≤ 25' on curves when $R \leq 1000'$	at railing & barrier location(s)	3/8" Horizontal & Vertical
AC Dikes ①	RP + Marker Stake	At beginning & end	as appropriate	0.1' Horizontal & Vertical
Box Culverts		10' to 33' as required by the Engineer, BC & EC, transition points & at beginning & end. Elevation points on footings & at invert	as appropriate	3/8" Horizontal & 1/4" Vertical
Pavement Markers ①	RP	200' on tangents, 50' on curves when $R \geq 1000'$ & 25' on curves when $R \leq 1000'$. For PCC surfaced streets lane cold joints will suffice	at pavement marker location(s)	1/4" Horizontal

① Staking for feature may be omitted when adjacent marker stakes reference the offset and elevation of those features and the accuracy requirements of the RP meet the requirements for the feature

② Reference points shall be sufficiently durable and set securely enough to survive with accuracy intact throughout the installation & inspection of the features or adjacent facilities for which they provide control. RP means reference point for the purposes of this table

③ Perpendicular to centerline

④ Some features are not necessarily parallel to centerline but are referenced thereto

⑤ Multi-plane surfaced features shall be staked so as to provide line & grade information for each plane of the feature

⑥ ≥ means greater than, or equal to, the number following the symbol. ≤ means less than, or equal to, the number following the symbol

⑦ The cut datum for storm drainage & sanitary sewer pipes & similar structures shall be their invert. The cut datum for all other utilities shall be the top of their pipe or conduit.



All guard stakes, line stakes and lath shall be flagged. Unless otherwise approved by the Engineer flagging, paint and marking cards shall be the color specified in TABLE 2-9.2.2(B)

TABLE 2-9.2.2(B)
Survey Stake Color Code for Construction Staking

Type of Stake	Description	Color*
Horizontal Control	Coordinated control points, control lines, control reference points, center-line, alignments, etc.	White/Red
Vertical Control	Bench marks	White/Orange
Clearing	Limits of clearing	Yellow/Black
Grading	Slope, intermediate slope, abutment fill, rough grade, contour grading, final grade, etc.	Yellow
Structure	Bridges, sound and retaining walls, box culverts, etc.	White
Drainage, Sewer, Curb	Pipe culverts, junction boxes, drop inlets, headwalls, sewer lines, storm drains, slope protection, curbs, gutters, etc.	Blue
Right-of-Way	Fences, R/ W lines, easements, property monuments, etc.	White/Yellow
Miscellaneous	Signs, railings, barriers, lighting, etc.	Orange

* Flagging and marking cards, if used.

2-9.2.3 Payment for Survey. Payment for work performed to satisfy the requirements of Sections 2-9.1 through 2-9.2.2 shall be included in the actual bid items requiring the survey work and no additional payment will be made. Extension of unit prices for extra work shall include full compensation for attendant survey work and no additional payment will be made. Payment for the replacement of disturbed monuments and the filing of records of survey and/or corner records, including filing fees, shall be incidental to the work necessitating the disturbance of said monuments and no additional payment will be made.

2-9.3 Private Engineers. Surveying by private engineers on the Work shall conform to the quality and practice required by the Engineer.

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

Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

Grades for underground conduits will be set at the surface of the ground. The Contractor shall transfer them to the bottom of the trench.

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 an authorized representative.

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



2-10.1 Availability of Records, The Contractor shall, at no charge to the Agency, provide copies of all records in the Contractor's or subcontractor's possession pertaining to the work that the Engineer may request.

2-10.2 Audit and Inspection, Contractor agrees to maintain and/or make available, to the Engineer, within San Diego County, accurate books and accounting records relative to all its activities and to contractually require all subcontractors to this Contract to do the same. The Engineer shall have the right to monitor, assess, and evaluate Contractor's and its subcontractor's performance pursuant to this Agreement, said monitoring, assessments, and evaluations to include, but not be limited to, audits, inspection of premises, reports, contracts, subcontracts and interviews of Contractor's staff and the staff of all subcontractors to this contract. At any time during normal business hours and as often as the Engineer may deem necessary, upon reasonable advance notice, Contractor shall make available to the Engineer for examination, all of its, and all subcontractors to this contract, records with respect to all matters covered by this Contract and will permit the Engineer to audit, examine, copy and make excerpts or transcripts from such data and records, and to make audits of all invoices, materials, payrolls, records of personnel, and other data relating to all matters covered by this Contract. However, any such activities shall be carried out in a manner so as to not unreasonably interfere with Contractor's ongoing business operations. Contractor and all subcontractors to this contract shall maintain such data and records for as long as may be required by applicable laws and regulations.

2-11 INSPECTION. The Work is subject to inspection and approval by 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 project 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.



SECTION 3 – CHANGES IN WORK

3-1 CHANGES REQUESTED BY THE CONTRACTOR.

3-1.1 General. 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 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 no additional cost to the Agency.

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 established method of payment, any adjustment in contract time of completion, and when negotiated prices are involved, shall provide for the Contractor's signature indicating acceptance.

3-2.2 Payment.

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 substantial change in character of the work from that shown on the Plans or specified in the Specifications, then an adjustment in payment will be made. This adjustment will be based upon the increase or decrease in quantity and the Contract Unit Price.

If the actual quantity of an item of work covered by a Contract Unit Price and constructed in conformance with the Plans and Specifications varies from the Bid quantity by 50 percent or less, payment will be made at the Contract Unit Price. If the actual quantity of said item of work varies from the Bid quantity by more than 50 percent, payment will be made per Section 3-2.2.2 or 3-2.2.3 as appropriate.

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 specified in the Specifications, an adjustment in payment will be made per Section 3-2.4.

3-2.2.2 Increases of More Than 50 Percent. Should the actual quantity of an item of work covered by a Contract Unit Price and constructed in conformance with the Plans and Specifications, exceed the Bid quantity by more than 50 percent, payment for the quantity in excess of 150 percent of the Bid quantity will be made on the basis of an adjustment in the Contract Unit Price mutually agreed to by the Contractor and the Agency, or at the option of the Engineer, on the basis of Extra Work per Section 3-3. The Extra Work per Section 3-3, basis of payment, shall not include fixed costs. Fixed costs shall be deemed to have been recovered by the Contractor through payment for 150 percent of the Bid quantity at the Contract Unit Price.



3-2.2.3 Decreases of More Than 50 Percent. Should the actual quantity of an item of work covered by a Contract Unit Price, and constructed in conformance with the Plans and Specifications, be less than 50 percent of the Bid quantity, an adjustment in payment will not be made unless so requested in writing by the Contractor. If the Contractor so requests, payment will be made on the basis of an adjustment in the Contract Unit Price mutually agreed to by the Contractor and the Agency, or at the option of the Engineer, on the basis of Extra Work per Section 3-3; however, in no case will payment be less than would be made for the actual quantity at the Contract Unit Price nor more than would be made for 50 percent of the Bid quantity at the Contract Unit Price.

3-2.3 Stipulated Unit Prices. Stipulated Unit Prices are unit prices 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 when so specified in the Special Provisions.

3-2.4 Agreed Prices. Agreed Prices are prices for new or unforeseen work, or adjustments in Contract Unit Prices per Section 3-2.2, established by mutual agreement between the Contractor and the Agency. If mutual agreement cannot be reached, the Engineer may direct the Contractor to proceed on the basis of Extra Work in accordance per Section 3-3, except as otherwise specified in Sections 3-2.2.2 and 3-2.2.3.

3.2.4.1 Schedule of Values. Prior to construction, Contractor shall provide a schedule of values for all lump sum bid items that shall be used for the purpose of progress payments. The prices shall be valid for the purpose of change orders to the project.

3.2.5 Eliminated Items. Should any Bid item be eliminated in its entirety, payment will be made to the Contractor for its actual costs incurred in connection with the eliminated item prior to notification in writing from the Engineer so stating its elimination. If material conforming to the Plans and Specifications is ordered by the Contractor for use in the eliminated item prior to the date of notification of elimination by the Engineer, and if the order for that material cannot be canceled, payment will be made to the Contractor for the actual cost of the material. In this case, the material shall become the property of the Agency. Payment will be made to the Contractor for its actual costs for any further handling. If the material is returnable, the material shall be returned, and payment will be made to the Contractor for the actual cost of charges made by the supplier for returning the material and for handling by the Contractor. Actual costs, as used herein, shall be computed on the basis of Extra Work per Section 3-3.

3-3 EXTRA WORK.

3-3.1 General. New or unforeseen work will be classified 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 costs of labor will be the actual cost for wages of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, workers compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs, resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements.

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 equipment rental. The labor cost for foremen shall be proportioned to all of their assigned work and only that applicable to extra work will be paid.

Non-direct labor costs, including superintendence, shall be considered part of the markup of Section 3-3.2.3 (a).

(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 job 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 and right-of-way delay factors to be used in determining rental and delay costs shall be the edition of the, "Labor Surcharge and Equipment Rental Rates" published by CALTRANS, current at the time of the actual use of the tool or equipment. The right-of-way delay factors therein shall be used as multipliers of the rental rates for determining the value of costs for delay to the Contractor and subcontractors, if any. The labor surcharge rates published therein are not a part of this contract.

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 included.

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 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 time for equipment already at the Work site shall be the duration of its use on the extra work. This time begins when equipment is first put into actual operation on the extra work, plus the time required to move it from its previous site and back, or to a closer site.

(d) **Other Items.** The Agency may authorize other items which may be required on the extra work, including labor, services, material, and equipment. These items must be different in their nature from those required for the Work and be of a type not ordinarily available from the Contractor or 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 percentages shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits:

1. Labor 20
2. Materials 15
3. Equipment Rental 15
4. Other Items and Expenditures ... 15

To the sum of the costs and markups provided for in this section, one 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 Section 3-3.2.3(a) shall be applied to the Subcontractor's actual cost of such work. A markup of 10 percent on the first \$5,000 of the subcontracted portion of the extra work and a markup of 5 percent on work added in excess of \$5,000 of the subcontracted portion of the extra work may be added by the Contractor.

3-3.3 Daily Reports by Contractor. When the price for the extra work cannot be agreed upon, the Contractor shall submit a daily report to the Engineer on forms approved by the Agency. Included are applicable delivery tickets, listing all labor, materials, and equipment involved for that day, and other services and expenditures when authorized. Payment for extra work will not be made until such time that the Contractor submits completed daily reports and all supporting documents to the Engineer. Failure to submit the daily report by the close of the next working day may waive any rights for that day. An attempt shall be made to reconcile the 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 report. Reports by Subcontractors or others shall be submitted through the Contractor.

The 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.

3-4 CHANGED CONDITIONS. The Contractor shall promptly notify the Engineer of the following Work site conditions (hereinafter called changed conditions), in writing, 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 conditions are changed conditions and they will materially affect 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 do not justify an adjustment in compensation, the Contractor will be notified in writing. This notice will also advise the Contractor of its obligation to notify the Engineer in writing if the Contractor disagrees.

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.

The Contractor shall not be entitled to the payment of any additional compensation for any act, or failure to act, by the Engineer, including failure or refusal to issue a change order, or for the happening of any event, thing, occurrence, or other cause, unless the Contractor shall have first given the Engineer due written notice of potential claim as hereinafter specified. Compliance with this section shall not be required as a prerequisite to notice provisions in Section 6-7.3 Contract Time Accounting, nor to any claim that is based on differences in measurement or errors of computation as to contract quantities. The written notice of potential claim for changed conditions shall be submitted by the Contractor to the Engineer upon their discovery and prior to the time that the Contractor performs the work giving rise to the potential claim. The Contractor's failure to give written notice of potential claim for changed conditions to the agency upon their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith.

The Contractor shall provide the City with a written document containing a description of the particular circumstances giving rise to the potential claim, the reasons for which the Contractor believes additional compensation may be due and nature of any and all costs involved within 20 working days of the date of service of the written notice of potential claim for changed conditions. Verbal notifications are disallowed.

The potential claim shall include the following certification relative to the California False Claims Act, Government Code Sections 12650-12655.



"The undersigned certifies that the above statements are made in full cognizance of the California False Claims Act, Government Code Sections 12650-12655. The undersigned further understands and agrees that this potential claim, unless resolved, must be restated as a claim in response to the City's proposed final estimate in order for it to be further considered."

By: _____ Title: _____

Date: _____

Company Name: _____

The Contractor's estimate of costs may be updated when actual costs are known. The Contractor shall submit substantiation of its actual costs to the Engineer within 20 working days after the affected work is completed. Failure to do so shall be sufficient cause for denial of any claim subsequently filed on the basis of said notice of potential claim.

It is the intention of this section that differences between the parties arising 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 be settled, if possible, or other appropriate action promptly taken.

3-5 DISPUTED WORK. The Contractor shall give the agency written notice of potential claim prior to commencing any disputed work. Failure to give said notice shall constitute a waiver of all claims in connection therewith. 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.

Prior to proceeding with dispute resolution pursuant to Public Contract Code provisions specified hereinafter, the contractor shall attempt to resolve all disputes informally through the following dispute resolution chain of command:

1. Project Inspector
2. Construction Manager
3. Deputy City Engineer, Construction Management & Inspection
4. City Engineer
5. City Manager

The Contractor shall submit a complete report within 20 working days after completion of the disputed work stating its position on the claim, the contractual basis for the claim, along with all documentation supporting the costs and all other evidentiary materials. At each level of claim or appeal of claim the City will, within 10 working days of receipt of said claim or appeal of claim, review the Contractor's report and respond with a position, request additional information or request that the Contractor meet and present its report. When additional information or a meeting is requested the City will provide its position within 10 working days of receipt of said additional information or Contractor's presentation of its report. The Contractor may appeal each level's position up to the City Manager after which the Contractor may proceed under the provisions of the Public Contract Code.

The authority within the dispute resolution chain of command is limited to recommending a resolution to a claim to the City Manager. Actual approval of the claim is subject to the change order provisions in the contract.



All claims by the -Contractor shall be resolved in accordance with Public Contract Code section 9204, which is set forth below:

9204. (a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3) (A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and



what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.



(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

In addition, all claims by Contractor for \$375,000 or less shall be resolved in accordance with the procedures in the Public Contract Code, Division 2, Part 3, Chapter 1, Article 1.5 (commencing with Section 20104) which is set forth below

ARTICLE 1.5 RESOLUTION OF CONSTRUCTION CLAIMS

20104. (a)(1) This article applies to all public works claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between a contractor and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b)(1) "Public work" has the same meaning as in Sections 3100 and 3106 of the Civil Code, except that "public work" does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) "Claim" means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the



claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

(c) The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

(d) This article applies only to contracts entered into on or after January 1, 1991.

20104.2. For any claim subject to this article, the following requirements apply:

(a) The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

(b)(1) For claims of less than fifty thousand dollars (\$50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

(c)(1) For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

(d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision

(a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

(f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.



20104.4. The following procedures are established for all civil actions filed to resolve claims subject to this article:

(a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

(b)(1) If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil procedure) shall apply to any proceeding brought under the subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other party arising out of the trial de novo.

(c) The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

20104.6. (a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed 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 Section 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.

4-1.2 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 such typical materials and fabricated items as bituminous paving 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 18 inches and 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 job 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.

The Contractor shall provide the Engineer free and safe access to any and all parts of work at any time. Such free and safe access shall include means of safe access and egress, ventilation, lighting, shoring, dewatering and all elements pertaining to the safety of persons as contained in the State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Division of Industrial Safety, Subchapter 4, Construction Safety Orders and such other safety



regulations as may apply. Contractor shall furnish Engineer with such information as may be necessary to keep the Engineer fully informed regarding progress and manner of work and character of materials. Inspection or testing of the whole or any portion of the work or materials incorporated in the work shall not relieve Contractor from any obligation to fulfill this Contract.

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 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 judge the materials by the requirements of the Plans and Specifications. The Contractor shall forward reports required by the Engineer. No material 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 50 miles of the geographical limits of the Agency. For private contracts, all costs of inspection at the source, including salaries and mileage costs, shall be paid by the permittee.

4-1.4 Test of Material. 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 expense, shall deliver the materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing will 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, it will be stated in the Specifications. For private contracts, the testing expense shall be borne by the permittee.

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 renotify the Engineer when samples which are representative may be obtained.

Except as specified in these Provisions, the Agency will bear the cost of testing of locally produced materials and/or on-site workmanship where the results of such tests meet or exceed the requirements indicated in the Standard Specifications, Technical Specification, and any Supplemental Provisions. The cost of all other tests shall be borne by the Contractor.

At the option of the Engineer, the source of supply of each of the materials shall be approved by the Engineer before the delivery is started. All materials proposed for use may be inspected or tested at any time during their preparation and use. If, after incorporating such materials into the Work, it is found that sources of supply that have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. If any product proves unacceptable after improper storage, handling or for any other reason it shall be rejected, not incorporated into the work and shall be removed from the project site all at the Contractor's expense.



Compaction tests may be made by the Engineer and all costs for tests that meet or exceed the requirements of the specifications shall be borne by the Agency. Said tests may be made at any place along the work as deemed necessary by the Engineer. The costs of any retests made necessary by noncompliance with the specifications shall be borne by the Contractor.

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. Material 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.

The Contractor is responsible for the satisfactory performance of substituted items. If, in the sole opinion of the Engineer, the substitution is determined to be unsatisfactory in performance, appearance, durability, compatibility with associated items, availability of repair parts and suitability of application the Contractor shall remove the substituted item and replace it with the originally specified item at no cost to the Agency.

4-1.7 Weighing and Metering Equipment. All scales and metering equipment 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 Construction Materials Dispute Resolution (Soils, Rock Materials, Concrete, Mortar and Related Materials, Masonry Materials, Bituminous Materials, Rock Products, and Modified Asphalts). In the interest of safety and public value, whenever credible evidence arises to contradict the test values of materials, the Agency and the Contractor will initiate an immediate and cooperative investigation. Test values of materials are results of the materials' tests, as defined by these Specifications or by the special provisions, required to accept the Work. Credible evidence is process observations or test values gathered using industry accepted practices. A contradiction exists whenever test values or process observations of the same or similar materials are diverse enough such that the work acceptance or performance becomes suspect. The investigation shall allow access to all test results, procedures, and facilities relevant to the disputed work and consider all available information and, when necessary, gather new and additional information in an attempt to determine the validity, the cause, and if necessary, the remedy to the contradiction. If the cooperative investigation reaches any resolution mechanism acceptable to both the Agency and the Contractor, the contradiction shall be considered resolved and the cooperative investigation concluded. Whenever the cooperative investigation is unable to reach resolution, the investigation may then either conclude without resolution or continue by written notification of one party to the other requesting the implementation of a resolution process by committee. The continuance of the investigation shall be contingent upon recipient's agreement and acknowledged in writing within 3 calendar days after receiving a request. Without acknowledgment, the investigation shall conclude without resolution. The committee shall consist of three State of California Registered Civil Engineers. Within 7 calendar days after the written request notification, the Agency and the Contractor will each select one engineer. Within 14 calendar days of the written request notification, the two selected engineers will select a third engineer. The goal in selection of the third member is to complement the professional experience of the first two engineers. Should the two engineers fail to select the third engineer, the Agency and the Contractor shall each propose 2 engineers to be the third member within 21 calendar days after the written request notification. The first two engineers previously selected shall then select one of the four proposed engineers in a blind draw. The committee shall be a continuance of the cooperative investigation and will re-consider all available information and if necessary gather new and additional information to determine the validity, the cause, and if necessary, the remedy to the contradiction. The committee will focus upon the performance adequacy of the material(s) using standard engineering principles and practices and to ensure public value, the committee may



provide engineering recommendations as necessary. Unless otherwise agreed, the committee will have 30 calendar days from its formation to complete their review and submit their findings. The final resolution of the committee shall be by majority opinion, in writing, stamped and signed. Should the final resolution not be unanimous, the dissenter may attach a written, stamped, and signed minority opinion. Once started, the resolution process by committee shall continue to full conclusion unless:

1. Within 7 days of the formation of the committee, the Agency and the Contractor reach an acceptable resolution mechanism; or
2. Within 14 days of the formation of the committee, the initiating party withdraws its written notification and agrees to bear all investigative related costs thus far incurred; or
3. At any point by the mutual agreement of the Agency and the Contractor. Unless otherwise agreed, the Contractor shall bear and maintain a record for all the investigative costs until resolution. Should the investigation discover assignable causes for the contradiction, the assignable party, the Agency or the Contractor, shall bear all costs associated with the investigation. Should assignable causes for the contradiction extended to both parties, the investigation will assign costs cooperatively with each party or when necessary, equally. Should the investigation substantiate a contradiction without assignable cause, the investigation will assign costs cooperatively with each party or when necessary, equally. Should the investigation be unable to substantiate a contradiction, the initiator of the investigation shall bear all investigative costs. All claim notification requirements of the contract pertaining to the contradiction shall be suspended until the investigation is concluded.

4-2 MATERIALS TRANSPORTATION, HANDLING AND STORAGE. The Contractor shall order, purchase, transport, coordinate delivery, accept delivery, confirm the quantity and quality received, prepare storage area(s), store, handle, protect, move, relocate, remove and dispose excess of all materials used to accomplish the Work. Materials shall be delivered to the site of the work only during working hours, as defined in Section 6-7.2, and shall be accompanied by bills of lading that shall clearly state for each delivery: the name of the Contractor as consignee, the project name and number, address of delivery and name of consignor and a description of the material(s) shipped. Prior to storage of any materials which have been shipped to or by the Contractor to any location within the Agency's boundaries the Contractor shall provide the Engineer a copy of lease agreements for each property where such materials are stored. The lease agreement shall clearly state the term of the lease, the description of materials allowed to be stored and shall provide for the removal of the materials and restoration of the storage site within the time allowed for the Work. All such storage shall conform to all laws and ordinances that may pertain to the materials stored and to preparation of the storage site and the location of the site on which the materials are stored. Loss, damage or deterioration of all stored materials shall be the Contractor's responsibility. Conformance to the requirements of this section, both within and outside the limits of work are a part of the Work. The Engineer shall have the right to verify the suitability of materials and their proper storage at any time during the Work.



SECTION 5 – UTILITIES

5-1 LOCATION. The Agency and affected utility companies have, by a search of known records, endeavored to locate and indicate on the Plans, all utilities which exist within the limits of the work. However, the accuracy and/or completeness of the nature, size and/or location of utilities indicated on the Plans is not guaranteed.

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 Section 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 Section 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 Section 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 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 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 backfilling 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 for man-hole frame and cover sets to be brought to grade as provided in the Standard Specifications for Public Works Construction, Section 301-1.6, 2006 Edition. 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 Section 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 Section 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.

In conformance with Section 5-6 the Contractor shall coordinate the work with utility agencies and companies. Prior to the installation of any and all utility structures within the limits of work by any utility agency or company, or its contractor, the Contractor shall place all curb or curb and gutter that is a part of the work and adjacent to the location where such utility structures are shown on the plans and are noted as being located, relocated or are otherwise shown as installed by others. In order to minimize delays to the Contractor caused by the failure of other parties to relocate utilities that interfere with the construction, the Contractor, upon the Engineer's approval, may be permitted to temporarily omit the portion of work affected by the utility. If such temporary omission is approved by the Engineer the Contractor shall place survey or other physical control markers sufficient to locate the curb or curb and gutter to the satisfaction of the utility agency or company.



Such temporary omission shall be for the Contractor's convenience and no additional compensation will be allowed therefore or for additional work, materials or delay associated with the temporary omission. The portion thus omitted shall be constructed by the Contractor immediately following the relocation of the utility involved unless otherwise directed by the Engineer.

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 Section 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 Section 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 Section 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.

5-6 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 THE WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK. Except as otherwise provided herein and unless otherwise prohibited by permits from other agencies as may be required by law the Contractor shall begin work within **5 calendar** days after receipt of the "Notice to Proceed".

6-1.1 Pre-Construction Meeting. After, or upon, notification of contract award, the Engineer will set the time and location for the Preconstruction Meeting. Attendance of the Contractor's management personnel responsible for the management, administration, and execution of the project is mandatory for the meeting to be convened. Failure of the Contractor to have the Contractor's responsible project personnel attend the Preconstruction Meeting will be grounds for default by Contractor per Section 6-4. No separate payment will be made for the Contractor's attendance at the meeting. The notice to proceed will only be issued on or after the completion of the preconstruction meeting.

6-1.1.1 Baseline Construction Schedule Submittal. The Contractor shall submit the Baseline Construction Schedule per the submittal requirements of Section 2-5.3. The submittal of the Baseline Construction Schedule shall include each item and element of Sections 6-1.2 through 6-1.2.9 and shall be on hard (paper) copy and electronic media conforming to Section 6-1.3.3 Electronic Media.

6-1.2 Preparation and Review of the Baseline Construction Schedule. The Contractor shall prepare the Baseline Construction Schedule as a Critical Path Method (CPM) Schedule in the precedence diagram method (activity-on-node) format. The Baseline Construction Schedule shall depict a workable plan showing the sequence, duration, and interdependence of all activities required to represent the complete performance of all project work as well as periods where work is precluded. The Baseline Construction Schedule shall begin with the projected date of issuance of the notice to proceed and conclude with the date of final completion per the contract duration. The Baseline Construction Schedule shall include detail of all project phasing, staging, and sequencing, including all milestones necessary to define beginning and ending of each phase or stage.

6-1.2.1 Time-Scaled Network Diagram. As a part of the Baseline Construction Schedule the Contractor shall prepare and submit to the Engineer a complete time-scaled network diagram showing all of the activities, logic relationships, and milestones comprising the schedule.

6-1.2.2 Tabular Listing. As a part of the Baseline Construction Schedule the Contractor shall prepare and submit to the Engineer a tabular listing of all of the activities, showing for each activity the identification number, the description, the duration, the early start, the early finish, the late start, the late finish, the total float, and all predecessor and successor activities for the activity described.

6-1.2.3 Bar Chart. As a part of the Baseline Construction Schedule the Contractor shall prepare and submit to the Engineer a chart showing individual tasks and their durations arranged with the tasks on the vertical axis and duration on the horizontal axis. The bar chart shall use differing texture patterns or distinctive line types to show the critical path.



6-1.2.4 Schedule Software. The Contractor shall use commercially available software equal to the Windows 2000 compatible "Suretrak" program by Primavera or "Project" program by Microsoft Corporation to prepare the Baseline Construction Schedule and all updates thereto. The Contractor shall submit to the Agency a CD-ROM data disk with all network information contained thereon, in a format readable by a Microsoft Windows 2000 system. The Agency will use a "Suretrak", "Project" or equal software program for review of the Contractor's schedule. Should the Contractor elect to use a scheduling program other than the "Suretrak" program by Primavera or "Project" program by Microsoft Corporation the Contractor shall provide the Engineer three copies of the substituted program that are fully licensed to the Agency and 32 class hours of on-site training by the program publisher for up to eight Agency staff members. The classes shall be presented on Mondays through Thursdays, inclusive, between the hours of 8:00 a.m. and 5:00 p.m. The on-site training shall be held at 1635 Faraday Avenue, Carlsbad, California. The dates and times of the on-site training shall be submitted to the Engineer for approval five working days before the start of the on-site training. The on-site training shall be completed prior to the submittal of the first Baseline Construction Schedule.

6-1.2.5 Schedule Activities. Except for submittal activities, activity durations shall not be shorter than 1 working day nor longer than 15 working days, unless specifically and individually allowed by the Engineer. The Baseline Construction Schedule shall include between 100 and 500 activities, including submittals, interfaces between utility companies and other agencies, project milestones and equipment and material deliveries. The number of activities will be sufficient, in the judgment of the Engineer, to communicate the Contractor's plan for project execution, to accurately describe the project work, and to allow monitoring and evaluation of progress and of time impacts. Each activity's description shall accurately define the work planned for the activity and each activity shall have recognizable beginning and end points.

6-1.2.6 Float. Float or slack time within the schedule is available without charge or compensation to whatever party or contingency first exhausts it.

6-1.2.7 Restraints to Activities. Any submittals, utility interfaces, or any furnishing of Agency supplied materials, equipment, or services, which may impact any activity's construction shall be shown as a restraint to those activities. Time periods to accommodate the review and correction of submittals shall be included in the schedule.

6-1.2.8 Late Completion. A Baseline Construction Schedule showing a project duration longer than the specified contract duration will not be acceptable and will be grounds for determination of default by Contractor, per Section 6-4.

6-1.2.9 Early Completion. The Baseline Construction Schedule will show the Contractor's plan to support and maintain the project for the entire contractual time span of the project. Should the Contractor propose a project duration shorter than contract duration, a complete Baseline Construction Schedule must be submitted, reflecting the shorter duration, in complete accordance with all schedule requirements of Section 6-1. The Engineer may choose to accept the Contractor's proposal of a project duration shorter than the duration specified; provided the Agency is satisfied the shortened Baseline Construction Schedule is reasonable and the Agency and all other entities, public and private, which interface with the project are able to support the provisions of the shortened Baseline Construction Schedule. The Agency's acceptance of a shortened duration project will be confirmed through the execution of a contract change order revising the project duration and implementing all contractual requirements including liquidated damages in accordance with the revised duration.



6-1.2.10 Engineer's Review. The Construction Schedule is subject to the review of the Engineer. The Engineer's determination that the Baseline Construction Schedule proposed by the Contractor complies with the requirements of these supplemental provisions shall be a condition precedent to issuance of the Notice to Proceed by the Engineer. If the Engineer determines that the Construction Schedule does not meet the requirements of these specifications the Contractor shall correct the Construction Schedule to meet these specifications and resubmit it to the Engineer. Failure of the Contractor to obtain the Engineer's determination that the initial Construction Schedule proposed by the Contractor complies with the requirements of these supplemental provisions within thirty (30) working days after the date of the preconstruction meeting shall be grounds for termination of the contract per Section 6-4. Days used by the Engineer to review the initial Construction Schedule will not be included in the 30 working days.

The Engineer will review and return to the Contractor, with any comments, the Baseline Construction Schedule within 15 working days of submittal. The Baseline Construction Schedule will be returned marked as per Sections 6-1.2.10.1 through 6-1.2.10.3.

6-1.2.10.1 "Accepted." The Contractor may proceed with the project work upon issuance of the Notice to Proceed and will receive payment for the schedule in accordance with Section 6-1.8.1.

6-1.2.10.2 "Accepted with Comments." The Contractor may proceed with the project work upon issuance of the Notice to Proceed. The Contractor must resubmit the schedule incorporating the comments prior to receipt of payment per Section 6-1.8.1.

6-1.2.10.3 "Not Accepted." The Contractor must resubmit the schedule incorporating the corrections and changes of the comments prior to receipt of payment per Section 6-1.8.1. The Notice to Proceed will not be issued by the Engineer if the changes of the comments are not submitted as required hereinbefore and marked "Accepted" or "Accepted with Comments" by the Engineer. The Contractor, at the sole option of the Engineer, may be considered as having defaulted the contract under the provisions of Section 6-4 DEFAULT BY CONTRACTOR if the changes of the comments are not submitted as required hereinbefore and marked "Accepted" by the Engineer.

6-1.3 Preparation of Schedule Updates and Revisions. The Contractor shall meet with the Engineer during the last week of each month to agree upon each activity's schedule status and shall submit monthly updates of the Baseline Construction Schedule confirming the agreements no later than the fifth working day of the following month. The monthly update will be submitted on hard (paper) copy and electronic media conforming to Section 6-1.3.3 Electronic Media per the submittal requirements of Section 2-5.3 and will include each item and element of Sections 6-1.2 through 6-1.2.9 and 6-1.3.1 through 6-1.3.7.

6-1.3.1 Actual Activity Dates. The actual dates each activity was started and/or completed during the month. After first reporting an actual date, the Contractor shall not change that actual date in later updates without specific notification to the Engineer with the update.

6-1.3.2 Activity Percent Complete. For each activity underway at the end of the month, the Contractor shall report the percentage determined by the Engineer as complete for the activity.

6-1.3.3 Electronic Media. The schedule data disk shall be a CD-ROM, labeled with the project name and number, the Contractor's name and the date of preparation of the schedule data disk. The schedule data disk shall be readable by the software specified in Section 6-1.2.4 "Schedule Software" and shall be free of file locking, encryption or any other protocol that would impede full access of all data stored on it.



6-1.3.4 List of Changes. A list of all changes made to the activities or to the interconnecting logic, with an explanation for each change.

6-1.3.5 Change Orders. Each monthly update will include the addition of the network revisions reflecting the change orders approved in the previous month. The network revisions will be as agreed upon during the review and acceptance of the Contractor's change orders.

6-1.3.6 Bar Chart. Each monthly update will include a chart showing individual tasks and their durations arranged with the tasks on the vertical axis and duration on the horizontal axis. The bar chart shall use differing texture patterns or distinctive line types to show the critical path.

6-1.4 Engineer's Review of Updated Construction Schedule. The Engineer will review and return the Updated Construction Schedule to the Contractor, with any comments, within 5 working days of submittal. The Updated Construction Schedule will be returned marked as per Sections 6-1.4.1 through 6-1.4.3. Any Updated Construction Schedule marked "Accepted with Comments" or "Not Accepted" by the Engineer will be returned to the Contractor for correction. Upon resubmittal the Engineer will review and return the resubmitted Updated Construction Schedule to the Contractor, with any comments, within 5 working days. Failure of the Contractor to submit a monthly updated construction schedule will invoke the same consequences as the Engineer returning a monthly updated construction schedule marked "Not Accepted".

6-1.4.1 "Accepted." The Contractor may proceed with the project work and will receive payment for the schedule in accordance with Section 6-1.8.2.

6-1.4.2 "Accepted with Comments." The Contractor may proceed with the project work. The Contractor must resubmit the Updated Construction Schedule to the Engineer incorporating the corrections and changes noted in the Engineer's comments prior to receipt of payment per Section 6-1.8.2.

6-1.4.3 "Not Accepted." The Contractor must resubmit the Updated Construction Schedule to the Engineer incorporating the corrections and changes noted in the Engineer's comments prior to receipt of payment per Section 6-1.8.2. The Contractor, at the sole option of the Engineer, may be considered as having defaulted the contract under the provisions of Section 6-4 DEFAULT BY CONTRACTOR if the changes of the comments are not submitted and marked "Accepted" by the Engineer before the last day of the month in which the Updated Construction Schedule is due. If the Contractor fails to submit the corrected Updated Construction Schedule as required herein the Contractor may elect to proceed with the project at its own risk. Should the Contractor elect not to proceed with the project, any resulting delay, impact, or disruption to the project will be the Contractor's responsibility.

6-1.5 Late Completion or Milestone Dates. Should the Schedule Update indicate a completion or contractually required milestone date later than the properly adjusted contract or milestone duration, the Agency may withhold Liquidated Damages for the number of days late. Should a subsequent "Accepted" Schedule Update remove all or a portion of the delay, all or the allocated portion of the previously held Liquidated Damages shall be released in the monthly payment to the Contractor immediately following the "Accepted" schedule.

6-1.6 Interim Revisions. Should the actual or projected progress of the work become substantially different from that depicted in the Project Schedule, independently of and prior to the next monthly update, the Contractor will submit a revised Baseline Construction Schedule, with a list



and explanation of each change made to the schedule. The Revised Construction Schedule will be submitted per the submittal requirements of Section 2-5.3 and per the schedule review and acceptance requirements of Section 6-1, including but not limited to the acceptance and payment provisions. As used in this section “substantially different” means a time variance greater than 5 percent of the number of days of duration for the project.

6-1.7 Final Schedule Update. The Contractor shall prepare and submit a final schedule update when one hundred percent of the construction work is completed. The Contractor’s Final Schedule Update must accurately represent the actual dates for all activities. The final schedule update shall be prepared and reviewed per Sections 6-1.3 Preparation of Schedule Updates and Revisions and 6-1. 4 Engineer’s Review of Updated Construction Schedule. Acceptance of the final schedule update is required for completion of the project and release of any and all funds retained per Section 9-3.2.

6-1.8 Measurement and Payment of Construction Schedule. The Contractor’s preparation, revision and maintenance of the Construction Schedule are incidental to the work and no separate payment will be made therefore.

6-2 PROSECUTION OF WORK.

To minimize public inconvenience and possible hazard and to restore street and other work areas to their original condition and state of usefulness as soon as practicable, the Contractor shall diligently prosecute the Work to completion. If the Engineer determines that the Contractor is failing to prosecute the Work to the proper extent, the Contractor shall, upon orders from the Engineer, immediately take steps to remedy the situation. All costs of prosecuting the Work as described herein shall be included in the Contractor’s Bid. Should the Contractor fail to take the necessary steps to fully accomplish said purposes, after orders of the Engineer, the Engineer may suspend the work in whole or part, until the Contractor takes said steps.

As soon as possible under the provisions of the 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 actions will not relieve the Contractor from liability.

6-2.1 Order of Work. The work to be done shall consist of furnishing all labor, equipment and materials, and performing all operations necessary to complete the Project Work as shown on the Project Plans and as specified in the Specifications. The work includes installation of a hydraulic surge tank system with related appurtenances, replacement of three check valves in the pump building and replacement of one check valve on the bypass pump system. The project also includes demolition and removal of decommissioned equipment in the lift station’s equipment room and the installation of a vacuum valve assembly on the downstream end of the forcemain.

Suggested Sequence of Work

Unless specifically noted the construction sequence, provided as follows, is strictly a suggested method to accomplish the work and is not a required sequence. Contractor shall determine its means and methods of performance based upon its own independent judgment. The Contractor shall be responsible for the successful completion of all work. Deviations from these suggested sequences are acceptable if techniques and methods to be performed by the Contractor will result



in further reduced risk of sewage spill, avoidance of adverse effects on the City's operations, reduction to inconvenience in traffic, businesses, and the amount of flow bypassing on the project. The Contractor shall submit to the Engineer for approval, a written plan of his means and methods of bypassing the existing Poinsettia Lift Station, demolition, and installation of new equipment, four (4) weeks prior to any planned installation work. The plan shall be reviewed and approved prior to commencing work.

The project falls under CAL-OSHA jurisdiction and the Contractor shall make its personnel aware that they will be exposed to raw wastewater during this construction project. The Contractor shall take the necessary health precautions to guard against contact with the raw wastewater. It is the responsibility of the Contractor to prevent any spill of raw wastewater because of his operations.

The existing emergency bypass pump at the Poinsettia Lift Station is not to be used by the Contractor for shutdowns and pump bypassing operations during construction. During all shutdowns and pump bypassing operations of the Poinsettia Lift Station, the Contractor shall furnish one trailer-mounted portable pump (with a pumping capacity indicated in Specification Section 02303) for pump bypassing operations.

Refer to record drawing No. 95-402, Sheet C-2, M-1, and M-3 for the location of the access manhole for temporary suction piping connection to the Poinsettia Lift Station wet well. Figure 1 indicates an 8" blind flange with a plug valve on the discharge piping of the existing emergency pump for potential connection of temporary bypass discharge piping. Refer to record drawing No. 486-6, Sheet M-2, for the location of the 8" blind flange connection for temporary discharge piping connection to the secondary bypass connection.



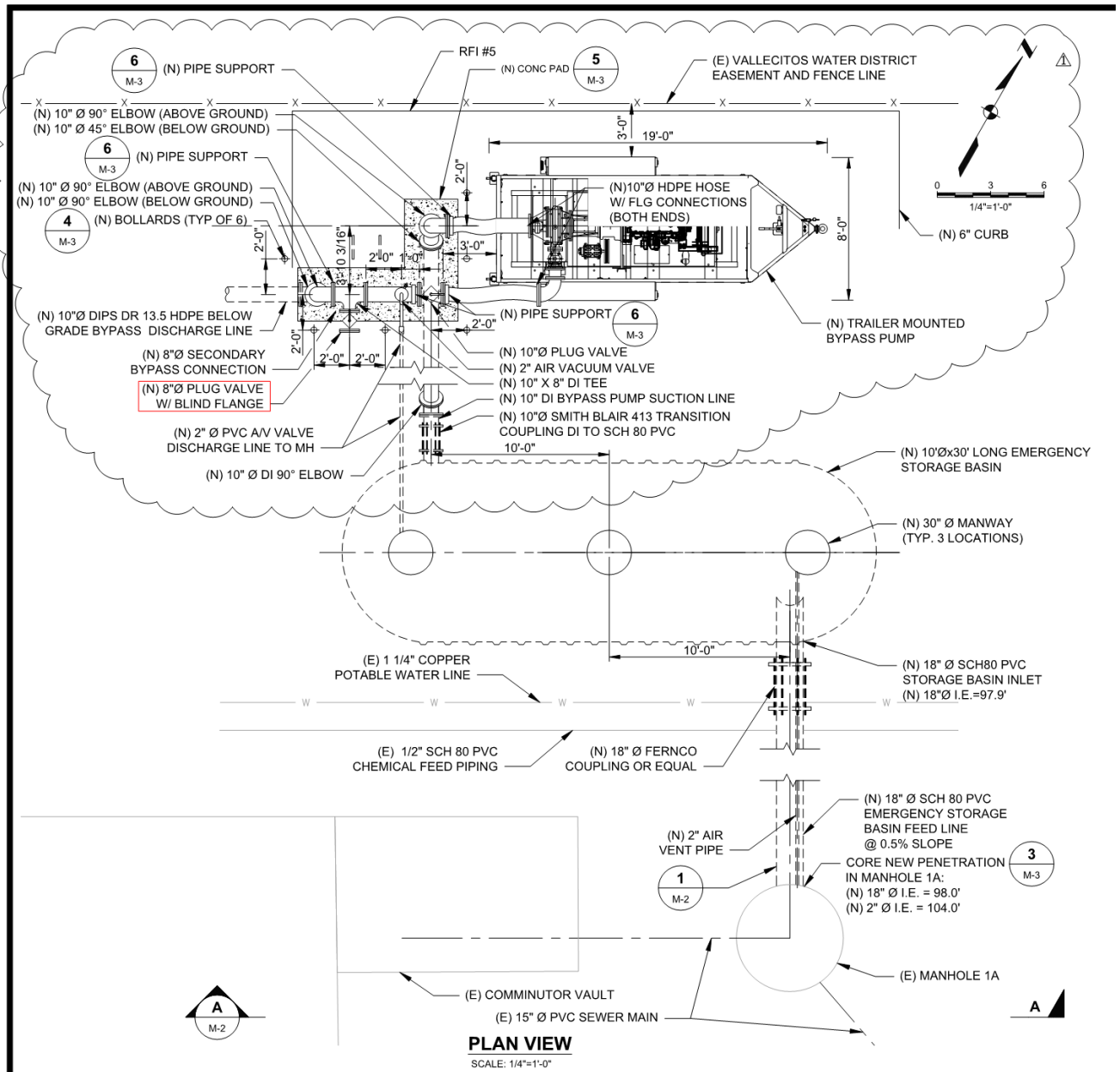


Figure 1 (Refer to Record Drawing No, 486-6, Sheet M-2)



To ensure a seamless bypass transition, in coordination with the Owner's operations staff, the Contractor shall perform a mock shutdown and bypass in the presence of the project inspector. The project inspector shall observe and approve of the Contractor's shutdown and bypass method prior to performing any shut-down of operations. The Contractor shall perform the shutdown and bypass at night during sewage flow conditions and provide noise suppression equipment.

The existing Poinsettia Lift Station facilities are critical components to the City of Carlsbad's sewer collection system and must remain in service throughout the improvement process. In an effort to minimize disruptions to the existing facilities, the construction activities will need to follow a construction sequence that ensures 1) minimal interruptions to operations, 2) proper redundancy is maintained, and 3) the Contractor can adequately complete the work. The following is a description of a suggested construction sequence that allows the City to achieve all three of the listed criteria above.

- 1) Mobilize equipment and perform pre-construction activities such as trailer set up, delivery of equipment, connection to construction water source and power source, acquire all necessary permits, etc.
- 2) Replace check valves in the lift station room and the bypass vault per the demolition plan. Isolate each pump one at a time for check valve replacement. No bypass is required due to pump redundancy.
- 3) Remove decommissioned chemical pumps and feed piping per the demolition plan.
- 4) Remove existing foul air ducts per the demolition plan.
- 5) Contractor shall protect in-place the existing flow meter and emergency bypass connection vault
- 6) Begin excavation and placement of shoring for surge tank and piping.
- 7) Construct new surge tank and associated equipment, piping, valves, and appurtenances up to the penetration in the flow meter and emergency bypass connection vault wall.
- 8) Install flow meter and emergency bypass connection vault wall penetration and connect surge tank piping.
- 9) Install new air compressor and associated piping and conduits.
- 10) During low sewer flow conditions, bypass the Poinsettia Lift Station using the temporary bypass pump.
- 11) Remove existing portion of discharge force main per the demolition plan.
- 12) Protect in place and properly restrain existing piping.
- 13) Install new piping, valves, and appurtenances for the surge tank connection within the flow meter and emergency bypass connection vault. Provide proper restraints of new piping.
- 14) Perform final start-up and testing (including pressure testing) of facilities.
- 15) Discontinue bypass operations and return the Poinsettia Lift Station to normal operation.
- 16) Backfill underground structures and piping and bring to finished grade.
- 17) Install new sewage vacuum relief valve on the lift station discharge force main.
- 18) Demobilize from site.

6-2.2 Project Meetings. The Engineer will establish the time and location of weekly Project Meetings. The Contractor's Representative shall attend each Project Meeting. The Project Representative shall be the individual determined under Section 7-6, "The Contractor's Representative". No separate payment for attendance of the Contractor, the Contractor's Representative or any other employee or subcontractor or subcontractor's employee at these meetings will be made.



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 Section 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 Section 6-6.

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 the Work schedule which will insure the Agency's interest, or, if the Contractor is not carrying out the intent of the Contract, the Agency 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 five (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 section 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 or elements necessitating cessation of work, inability to obtain materials, labor or equipment, 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. the proof must be provided 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, the Engineer may deem an extension of time to be in the best interests of the Agency. The Contractor will not be entitled to damages or additional payment due to such delays, except as provided in Section 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 Section 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. They will not be granted for noncontrolling delays to minor portions of the Work unless it can be shown that such delays did or will delay the progress of the Work.

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. Such actual costs will be determined by the Engineer. The Agency will not be liable for damages which the Contractor could have avoided by any reasonable means, such as judicious handling of forces, equipment, or plant. The determination of what damages the Contractor could have avoided will be made by the Engineer.

6-6.4 Written Notice and Report. The Contractor shall provide written notice to the Engineer within two hours of the beginning of any period that the Contractor has placed any workers or equipment on standby for any reason that the Contractor has determined to be caused by the Agency or by any organization that the Agency may otherwise be obligated by. The Contractor shall provide continuing daily written notice to the Engineer, each working day, throughout the duration of such period of delay. The initial and continuing written notices shall include the classification of each workman and supervisor and the make and model of each piece of equipment placed on standby, the cumulative duration of the standby, the Contractor's opinion of the cause



of the delay and a cogent explanation of why the Contractor could not avoid the delay by reasonable means. Should the Contractor fail to provide the notice(s) required by this section the Contractor agrees that no delay has occurred and that it will not submit any claim(s) therefore.

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. The time of completion of the Contract shall be expressed in working days. The Contractor shall diligently prosecute the work to completion within **150 working days** after the starting date specified in the Notice to Proceed.

6-7.2 Working Day. A working day is any day within the period between the start of the Contract time as defined in Section 6-1 and the date provided for completion, or upon field acceptance by the Engineer for 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 Section 6-6.1,
6. any day the Contractor is prevented from working during the first 5 hours with at least 60 percent of the normal work force for cause as defined in Section 6-6.1.

Unless otherwise approved in writing by the Engineer, the hours of work shall be between the hours of 7:00 a.m. and 4:00 p.m. on Mondays through Fridays, excluding Agency holidays. The Contractor shall obtain the written approval of the Engineer if the Contractor desires to work outside said hours or at any time during weekends and/or holidays. This written permission must be obtained at least 48 hours prior to such work. The Engineer may approve work outside the hours and/or days stated herein when, in his/her sole opinion, such work conducted by the Contractor is beneficial to the best interests of the Agency. The Contractor shall pay the inspection costs of such work.

Contractor is hereby advised that the Engineer will require after hours work on an interim basis to accomplish work requiring shutdown of the primary pumps at the lift station. Shutdown of the primary pumps will be permitted between 11:30 pm and 5:00 am. Work requiring the shutdown of the primary pumps shall only occur during that specified time unless otherwise approved by the Engineer. The required after hours work is included as part of the work in the bid cost for this contract, no additional payment will be provided.

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 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, it shall 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.



6-8 COMPLETION, ACCEPTANCE, AND WARRANTY. The Work will be inspected by the Engineer for acceptance upon receipt of the Contractor's written assertion that the Work has been completed.

The Engineer will not accept the Work or any portion of the Work before all of the Work is completed and all outstanding deficiencies that may exist are corrected by the Contractor and the Engineer is satisfied that all the materials and workmanship, and all other features of the Work, meet the requirements of all of the specifications for the Work. Use, temporary, interim or permanent, of all, or portions of, the Work does not constitute acceptance of the Work. If, in the Engineer's judgment, the Work has been completed and is ready for acceptance the Engineer will so certify to the Board. Upon such certification by the Engineer the Board may accept the completed Work. Upon the Board's acceptance of the Work the Engineer will cause a "Notice of Completion" to be filed in the office of the San Diego County Recorder. The date of recordation shall be the date of completion of the Work.

All work shall be warranted for one (1) year after recordation of the "Notice of Completion" and any faulty work or materials discovered during the warranty period shall be repaired or replaced by the Contractor, at its expense. Twenty-five percent of the faithful performance bond shall be retained as a warranty bond for the one-year warranty period. The Contractor shall replace or repair any such defective work in a manner satisfactory to the Engineer, after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such replacement or repairs within the time specified in the notice, the Agency may perform this work and the Contractor's sureties shall be liable for the cost thereof.

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. For each consecutive calendar day in excess of the time specified for completion of Work, as adjusted in accordance with Section 6-6, the Contractor shall pay the Agency, or have withheld monies due it, the sum of **one thousand dollars (\$1,000.00)**. Such sum is liquidated damages and shall not be construed as a penalty and may be deducted from payments due the Contractor if such delay occurs.

Execution of the Contract shall constitute agreement by the Agency and Contractor that **one thousand dollars (\$1,000.00)** per day is the minimum value of costs and actual damages caused by the Contractor to complete the Work within the allotted time. Any progress payments made after the specified completion date shall not constitute a waiver of this paragraph or of any damages.

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 Contractor operations or negligence. The Contractor will not be required to reclean such portions of the improvement before field acceptance, 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 will assume the responsibility and liability for injury to persons or property resulting from the utilization of the facility or appurtenance so placed into



service, except for any such injury to persons or property caused by any willful or negligent act or omission by the Contractor, Subcontractor, their officers, employees, or agents.



SECTION 7 – RESPONSIBILITIES OF THE CONTRACTOR

7-1 CONTRACTOR'S EQUIPMENT AND FACILITIES. The Contractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work. Such equipment and facilities shall meet all requirements of applicable ordinances and laws.

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 work properly and acceptably, shall be immediately removed from the Work by the Contractor and not be reemployed on the Work.

7-2.2 Laws. The Contractor, its agents, and employees shall be bound by and comply with applicable provisions of the Labor Code and 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 40-hour week; overtime; Saturday, Sunday, and holiday work; and nondiscrimination 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 agreement 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 project. The Contractor shall agree through the Contract to comply with this Section and the remaining provisions of the Labor Code.

7-3 LIABILITY INSURANCE. Insurance shall be required as specified in section 10 of the Public Works Contract.

The cost of this insurance shall be included in the Contractor's Bid.

7-4 WORKERS' COMPENSATION INSURANCE. Before execution of the Contract by the Board, the 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."



The Contractor shall also comply with Section 3800 of the Labor Code by securing, paying for, and maintaining in full force and effect for the duration of the contract, complete Workers' Compensation Insurance, and shall furnish a Certificate of Insurance to the Engineer before execution of the Contract. The Agency, its officers, or employees, will not be responsible for any claims in law or equity occasioned by failure of the Contractor to comply with this paragraph.

All compensation insurance policies shall bear an endorsement or shall have attached a rider whereby it is provided that, in the event of expiration or proposed cancellation of such policies for any reason whatsoever, the Agency shall be notified by registered mail not less than 30 days before expiration or cancellation is effective.

All insurance is to be placed with insurers that are admitted and authorized to conduct business in the state of California and are listed in the official publication of the Department of Insurance of the State of California. Policies issued by the State Compensation Fund meet the requirement for workers' compensation insurance.

7-5 PERMITS. Except as specified herein the Contractor will obtain, at no cost to the Contractor all City of Carlsbad encroachment, right-of-way, grading and building permits necessary to perform work for this contract on Agency property, streets, or other rights-of-way. Contractor shall not begin work until all permits incidental to the work are obtained. The Contractor shall obtain and pay for all permits for the disposal of all materials removed from the project. The cost of said permit(s) shall be included in the price bid for the appropriate bid item and no additional compensation will be allowed therefore. 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. For private contracts, the Contractor shall obtain all permits incidental to the Work or made necessary by its operations, and pay all costs incurred by the permit requirements.

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

7-5.1 Resource Agency Permits. NOT APPLICABLE

7-5.2 Relations with the Railroad. NOT APPLICABLE

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 project, and any extension of time.

7-7.1 Coordination. The Contractor shall coordinate and cooperate with all the utility companies during the relocation or construction of their lines. The Contractor may be granted a time extension if, in the opinion of the Engineer, a delay is caused by the utility company. No additional compensation will be made to the Contractor for any such delay.

7-8 PROJECT SITE MAINTENANCE.

7-8.1 Cleanup and Dust Control. Throughout all phases of construction, including suspension of work, and until the final acceptance, the Contractor shall keep the site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning, sweeping and sprinkling with water, or other means as necessary. The use of water resulting in mud on public streets will not be permitted as a substitute for sweeping or other methods.

When required by the Plans or Specifications, the Contractor shall furnish and operate a self-loading motor sweeper with spray nozzles at least once each working day for the purpose of keeping paved areas acceptably clean wherever construction, including restoration, is incomplete.

Materials and equipment shall be removed from the site as soon as they are no longer necessary. Before the final inspection, the site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.

Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately, and the area cleaned.

Excess excavation material from catch basins or similar structures shall be removed from the site immediately. Sufficient material may remain for use as backfill if permitted by the Specifications. Forms and form lumber shall be removed from the site as soon as practicable after stripping.

Failure of the Contractor to comply with the Engineer's cleanup orders may result in an order to suspend work until the condition is corrected. No additional compensation will be allowed as a result of such suspension.



Cleanup and dust control required herein shall also be executed on weekends and other non-working days when needed to preserve the health safety or welfare of the public. The Contractor shall conduct effective cleanup and dust control throughout the duration of the Contract. The Engineer may require increased levels of cleanup and dust control that, in his/her sole discretion, are necessary to preserve the health, safety and welfare of the public. Cleanup and dust control shall be considered incidental to the items of work that they are associated with and no additional payment will be made therefore.

7-8.2 Air Pollution Control. The Contractor shall not discharge smoke, dust, or any other air contaminants into the atmosphere in such quantity as will violate the regulations of any legally constituted authority.

7-8.3 Vermin Control. At the time of acceptance, structures entirely constructed under the Contract shall be free of rodents, insects, vermin, and pests. Necessary extermination work shall be arranged and paid for by the Contractor as part of the Work within the Contract time and shall be performed by a licensed exterminator in accordance with requirements of governing authorities. The Contractor shall be liable for injury to persons or property and responsible for the elimination of offensive odors resulting from extermination operations.

7-8.4 Sanitation. 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. They shall also comply with all applicable laws, ordinances, and regulations pertaining to public health and sanitation of dwellings and camps.

Wastewater shall not be interrupted. Should the Contractor disrupt existing sewer facilities, sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches or be covered by backfill.

7-8.5 Temporary Light, Power, and Water. The Contractor shall furnish, install, maintain, and remove all temporary light, power, and water at its own expense. These include piping, wiring, lamps, and other equipment necessary for the Work. The Contractor shall not draw water from any fire hydrant (except to extinguish a fire), without obtaining permission from the water agency concerned. The Contractor shall obtain a construction meter for water used for the construction, plant establishment, maintenance, cleanup, testing and all other work requiring water related to this contract. The Contractor shall contact the appropriate water agency for requirements. The Contractor shall pay all costs of temporary light, power and water including hookup, service, meter and any, and all, other charges, deposits and/or fees therefore. Said costs shall be considered incidental to the items of work that they are associated with and no additional payment will be made therefore.

7-8.6 Water Pollution Control. The Contractor shall exercise every reasonable precaution to protect channels, storm drains, and bodies of water from pollution. It shall conduct and schedule operations so as to minimize or avoid muddying and silting of said channels, drains, and waters. Water pollution control work shall consist of constructing those facilities which may be required to provide prevention, control, and abatement of water pollution.

This project requires to provide and comply with a City of Carlsbad Tier 1 Construction SWPPP. Contr. A model Storm Water Pollution Prevention Plan (SWPPP) is provided to the Contractor, in Appendix 1, for use in preparing the Project SWPPP for approval by the City. The Contractor shall be responsible for the preparation and implementation of the SWPPP and coordination with the City and the Regional Water Quality Control Board. All costs for preparing and implementing the



Storm Water Pollution Prevention and Monitoring Plans and coordination with the City and the Regional Water Quality Control Board shall be included as part of the contract price bid.

A Notice of Intent (NOI) **shall not** be filed for the project.

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. Such dams shall be removed from the site as soon as their use is no longer necessary.

7-8.8 Noise Control. All internal combustion engines used in the construction shall be equipped with mufflers in good repair when in use on the project with special attention to the City Noise Control Ordinance, Carlsbad Municipal Code Chapter 8.48.

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 to be removed shall be protected from damage or injury. If damaged or removed due to 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, within the right-of-way 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 included in the Bid.

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 90 m (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 schedule the work so as to prevent damage by all traffic, including but not limited to mail delivery. The Contractor shall not schedule work so as to conflict with trash pickup. The trash hauling schedule can be obtained by calling the City's contracted waste disposal company, Coast Waste Management at 929-9417.

During overlay operations, the Contractors schedule for overlay application shall be designated to provide residents and business owners whose streets are to be overlaid sufficient paved parking within an 800-foot distance from their homes or businesses.

Seventy-two hours prior to the start of any construction in the public right-of-way that affects vehicular traffic and/or parking or pedestrian routes, the Contractor shall give written notification of the impending disruption. For a full street closure, all residences and/or businesses on the affected street or alley shall be notified. For partial street closures, or curb, sidewalk and driveway repairs, the residences and/or businesses directly affected by the work shall be notified.

The notification shall be hand delivered and shall state the date and time the work will begin and its anticipated duration. The notification shall list two telephone numbers that may be called to obtain additional information. One number shall be the Contractor's permanent office or field office and the other number shall be a 24-hour number answered by someone who is knowledgeable about the project. At least one of the phone numbers shall be in the (760) area code. An answering machine shall not be connected to either number. The notification shall also give a brief description of the work and simple instructions to the home or business owner on what they need to do to facilitate the construction. The Contractor shall submit the contents of the notification to the Engineer for approval. Notices shall not be distributed until approved by the Engineer.

For residences, the notification shall be pre-cut in a manner that enables it to be affixed to a doorknob without adhesives. It shall be a minimum size of 3-1/2 inches by 8-1/2 inches and shall be brightly colored with contrasting printing. The material shall be equivalent in strength and durability to 65 lb. card stock. The printing on the notice shall be no smaller than 12 point. An example of such notice is provided in Appendix "A".



In addition to the notifications, the contractor shall post no parking signs 72 hours in advance of the work being performed. The no parking signs shall state the date and time of parking restriction for a duration not to exceed the time necessary to complete the work at that location. Failure of the contractor to meet the posted date requires re-posting the no parking signs 72 hours in advance of the rescheduled work. If the work is delayed or rescheduled the no parking signs shall be removed and re-posted 72 hours in advance of the rescheduled work.

The preparation, materials, printing and distribution of the notifications shall be included in the contract price bid for traffic control and the Contractor will not be entitled to any additional compensation for printing and distributing these notices.

The contractor shall replace all street markings and striping damaged by construction activities.

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 shall not be stored in streets, roads, or highways for more than 5 days after unloading. All materials or equipment not installed or used in construction within 5 days after unloading shall be stored elsewhere by the Contractor at its expense unless 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. 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, shall not be stored in public streets 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, flag persons, and watchpersons. The Contractor shall be responsible for compliance with additional public safety requirements which may arise. The Contractor shall furnish and install signs and warning devices and promptly remove them upon completion of the Work.

After obtaining the Engineers approval and at least 5 working days before closing, detouring, partially closing or reopening any street, alley or other public thoroughfare the Contractor shall notify the following:

- | | |
|--|--------------|
| 1. The Engineer..... | 760-602-2720 |
| 2. Carlsbad Fire Department Dispatch..... | 760-931-2197 |
| 3. Carlsbad Police Department Dispatch | 760-931-2197 |
| 4. Carlsbad Traffic Signals Maintenance (extension 2937) | 760-438-2980 |
| 5. Carlsbad Traffic Signals Operations..... | 760-602-2752 |
| 6. North County Transit District..... | 760-967-2828 |
| 7. Waste Management | 760-929-9400 |

The Contractor shall comply with their requirements. The Contractor shall obtain the Engineer's written approval prior to deviating from the requirements of 2) through, and including, 7) above.



The Contractor shall obtain the written approval no less than five working days prior to placing any traffic control that affects bus stops.

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 covering "signs" as set forth in the Traffic Manual published by the California Department of Transportation. 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.

Traffic controls shall be in accordance with the plans, The California Manual on Uniform Traffic Control Devices (FHWA MUTCD 2003 Revision 1, as amended for use in California) and these provisions. If any component in the traffic control system is damaged, displaced, or ceases to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair said component to its original condition or replace said component and shall restore the component to its original location. In the event that the Contractor fails to install and/or maintain barricades or such other traffic signs, markings, delineation or devices as may be required herein, the Engineer may, at his/her sole option, install the traffic signs, markings, delineation or devices and charge the Contractor twenty dollars (\$25.00) per day per traffic sign or device, or the actual cost of providing such traffic control facility, whichever is the greater.

7-10.3.1 Construction Area Signs and Control Devices. All construction traffic signs and control devices shall be maintained throughout the duration of work in good order and according to the approved traffic control plan. All construction area signs shall conform to the provisions of Section 206-7.2 et seq. All temporary reflective pavement markers shall conform to the provisions of Section 214-5.1 et seq. All temporary reflective channelizers shall conform to the provisions of Section 214-5.2 et seq. All paint for temporary traffic striping, pavement marking, and curb marking shall conform to the provisions of Section 210-1.6 et seq. except that all temporary paint shall be rapid dry water borne conforming to Section 210-1.6 for materials and Section 310-5 et seq. For workmanship. Warning and advisory signs, lights and devices installed or placed to provide traffic control, direction and/or warning shall be furnished, installed and maintained by the Contractor. Warning and advisory signs, lights and devices shall be promptly removed by the Contractor when no longer required. Warning and advisory signs that remain in place overnight shall be stationary mounted signs. Stationary signs that warn of non-existent conditions shall be removed from the traveled way and from the view of motorists in the traveled way or shielded from the view of the traveling public during such periods that their message does not pertain to existing conditions. Care shall be used in performing excavation for signs in order to protect underground facilities. All excavation required to install stationary construction area signs shall be performed by hand methods without the use of power equipment. Warning and advisory signs that are used only during working hours may be portable signs. Portable signs shall be removed from the traveled way and shielded from the view of the traveling public during non-working hours. During the hours of darkness, as defined in Division 1, Section 280, of the California Vehicle Code, portable signs shall be illuminated or, at the option of the Contractor, shall be in conformance with the provisions in Section 206-7.2 et seq. If illuminated traffic cones rather than post-type delineators are used during the hours of darkness, they shall be affixed or covered with reflective cone sleeves as specified in CALTRANS "Standard Specifications", except the sleeves shall be 7" long. Personal vehicles of the Contractor's employees shall not be parked within the traveled way, including any Section closed to public traffic. Whenever the Contractor's vehicles or equipment are parked on the shoulder within 6' of a traffic lane, the shoulder area shall be closed with fluorescent



traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at not less than 25' intervals to a point not less than 25' past the last vehicle or piece of equipment. A minimum of nine (9) cones or portable delineators shall be used for the taper. A W20-1 (Road Work Ahead) or C24 (Shoulder Work Ahead) sign shall be mounted, as required herein, on a signpost or telescoping flag tree with flags. The signpost or flag tree shall be placed where directed by the Engineer.

7-10.3.2 Maintaining Traffic. The Contractor's personnel shall not work closer than 6' nor operate equipment within 0.6 m (2') from any traffic lane occupied by traffic. For equipment the than (insert minimum acceptable shy distance, 2' shall be measured from the closest approach of any part of the equipment as it is operated and/or maneuvered in performing the work. This requirement may be waived when the Engineer has given written authorization to the reduction in clearance that is specific to the time, duration and location of such waiver, when such reduction is shown on the traffic control plans included in these contract documents, when such reduction is shown on the traffic control plans prepared by the Contractor and approved by the Engineer or for the work of installing, maintaining and removing traffic control devices. As a condition of such waiver the Engineer may require the Contractor to detour traffic, adjust the width of, or realign the adjacent traffic lane, close the adjacent traffic lane or provide barriers.

7-10.3.3 Traffic Control System for Lane Closure. A traffic control system consists of closing traffic lanes or pedestrian walkways in accordance with the details shown on the plans, California Manual on Uniform Traffic Control Devices (FHWA MUTCD 2003 Revision 1, as amended for use in California) and provisions under "Maintaining Traffic" elsewhere in these Provisions. The provisions in this section will not relieve the Contractor from its responsibility to provide such additional devices or take such measures as may be necessary to maintain public safety.

When lanes are closed for only the duration of work periods, all components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder at the end work period. If the Contractor so elects, said components may be stored at selected central locations, approved by the Engineer, within the limits of the right-of-way.

7-10.3.4 Traffic Control for Permanent and Temporary Traffic Striping. During traffic stripe operations, traffic shall be controlled with lane closures, as provided for under "Traffic Control System for Lane Closure" of these Supplemental Provisions or by use of an alternative traffic control plan proposed by the Contractor and approved by the Engineer. The Contractor shall not start traffic striping operations using an alternative plan until the Contractor has submitted its plan to the Engineer and has received the Engineer's written approval of said plan.

7-10.3.5 Temporary Pavement Delineation. Temporary pavement delineation shall be furnished, placed, maintained and removed in accordance with the minimum standards specified in the California Manual on Uniform Traffic Control Devices (FHWA MUTCD 2003 Revision 1, as amended for use in California) published by CALTRANS. Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Lane line or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic. All work necessary, including any required lines or marks, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. When temporary pavement delineation is removed, all lines and marks used to establish the alignment of the temporary pavement delineation shall be removed by grinding.



Surfaces to receive temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with permanent pavement delineation.

Temporary pavement delineation shall be removed when, as determined by the Engineer, the temporary pavement delineation conflicts with the permanent pavement delineation or with a new traffic pattern for the area and is no longer required for the direction of public traffic. When temporary pavement delineation is required to be removed, all lines and marks used to establish the alignment of the temporary pavement delineation shall be removed.

7-10.3.6 Preparation of New, or Modifications and Additions to Existing, Traffic Control Plan Sheets. If no traffic control plans (TCP) or Traffic Control Staging plans (TCP) are included in the project plans, or if the Contractor elects to modify TCP included in the project plans, the Contractor shall have such new or modified TCP prepared and submitted as a part of the Work for any and all construction activities that are located within the traveled way. The Contractor shall have TCP prepared and submitted as a part of the Work for any construction activities that are a part of this project that are not included in the project plans. The Contractor must submit the TCP for the Engineer's review in conformance with the requirements of Section 2-5.3, et seq. and obtain the Engineer's approval of the TCP prior to implementing them. The minimum 20-day review period specified in Section 2-5.3.1 for shop drawings and submittals shall pertain to each submittal of TCP, new, modified or added to, for the Engineer's review. New or revised TCP submittals shall include all TCP needed for the entire duration of the Work. Each phase of the TCP shall be shown in sufficient scale and detail to show the lane widths, transition lengths, curve radii, stationing of features affecting the traffic control plan and the methodology proposed to transition to the subsequent TCP phase. When the vertical alignment of the traveled surface differs from the finished pavement elevation vertical curves must also be shown.

7-10.3.7 Payment.

The Contractor shall prepare and implement traffic control plans and shall furnish all labor and materials to perform, install, maintain, replace and remove all traffic control as incidentals to the work with which they are associated, and no other compensation will be allowed therefore.

7-10.4 Safety.

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

Before excavating any trench 5 feet or more in depth, the Contractor shall submit a detailed plan to the Agency 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 start 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 liability for claims caused by 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 products used.

Material usage shall be accomplished with strict adherence to California Division of Industrial Safety requirements and all manufacturer 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 Safety and Protection of Workers and Public. The Contractor shall take all necessary precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State and Municipal safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the work is being performed. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and public and shall use danger signs warning against hazards created by such features of construction as protruding nails, hoists, well holes, and falling materials.

7-11 PATENT FEES OR ROYALTIES. The Contractor shall absorb in its Bid the patent fees or royalties on any patented article or process 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, addresses, and specialties of Contractors, Subcontractors, architects, or engineers may be displayed on removable signs. The size and location shall be subject to the Engineer's approval.

Commercial advertising matter shall not be attached to 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. The Contractor shall at all times observe and comply with such laws, ordinances, and regulations. Municipal ordinances that affect this work include Chapter 11.06. Excavation and Grading. If this notice specifies locations or possible materials, such as borrow pits or gravel beds, for use in the proposed construction project which would be subject to Section 1601 or Section 1603 of the Fish and Game Code, the conditions established pursuant to Section 1601 et seq. of the Fish and Game Code shall become conditions of the contract.

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 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. The assignment shall be made and become effective at the time the awarding body tender's final payment to the contractor, without further acknowledgment of the parties."



SECTION 8 – FACILITIES FOR AGENCY PERSONNEL
(NOT APPLICABLE)



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 basis of measurement shall be measured in accordance with 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 certificates as evidence of weights delivered.

9-1.4 Units of Measurement. The system of measure for this contract shall be the U.S. Standard Measures.

9-2 LUMP SUM WORK. Items for which quantities are indicated "Lump Sum", "L.S.", or "Job", shall be paid for at the price indicated in the Bid. 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 designated lump sum bid item. This schedule shall equal 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.

9-3 PAYMENT

9-3.1 General. The quantities listed in the Bid schedule will not govern final payment. Payment to the Contractor will be made only for 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 Section 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 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.

Payment for work performed or materials furnished under an Assessment Act Contract will be made as provided in particular proceedings or legislative act under which such contract was awarded.

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.

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 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 acceptance of the Work, except as provided in Section 6-10.

Guarantee periods shall not be affected by any payment but shall commence on the date of recordination of the "Notice 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 acceptance of the Work by the Board, 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 as basis for making monthly progress payments. The estimated value will be based on contract unit prices, completed change order work and as provided for in Section 9-2 of these General Provisions. Progress payments shall be made no later than thirty (30) calendar days after the closure date. Five (5) working days following the closure date, the Engineer shall complete



the detailed progress pay estimate and submit it to the Contractor for the Contractor's information. Should the Contractor assert that additional payment is due, the Contractor shall within ten (10) days of receipt of the progress estimate, submit a supplemental payment request to the Engineer with adequate justification supporting the amount of supplemental payment request. Upon receipt of the supplemental payment request, the Engineer shall, as soon as practicable after receipt, determine whether the supplemental payment request is a proper payment request. If the Engineer determines that the supplemental payment request is not proper, then the request shall be returned to the Contractor as soon as practicable, but not later than seven (7) days after receipt. The returned request shall be accompanied by a document setting forth in writing the reasons why the supplemental payment request was not proper. In conformance with Public Contract Code Section 20104.50, the City shall make payments within thirty (30) days after receipt of an undisputed and properly submitted supplemental payment request from the Contractor. If payment of the undisputed supplemental payment request is not made within thirty (30) days after receipt by the Engineer, then the City shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

From each progress estimate, 5 percent will be deducted and retained by the Agency, and the remainder less the amount of all previous payments will be paid. After 50 percent of the Work has been completed and if progress on the Work is satisfactory, the deduction to be made from remaining progress estimates and from the final estimate may be limited to \$500 or 10 percent of the first half of total Contract amount, whichever is greater.

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

As provided in Section 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.

After final inspection, the Engineer will make a Final Payment Estimate and process a corresponding payment. This estimate will be in writing and shall be for the total amount owed the Contractor as determined by the Engineer and shall be itemized by the contract bid item and change order item with quantities and payment amounts and shall show all deductions made or to be made for prior payments and amounts to be deducted under provisions of the contract. All prior estimates and progress payments shall be subject to correction in the Final Payment Estimate.

The Contractor shall have 30 calendar days from receipt of the Final Payment Estimate to make written statement disputing any bid item or change order item quantity or payment amount. The Contractor shall provide all documentation at the time of submitting the statement supporting its position. Should the Contractor fail to submit the statement and supporting documentation within the time specified, the Contractor acknowledges that full and final payment has been made for all contract bid items and change order items.

If the Contractor submits a written statement with documentation in the aforementioned time, the Engineer will review the disputed item within 30 calendar days and make any appropriate adjustments on the Final Payment. Remaining disputed quantities or amounts not approved by the Engineer will be subject to resolution as specified in Section 3-5, Disputed Work.

The written statement filed by the Contractor shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of said disputed items. The Engineer will consider the merits of the Contractor's claims. It will be the responsibility of the Contractor to furnish within a reasonable



time such further information and details as may be required by the Engineer to determine the facts or contentions involved in its claims. Failure to submit such information and details will be sufficient cause for denying payment for the disputed items.

9-3.2.1 Payment for Claims. Except for those final payment items disputed in the written statement required in Section 9-3.2 all claims of any dollar amount shall be submitted in a written statement by the Contractor no later than the date of receipt of the final payment estimate. Those final payment items disputed in the written statement required in Section 9-3.2 shall be submitted no later than 30 days after receipt of the Final Payment estimate. No claim will be considered that was not included in this written statement, nor will any claim be allowed for which written notice or protest is required under any provision of this contract including Sections 3-4 Changed Conditions, 3-5 Disputed Work, 6-6.3 Payment for Delays to Contractor, 6-6.4 Written Notice and Report, or 6-7.3 Contract Time Accounting, unless the Contractor has complied with notice or protest requirements.

The claims filed by the Contractor shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of said claims. The Engineer will consider and determine the Contractor's claims and it will be the responsibility of the Contractor to furnish within a reasonable time such further information and details as may be required by the Engineer to determine the facts or contentions involved in its claims. Failure to submit such information and details will be sufficient cause for denying the claims.

Payment for claims shall be processed within 30 calendar days of their resolution for those claims approved by the Engineer. The Contractor shall proceed with informal dispute resolution under Section 3-5, Disputed Work, for those claims remaining in dispute.

9-3.3 Delivered Materials. When provided for in the Specifications, and subject to the limitation and conditions therein, the cost of materials and equipment delivered but not incorporated into the Work will be included in the progress estimate.

9-3.3.1 Delivered Materials. The cost of materials and equipment delivered but not incorporated into the work will not be included in the progress estimate.

9-3.4 Mobilization. When a bid item is included in the Proposal form for mobilization and subject to the conditions and limitations in the Specifications, the costs of work in advance of construction operations and not directly attributable to any specific bid item will be included in the progress estimate. When no such bid item is provided, payment for such costs will be considered to be included in the other items of work.

9-3.4.1 Mobilization, Preparatory Work and De-mobilization. Contract lump-sum price paid for mobilization shall not exceed 5% of the total contract bid cost. and includes full compensation for furnishing all insurance, bonds, licenses, labor, materials, utilities, tools, equipment and incidentals, and for doing all the work involved in mobilization, preparatory work and operations, and de-mobilization, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidental to preparing to conduct work on and off the project site and other offsite facilities necessary for work on the project; for all other facilities, sureties, work and operations which must be performed or costs incurred prior to beginning work and closing out the work on various contract items on or off the project site, excepting those specifically paid for under separate sections of these specifications. The Contractor hereby agrees that the lump sum bid amount is sufficient for Mobilization, Preparatory Work and De-mobilization, as described in this



section, and that the Contractor shall have no right to additional compensation for Mobilization, Preparatory Work and De-mobilization.

Progress payments for Mobilization, Preparatory Work and De-mobilization will be made as follows:

For the first progress payment (after the issuance of the Notice to Proceed), forty percent (40%) of the amount bid for Mobilization and Preparatory Work will be allowed. For the second progress payment, an additional sixty percent (50%) of the amount bid for mobilization and preparatory work will be allowed therefore. The final ten percent (10%) of the amount for Mobilization and Preparatory Work will be allowed upon the completion of demobilization from the site.

9-4 BID ITEMS. Payment for each Bid Item shall be made at the quantity and type as listed in the Contractor's Proposal. All work shown or mentioned on the plans, in the Contract Documents, General Provisions, or Technical Provisions/Specifications shall be considered as included in the Bid Items. Contractor must protect existing utilities, improvements, landscaping, irrigation systems, and vegetation in place. If damaged during the work, Contractor is responsible to repair or replace any utilities, improvements, landscaping, irrigation systems, and vegetation at his expense.

Refer to Schedule "A" for the bid schedule.

Mobilization, bonding, and de-mobilization (Bid Item A-1) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to mobilize, acquire bonding, and de-mobilization to complete the work as described in the plans and contract documents. The contract lump sum price paid for this bid item shall not exceed 5% of total contract price paid for the work.

Demolition (Bid Item A-2) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to demolish and remove materials and equipment per the demolition plan. This includes, but is not limited to, removal of existing ductile iron pipe, pipe supports, chemical feed pumps and piping, and foul air ducts.

Installation of a complete surge protection system (Bid Item A-3) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to install a complete surge protection system in accordance with the plans and contract documents. This includes, but is not limited to, connections, excavation, shoring, backfill, concrete formwork, air compressor installation, and surge tank installation.

Replacement of four swing check valves (Bid Item A-4) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to furnish and install the swing check valves in accordance with the plans and contract documents. This includes, but is not limited to, equipment installation and connections.

Installation of one vacuum relieve valve off-site (Bid Item A-5) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to furnish and install the sewage vacuum relief valve in accordance with the plans and contract documents. This includes, but is not limited to, surveying, locating utilities, excavation, shoring, backfill, compaction, forming, and compacted fill.



Installation of 12" ductile iron pipe, fittings, and accessories (Bid Item A-6) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to furnish and install the pipe in accordance with the plans and contract documents. This includes, but is not limited to, surveying, locating utilities, connections, flared end sections, fittings, adapters, bends, pipe supports, trenching, trench plates, shoring, backfill, compaction, resurfacing, AC paving, aggregate base, crushed rock, and compacted fill.

Bypass Pumping (Bid Item A-7) Lump Sum

The contract lump sum price paid for this bid item shall constitute full compensation to furnish and install a temporary bypass pump for the purposes of bypassing the existing lift station to perform the piping modifications in accordance with the plans and contract documents. This includes, but is not limited to, locating utilities, temporary piping, electric or diesel power supply, connections, fittings, adapters, bends, pipe supports, and equipment installation.



TECHNICAL SPECIFICATIONS
FOR
**Poinsettia Lift Station Surge
Protection**

**Final Specifications
For Construction**



Prepared for

City of Carlsbad
Carlsbad, CA

Contract No. 5503-14

June 2020

Kennedy/Jenks Project No. 1844107*03

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

DIVISION 0: BIDDING REQUIREMENTS, CONTRACT FORMS, CONTRACT CONDITIONS

Title Page
Table of Contents

SPECIFICATIONS

DIVISION 1: GENERAL REQUIREMENTS

01010 Summary of Work and Contract Considerations
01040 Coordination and Project Requirements
01190 Seismic Requirements for Contractor Furnished/Installed Items
01300 Submittals
01650 Facility Startup
01700 Contract Closeout

DIVISION 2: SITE WORK

02050 Demolition
02302 Earthwork
02303 Bypass Pumping
02705 Paving and Resurfacing

DIVISION 9: FINISHES

09960 High Performance Coatings

DIVISION 11: EQUIPMENT

11001 General Equipment and Mechanical Requirements
11372 Compressed Air System

DIVISION 13: SPECIAL CONSTRUCTION

13210 Surge Tank

DIVISION 15: MECHANICAL

15050 Piping, Valves and Accessories
15060 Pipe Supports

DIVISION 16: ELECTRICAL

16010 General Electrical Requirements
16110 Electrical Raceway Systems

TABLE OF CONTENTS
(Continued)

16120	Low Voltage Wire and Cable
16124	Signal Cable
16402	Underground Electrical Work
16450	Electrical Grounding
16955	Control Devices

DIVISION 17: INSTRUMENTATION

17010	General Instrumentation, Controls Requirements
17150	Pressure Measurement

END OF TABLE OF CONTENTS

SECTION 01010

SUMMARY OF WORK AND CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The project includes: excavation, shoring, modifications to existing structures, check valve replacements, installation of a vacuum relief valve, a concrete pad, a surge tank, and an air compressor; together with associated site work, sewer systems piping, electrical work, instrumentation, painting, and asphalt paving.

1.02 TYPE OF CONTRACT

- A. The Work covered by these Contract Documents shall be provided under as lump sum Contract.

1.03 WORK UNDER OTHER CONTRACTS

- A. Work under other contracts is not anticipated at the Poinsettia Sewage Lift Station Site and discharge force main. However, work for the City of Carlsbad may be occurring simultaneously at nearby locations. All interaction, sequencing and operations of the City's systems shall be accommodated by the contractor per Section 7-7 of the General Provisions.

1.04 CONTRACTOR'S USE OF SITE AND OWNERS CONTINUED OPERATIONS

- A. The Contractor shall confine his use of the site for work and storage to the Work Area Limits shown on the contract drawings. The Contractor's use of adjacent lands and roads for access to move onto and off of the site and for daily access of workers, material and equipment shall be arranged and scheduled to minimize interference with the Owner's continued operations.
- B. The Owner intends to continue operation of its existing facility during all or most of the construction period. The Contractor shall plan and schedule its work to minimize impacting the Owner's continued operations and shall, at all times, maintain safe access for the Owner's operating personnel and equipment.
- C. The Contractor shall be responsible for maintaining safe emergency exiting for the Owner's and Contractor's personnel in all areas affected by the Contractor's work.
- D. If operation of the Owner's existing facility is adversely affected by the Contractor's work, the Owner may suffer a financial loss and may make a claim against the Contractor to recover its loss.

1.05 DOCUMENTING EXISTING

- A. Prior to commencing the Work, tour the site with the Owner and the Engineer. Examine and document photographically and in writing the condition of existing buildings, equipment, improvements, and landscape planting on or adjacent to the site. This record shall serve as a basis for determination of subsequent damage due to the Contractor's operations and shall be signed by all parties making the tour. Record existing conditions by video and still photos with digital copies provided in .mp4 and .jpg format or similar accepted by City.

1.06 SHUTDOWN OF EXISTING UTILITIES, SERVICES OR OPERATIONS

- A. Obtain the Engineer's approval at least seven (7) days (five working days) prior to the shutdown of any utility, service or operation of any existing facility. Give required notice and make appropriate arrangements with utility owners and other affected parties prior to shutdown of any utility service. The Contractor's Bid shall include the cost of premium time to perform work requiring utility shutdowns on weekends or outside of normal working hours.
- B. Schedule utility service or operations shutdowns for periods of minimum use and at the Owner's convenience. Have all required material, equipment and workers on site prior to beginning any work involving a possible shutdown. Perform work as required to reduce shutdown time to the minimum. In some cases, this may require increased numbers of workers and/or premium time night or weekend work.
- C. The Contract Price shall include the cost of additional workers and premium time work required to minimize the impact of utility service or operations shutdowns.

1.07 SCHEDULE OF VALUES

- A. Specific provisions are described in Section 3.2.4.1 of the General Provisions.
- B. The Contractor's Schedule of Values shall be in a form acceptable to the Engineer and have at least the following level of detail: a separate line item for each technical specification section, for site mobilization, for Construction Scheduling, for bonds and insurance, for final cleanup and for final deliverables. Subdivide final deliverables into: Record Drawings; Operation and Maintenance Manuals with Parts Lists; and Special Guarantees. Include the appropriate specification section and paragraph number for each line item. Subdivide major trades or portions of the work into multiple line items that relate to observable milestones to aid monthly progress evaluations in accordance with the following example:

Concrete Work
Foundations
Slab on grade
First floor walls and columns
Second floor beams and slabs
Second floor walls and columns, etc.

1.08 APPLICATION FOR PAYMENT

- A. Applications for Payment may be made only in accordance with General Provisions Section 6-1.8. Line items on the Application for Payment shall be the same as those used on the Schedule of Values. Applications for Payment shall contain the Contractors Certification.

1.09 CONTRACT MODIFICATIONS

- A. Methods of modifying the Contract Documents are covered in General Provisions, Section 3.
- B. The following documents may be used by the Engineer:
 - 1. Request for Quotation: Issued by the Engineer, a Request for Quotation is used to describe a proposed change and request a cost quotation from the Contractor but does not authorize a change in the Work or in the Contract Time or Price.
 - 2. Change Order: Signed by the Engineer signifying its recommendation, and signed by the Contractor and Owner signifying their acceptance, a Change Order changes the Scope of Work and possibly the Contract Price and/or Contract Time.
 - 3. Work Directive Change: Signed by the Owner (and in some cases by the Contractor) signifying their acceptance and issued by the Engineer, a Work Directive Change is used: (1) to direct the Contractor to do extra work on a cost accounting basis with a fixed maximum sum when the Owner and Contractor have not agreed on the price and time for the change, and (2) to direct the Contractor to do work that the Contractor contends is not included in the contract scope. Work done under case 1 will be converted to a Change Order when the Contractor and Owner agree on the change in price and time. The Contractor may make a claim for recovery of cost and time extension for work done under case 2; but if the claim is denied because the work is determined to be included in the contract scope, then the Contract Time and Price will not be changed. Work done under both cases 1 and 2 shall be done in accordance with the requirements for work done on a cost accounting basis.
 - 4. Response to Request for Information: Issued by the Engineer, a Response to Request for Information is used to order or document minor changes in the work consistent with the intent of the Contract Documents and NOT involving a change in price or time. Information issued on a Response to Request for Information shall NOT authorize a change in Contract Price or Contract Time and shall not be considered a Constructive Change Order. If the Contractor considers that a Response to Request for Information would cause a change in Contract Price or Time, it shall notify the Engineer in writing within 15 days of receipt of the Response to Request for Information and shall not proceed with the work. See General Provisions Section 3.
 - 5. The Contractor hereby expressly waives any claim or right to make a claim for an increase in contract time or price without written notice to the Engineer of the Contractor's intent to make a claim 5 days prior to proceeding to execute the work or portion thereof giving rise to such claim.
 - 6. The Contractor agrees that it shall not consider any Response to Request for Information, order, instruction, clarification, suggestion or any other communication either written or oral, given intentionally or unintentionally by the

Engineer, Owner or any other person as authorization or direction to do any work that would cause a change in Contract Time or Price unless it is a formal written Change Order or Work Directive Change signed by the Owner.

1.10 REGULATORY REQUIREMENTS

- A. The codes and regulations adopted by the State and other governmental authorities having jurisdiction shall establish minimum requirements for this project. This project shall comply with the following:
 - 1. Uniform Building Code (UBC)
 - 2. Uniform Building Code Standards (UBCS)
 - 3. Uniform Fire Code (UFC)
 - 4. Uniform Mechanical Code (UMC)
 - 5. Uniform Plumbing Code (UPC)
 - 6. National Electric Code (NEC)
 - 7. California Building Code
- B. The latest edition of the requirements in effect at the date of submission of bids shall apply.
- C. The Contractor is responsible for complying with laws and codes applicable to Means and Methods for performing the Work.
- D. The Contractor is responsible to report code deficiencies in the design to the Engineer prior to proceeding with the Work.
- E. Paragraphs addressing Pre-Engineered Systems and Performance Specifications in other Sections cover the Contractor's responsibility to comply with code requirements when (1) performance specifications are used to describe all or portions of Work or items and (2) when pre-engineered (contractor designed) systems are specified.
- F. In cases where the Contract Documents are more restrictive than applicable codes, the Contractor shall comply with the Contract Documents.

1.11 REFERENCE STANDARDS

- A. When these specifications state that Work or tests shall conform to specific provisions in a referenced standard, specification, code, recommendation or manual published by an association, organization, society or agency the referenced provisions, as they apply to the Work of the Contractor only shall be considered a part of these specifications as fully as if included in total. When these specifications or applicable codes contain higher or more restrictive requirements than those contained in reference standards these specifications or applicable codes shall govern.
- B. The latest edition of a referenced standard published at the time of submission of bids shall apply unless a specific date for the referenced standard is cited in these specifications.

- C. General provisions in referenced standards, specifications, manuals or codes shall not change the specific duties and responsibilities between any of the parties involved in this work from those described in the General Conditions. Provisions in referenced standards with regard to measurement and payment shall not apply to this Work unless specifically cited.

1.12 SPECIFICATION LANGUAGE AND STYLE

- A. Many parts of the Specifications as well as notes on the Drawings are written in the active voice and are addressed to the Contractor.
1. When words or phrases requiring an action or performance of a task are used, it means that the Contractor shall provide the action or perform the task. For example: provide, perform, install, furnish, erect, connect, test, operate, adjust or similar words mean that the Contractor shall perform the action or task referred to.
 2. When words or phrases requiring selection, acceptance, approval, review, direction, designation or similar actions are referred to, it means that such actions are the Owner's or the Engineer's prerogative and that the Contractor must obtain such action before proceeding.
- B. Requirements in the Specifications and Drawings apply to all work of a similar type, kind or class even though the word "all" or "typical" may not be stated.

1.13 DEFINITIONS

- A. The following terms, when used in the Contract Documents, shall have the meanings listed:

ACCEPTABLE	"acceptable to the Engineer"
PERFORM	"perform all operations required to complete the work referred to in accordance with the intent of the Contract Documents"
PROVIDE	"furnish and install the work referred to including proper anchorage, connection to required utilities or other work, testing, adjustment and startup ready to put in service and perform the intended function"
REQUIRED	"required by the Contract Documents or required to complete the Work and produce the intended results"
SATISFACTORY	"acceptable to the Engineer"
SHOWN	"as indicated on the Drawings"
SITE	"geographical location of the Project and land within the work area shown on the contract drawings and within which the Work will be installed or built"
SPECIFIED	"as written in the Contract Documents including the Specifications and the Drawings"
SUBMIT	"submit to the Engineer"

1.14 ABBREVIATIONS

- A. The following acronyms or abbreviations are used in these specifications for the organizations listed.

<u>Abbreviation</u>	<u>Stands for</u>
AASHTO	American Association of State Highway and Transportation Officials
AAMA	Architectural Aluminum Manufacturers Association
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute (formerly United States of America Standards Institute)
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute
CAL/OSHA	State of California Department of Industrial Relations, Division of Industrial Safety
CAL TRANS	California Department of Transportation
CBC	California Building Code
CBM	Certified Ballast Manufacturers
CBR	California Bearing Ratio
CI	Chlorine Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Products Safety Commission
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards for the U.S. Department of Commerce
CTI	Cooling Tower Institute
DFPA	Douglas Fir Plywood Association
EIA	Electronic Industries Association
EPA	U.S. Environmental Protection Agency
ETL	Electronic Testing Laboratory
FM	Factory Mutual Insurance Company
FPS	Fluid Power Society
FS	Federal Specifications

<u>Abbreviation</u>	<u>Stands for</u>
GO 95	General Order No. 95, California Public Utilities Commission Rules for Overhead Electric Line Construction
GO 128	General Order No. 128, California Public Utilities Commission Rules for Underground Electrical Construction
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IGCC	Insulating Glass Certification Council
IPCE	International Power Cable Engineers Association
ISA	Instrument Society of America
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NGVD	National Geodetic Vertical Datum
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Act
PCA	Portland Cement Association
REA	Rural Electrification Administration
SAMA	Scientific Apparatus Makers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
TCA	Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USDC	U.S. Department of Commerce
UL	Underwriters Laboratories
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California
WQCB	Water Quality Control Board (Regional)
WRCB	Water Resources Control Board

END OF SECTION

SECTION 01040

COORDINATION AND PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 PROJECT COORDINATION

- A. Coordinate scheduling, submittals and work of various Sections of the Specifications and subcontractors to assure efficient and orderly sequence of interdependent construction.

1.02 MECHANICAL AND ELECTRICAL COORDINATION

- A. The Contractor's superintendent or a specially assigned assistant shall be designated the mechanical/electrical coordinator and shall coordinate the exact location, space priorities and sequence of installation of all mechanical and electrical work with each other and with all other trades. The mechanical/electrical coordinator shall assure compliance with the requirements of this paragraph 1.02.
- B. The location of mechanical and electrical work may be indicated diagrammatically on the Drawings. Actual locations shall follow locations shown on the Drawings as closely as practicable but shall be altered or adjusted in the field by the mechanical/electrical coordinator as required by the following:
 - 1. In finished spaces install mechanical and electrical work concealed within the space available.
 - 2. Organize mechanical and electrical work to make efficient use of space. Combine similar items into groups; make all runs parallel to or at right angles with building lines.
 - 3. Layout and install work to provide adequate space and access for adjustment, servicing, and maintenance and maximize space available for future installation of additional services or replacement of existing services.
 - 4. Coordinate location of fixtures, outlets, switches, panelboards, pullboxes, and other exposed mechanical and electrical items with functional and visual elements. Verify location of questionable items with Engineer before proceeding.
- C. Prepare large scale coordinated detailed installation drawings showing the work of all affected trades to coordinate the actual installed location of all equipment and of all mechanical and electrical work for all areas. Review coordination drawings with Engineer and all affected trades before proceeding.
- D. Review Shop Drawings and Product Data prior to submission for the Engineer's Review to assure that physical characteristics and service requirements are compatible with contract requirements, field conditions, and other items submitted.
- E. Verify that required services such as electrical power characteristics, control wiring, and utility requirements of items and equipment submitted and furnished are compatible with services provided. Notify Engineer of potential problems prior to ordering items or equipment and prior to installing services or completing construction in areas where services would have to be installed.

- F. Schedule installation sequence of various elements of mechanical and electrical work to achieve optimum compliance with requirements under Mechanical and Electrical Coordination in this Section.
- G. Conduct regular weekly coordination meetings with affected trades and Engineer to establish and maintain coordination and resolve conflicts or disputes.

1.03 CUTTING, FITTING, AND PATCHING

- A. Provide cutting, fitting, or patching required to complete the Work and to make all of its parts fit together properly. Include cutting, fitting, and patching required to:
 - 1. Fit the several parts together and to integrate with other work.
 - 2. Uncover work to install or correct ill-timed work.
 - 3. Provide openings in elements of work for penetrations of mechanical and electrical work.
 - 4. Remove and replace defective and non-conforming work.
 - 5. Remove samples of installed work for testing.
- B. Request guidance from the Engineer prior to beginning cutting or altering construction, which affects:
 - 1. Structural integrity of any element.
 - 2. Functional performance of any element.
 - 3. Integrity of weather-exposed or moisture-resistant elements.
 - 4. Efficiency, maintenance, or safety of elements.
 - 5. Visual qualities of sight-exposed elements.
 - 6. Work by Owner or separate contractor.
- C. Execute cutting and patching using workers that specialize in and are skilled in installing the type of work being cut or patched.
- D. Perform work in accordance with the Contract Documents or in the absence of specific requirements comply with best trade practice for the work involved.
 - 1. Execute work by methods that will avoid damage to other work.
 - 2. Provide proper support and substrates to receive patching and finishing materials.
 - 3. Cut concrete materials using masonry saw or core drill. Locate all reinforcing steel, conduits and pipes with electronic detecting devices prior to cutting or core drilling existing concrete.
 - 4. Replace or patch work with new materials meeting the requirements of these specifications or if not specified matching materials and finishes of existing or adjacent work.
 - 5. Cut wall, ceiling and floor finishes to fit snugly around pipes, sleeves, ducts, conduit, and other penetrations. Provide fire and/or acoustical caulking as required by code or conditions of use.
 - 6. Maintain integrity of wall, ceiling, or floor construction; completely seal voids against smoke, fire and water.
 - 7. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
 - 8. Report any hazardous or unsatisfactory conditions to the Engineer.

1.04 ALTERATION PROJECT PROCEDURES

- A. Plan, schedule and perform alteration work as required to minimize impacting the Owner's continued operations. See Section 01010 paragraph titled "Contractor's Use of Site and Owner's Continued Operations."
- B. The existing lift station must remain in operation during construction. Schedule utility interruptions, piping connections, and interruption of existing plant operations as required to permit continued compliance with regulatory requirements and to meet Owners flow and processing requirements.
- C. Perform cutting fitting and patching in accordance with provisions in other paragraphs of this Section. Where new work abuts or aligns with existing work perform a smooth even transition. When a smooth unnoticeable transition is not feasible cut existing surfaces along a straight line at a natural dividing point and provide a groove or cover plate as recommended by the Engineer.
- D. Provide new construction in accordance with the technical specifications or if not specified provide new construction matching adjacent or similar existing work in material and finish.

1.05 CONNECTIONS TO UNDERGROUND UTILITIES, CONDUITS, OR PROCESS PIPING

- A. Obtain best available current information on location, identification and marking of existing utilities, piping and conduits and other underground facilities before beginning any excavation. In areas where utilities that participate in Underground Service Alert may occur, call 811 in Southern California for information at least 48 hours in advance of beginning work. Give Engineer 24 hours notice before beginning work.
- B. The location of existing utilities and underground facilities known to the Design Engineer are shown in their approximate location based on information available at the time of preparing the Drawings. The actual location, size type and number of utilities and underground facilities may differ from that shown and utilities or underground facilities may be present that are not shown. See General Provisions, Section 5 for the Contractor's responsibilities and for differing conditions that warrant a change in Contract Price.
- C. Use extreme care when excavating or working in areas that may contain existing utilities, process piping, conduits or other underground facilities. Use careful potholing, hand digging and probing to determine the exact location of underground installation. Some locations contain multiple pipes or conduits. Prior to performing any subsurface work, investigate, determine and prepare a plan to turn off or disconnect each utility believed to be in the within 100 feet of the subsurface work in the event of an accidental breach of a utility conduit.
- D. Where connections to existing utilities or other underground facilities is required or where new piping or conduits may cross or interfere with existing utilities or underground facilities carefully excavate and uncover existing installations to a point

1 foot below the pipe or conduit to determine the actual elevation and alignment. Call the Engineer's attention to differing existing conditions that may require a clarification or change.

- E. Shutdown of existing utilities, services or operations shall be done in accordance with Section 01010.

1.06 FIELD ENGINEERING AND LAYOUT

- A. See General Provisions, Section 2-9 regarding reference points provided by Owner.
- B. General Provisions, Section 2-9 requires the Contractor to accurately layout the Work including the corners of buildings and other structures and the elevation of every pipe and tank bottom.
- C. Employ a Land Surveyor or Civil Engineer to establish and verify the elevation of all elements effecting the hydraulic gradient of the facility including: Pump location, invert of all piping, tank bottoms, and tank tops. Use recognized engineering surveying methods and documentation techniques.

1.07 PRECONSTRUCTION MEETINGS

- A. Prior to beginning the Work, the Contractor and its key personnel and Subcontractors including the Contractor's Superintendent, Project Manager, and Field Engineer shall attend a meeting with the Owner and the Engineer to discuss the following:
 - 1. Name, Authority, and Responsibilities of Parties Involved
 - 2. Project Procedures:
 - a. Progress meetings
 - b. Correspondence
 - c. Notification
 - d. Submittal of Product Data, Shop Drawing Samples, and Proposed Equivalents
 - e. Requests for Information
 - f. Response to Requests for Information
 - g. Requests for Quotation
 - h. Work Directive Change
 - i. Change Orders
 - j. Engineer's "Items of Concern List"
 - 3. Temporary Schedule and Contractor's Construction Schedule
 - 4. Temporary Facilities and Control
 - 5. Testing During Construction
 - 6. Contractors Coordination
 - 7. Mechanical/Electrical Coordination
 - 8. Maintenance of Record Drawings
 - 9. Owner Provided Items or Work and Owner Furnished Contractor Installed items
 - 10. Early Beneficial or Partial Occupancy
 - 11. Final Testing, Startup, and Balancing
 - 12. Punch Lists and Project Closeout Procedures
 - 13. Final Deliverables including Record Drawings, Operation and Maintenance Manuals, and Special Guarantees.

1.08 PROGRESS MEETINGS

- A. The Engineer will conduct monthly progress meetings with Contractor and Owner at job site. Attendance required by Contractor's project manager, superintendent and affected Subcontractors and suppliers. The Engineer will prepare, maintain and distribute agenda and dated record of: (1) actions required and taken and (2) decisions needed and made.
- B. Agenda:
 - 1. Review critical items/action list.
 - 2. Review work progress. Compare actual progress with planned progress shown on Contractors rolling three-week Schedule, CPM Construction Schedule. Discuss Corrective action required. Compare actual and projected progress with Contractor's Construction Schedule, propose methods to correct deficiencies.
 - 3. Review status of Submittals; review delivery dates and date of need for critical items.
 - 4. Review coordination problems.
 - 5. Schedule needed testing and critical inspections.
 - 6. Review critical requirements for each trade or major piece of equipment prior to beginning work or installation.
 - 7. Discuss Contractor Quality Control.
 - 8. Discuss open items on Engineers "Items of Concern List."
 - 9. Discuss impact of proposed changes on progress Schedule.
 - 10. Other business.

1.09 PERFORMANCE SPECIFICATIONS AND CONTRACTOR DESIGNED WORK

- A. Work under this Contract may be specified by a combination of descriptive, performance, reference standard and proprietary specifications. In the event of conflict between any of the various specification methods used to specify a single item the order of precedence shall be the order in which the methods are listed in the preceding sentence. The terms used to describe types of Specifications are taken from the Construction Specification Institute (CSI) Handbook of Practice.
- B. Where Specifications are used to define the characteristics of Contractor designed systems, items or components, the Contractor shall be fully responsible to design, engineer, manufacture, and install the systems, items and components to meet the specified functional requirements, performance requirements, quality standards, durability standards and conditions of use as well as all applicable codes, regulations and referenced trade or industry standards. The Contractor shall perform such design by employing engineers licensed in the State in which the Work is being constructed. The Contractor's design submittals shall include calculations and assumptions on which the design is based and shall be stamped and signed by appropriately licensed engineers.
- C. The Owner and the Engineer shall have the right to rely on the expertise and professional competence of the Contractor's design. Favorable review of the Contractor's design submittal shall not relieve the Contractor from full responsibility for the adequacy of the Contractor design.

1.10 MATERIAL AND EQUIPMENT

A. General:

1. Verify that products delivered meet requirements of Contract Documents and the requirements for Favorably Reviewed submittals.

B. Compatibility of Equipment and Material:

1. Similar items, equipment, devices or products furnished under a single specification section shall all be made by the same maker and have interchangeable parts.
2. In addition, but only if so stated in each affected Specification Section, similar items furnished under two or more Specification Sections shall be made by the same maker and have interchangeable parts.
3. All similar materials or products that are interrelated or used together in an assembly shall be compatible with each other.

C. Transportation and Handling:

1. Transport and handle products in accordance with manufacturer's instructions.
2. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
3. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

D. Storage and Protection:

1. Store and protect products in accordance with manufacturer's instructions. Seals and labels shall be intact and legible.
2. Store moisture sensitive products including motors, electrical equipment, instruments and controls in weathertight, humidity and temperature controlled enclosures.
3. For exterior storage of fabricated products, place items on sloped supports, aboveground.
4. Cover products subject to deterioration from moisture, dust, or sunlight with opaque watertight but breathable sheet covering. Provide ventilation to avoid condensation.
5. Provide offsite storage and protection including insurance coverage when site does not permit onsite storage or protection.
6. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
7. Provide facilities, equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
8. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

E. Installation Standards and Manufacturers' Recommendations:

1. Install all products and materials in strict compliance with the most restrictive of the following:
 - a. The manufacturer's or provider's written instructions or recommendations. Follow step-by-step installation procedures.
 - b. Recommendations of referenced trade associations or standards.

- c. These specifications and drawings.
- 2. Where conflicts exist present alternatives with advantages and disadvantages to Engineer for decision.

F. If reference standards or manufacturer's instructions contain provisions that would alter or are at variance with relationships between the parties to the Contract set forth in the Contract Documents, the provisions in the Contract Documents shall take precedence. See General Conditions paragraph 2.3.

1.11 BACKING, SUPPORTS AND FASTENERS

- A. Provide backing, supports, bracing, fasteners and other provisions required for the proper support and attachment of all work. Backing, supports, bracing and fasteners shall be sized to resist vertical and horizontal loads including seismic and wind loads required by codes listed under Regulatory Requirements in Section 01010 and in accordance with Seismic Design Requirements in this Section and Section 01190. Where finishes in existing facilities must be removed to install backing or where finishes are installed in new construction prior to installing backing the Contractor shall remove finishes, install backing and reinstall finishes.
- B. Use of explosive powder-driven fasteners is NOT PERMITTED.
- C. Low velocity pneumatic type power-driven fasteners may be used only:
 - 1. Where specifically shown, specified or approved.
 - 2. Where they meet the structural requirements for a particular assembly with a safety factor of at least 400 percent.
 - 3. Power-driven fasteners may not be used for electrical or mechanical installations or to attach any items loaded in withdrawal or subject to vibration.
 - 4. Non-load bearing metal stud tracks fastened to concrete. Powder-driven fasteners shall not be used within 3 inches of the edge or corners of concrete surfaces

1.12 SAFETY

- A. In accordance with generally accepted construction practice, applicable law and the General Provisions, Section 7-10, the Contractor shall be solely and exclusively responsible for:
 - 1. Construction means and methods.
 - 2. Safety of employees engaged in the work while on and off the site.
 - 3. Safety of the Owner, the Engineer, the Design Engineer, and others who may visit or be affected by the work.
 - 4. Safety of the work itself including material and equipment to be incorporated therein.
 - 5. Safety of other property at the site or adjacent thereto.
 - 6. Safety programs, equipment and protective devices required to assure the safety of persons and property for whom/which the Contractor is responsible.
- B. The duties of the Engineer in conducting review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing, scaffolding or safety measures in, on, or near the construction site.

- C. The Contractor is hereby informed that work on this project could be hazardous. The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instructions as required to prevent injury to personnel and damage to property, and to comply with all applicable laws and regulations including State OSHA, Federal OSHA, and other regulations referenced in these Contract Documents.
- D. The Contractor shall, at all times, maintain the job in a condition that is safe for the Owner, the Engineer and their Consultants to make site visits and to conduct construction reviews. If the Owner or the Engineer cannot allow personnel to visit the job because it is not safe, the Contractor is not providing required safe access to the Work.
- E. The Contractor shall prepare a Safety Plan meeting the requirements of applicable regulations. As a minimum, the Contractors Safety Plan shall set forth definite procedures for informing workers about safety, for instructing workers in safe practices, for assuring that workers are using appropriate safety equipment and safe work practices and for reporting accidents.

1.13 EXCAVATION AND TRENCHING; WORK WITHIN CONFINED SPACES

- A. Submit specific plans to the Owner showing details of provisions for worker protection from caving ground in accordance with Section 6705 of the California State Labor Code. The detailed plans shall show the design of shoring, bracing, sloping banks or other provisions and shall be prepared, signed and stamped by a Civil or Structural Engineer licensed in the State in which the Work is performed and retained by the Contractor. The Owner's acceptance of the detailed plans submitted is only an acknowledgment of the submission and does not constitute review or approval of the designs, design assumptions, criteria, completeness, applicability to areas of intended use, or implementation of the plans, which are solely the responsibility of the Contractor and his Registered Engineer.
- B. Work Within Confined Spaces: Work within confined spaces is subject to applicable laws, regulations and safety orders including applicable California Tunnel Safety Orders.
- C. The foregoing provisions do NOT reduce the requirement for the Contractor to maintain safety in ALL operations performed by the Contractor or its Subcontractors.

1.14 CONTRACTOR'S QUALITY CONTROL

- A. The Contractor shall be fully responsible for inspecting the work of its suppliers and Subcontractors to assure that the work when completed will comply with the standards for materials and workmanship required by the Contract Documents.
- B. Inspections, periodic observations and testing performed by the Owner or the Engineer are for the Owner's benefit and information only and shall not be construed as partial or incremental acceptance of the work and shall not be deemed to establish any duty on the part of the Owner or the Engineer to the Contractor, its

subcontractors or suppliers. See General Provisions, Section 4-1.3.

C. The Contractor shall:

1. Monitor quality control over suppliers, manufacturer, products, services, site conditions, and workmanship, to produce work of specified quality.
2. Comply fully with manufacturer's installation instructions, including performing each step in sequence as recommended by the manufacturer.
3. Submit a Request for Information to Engineer before proceeding with work when manufacturers' instructions or reference standards conflict with Contract Documents.
4. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Perform work by persons specializing in the specific trade and class of work required and qualified to produce workmanship of specified quality.
6. Secure products in place with positive anchorage devices designed and sized to withstand seismic, static and dynamic loading, vibration, and physical distortion or disfigurement.

D. If reference standards or manufacturers' instructions contain provisions that would alter or are at variance with relationships between the parties to the Contract set forth in the Contract Documents, the provisions in the Contract Documents shall take precedence.

E. The Contractor shall provide assistance required by the Engineer to adequately inspect the Work including ladders, scaffolding, lighting, ventilation and other aids to facilitate access and provide a safe working environment.

1.15 TESTING LABORATORY SERVICES AND CERTIFIED LABORATORY REPORTS

- A. Provide testing service in accordance with General Provisions, Section 4-1.4 and specific requirements contained in each technical specification section. Submit Certified Laboratory Reports required by technical specification sections.

END OF SECTION

SECTION 01190
SEISMIC REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section is applicable to the following secondary structural system elements, non-structural components, and/or equipment supported by structures.
 - 1. Mechanical, electrical, and plumbing equipment and appurtenances, including, but not limited to:
 - 2. Conduit, piping, cable trays, raceways, ducts and similar systems.
 - 3. Tanks and vessels (include contents), including support systems, including, but not limited to:
 - a. All equipment specifically listed in this specification.
 - b. Storage racks, suspended ceilings, light fixtures, raised floors, partitions, store-front, windows, louvers, architectural features and other non-structural components.

1.02 REFERENCES

- A. American Society of Civil Engineers Standard ASCE 7-16, Minimum Design Loads for Buildings and Other Structures, Chapters 11, 13, 15.
- B. International Building Code (IBC) Section 1613
- C. California Building Code (CBC), 2019 Edition

1.03 DEFINITIONS

- A. Engineer of Record: The Engineer responsible for the preparation of Contract Documents.
- B. Specialty Engineer: Structural or Civil Engineer provided by the Contractor licensed in the State where the project is being built. Specialty Engineer will be responsible for specific elements of the primary structural system, the secondary structural system, non-structural elements and/or equipment supported by structures.

1.04 GENERAL DESIGN REQUIREMENTS

- A. The Contractor and Specialty Engineer are responsible for producing structural designs that resist applicable loads including: Dead, Live, Wind, Seismic, Fluid, Snow, Rain, Earth, operational, or other special loads applicable to the component being designed.
- B. Minimum design loads shall be based on guidelines given in this Section, the Drawings, ASCE 7-16, CBC Chapter 16, equipment manufacturer's recommendations and/or other industry accepted design standard for the component being designed (i.e. AWWA D100, API 650, ANSI MH16.1).

1.05 SEISMIC DESIGN REQUIREMENTS

- A. The Contractor is responsible for producing designs that resist the total seismic forces in accordance with the seismic design criteria. The Contractor is responsible for coordinating between the Engineer of Record and the Specialty Engineer. The Contractor is responsible to coordinate the favorably reviewed design in the field, and shall provide the proposed design, including any modifications required to the primary structure, at no additional cost to the Owner.
- B. The seismic design for non-structural components and equipment shall be in accordance with the CBC Chapter 16, and the required coefficients and factors for determining the total design seismic forces are shown on the Drawings.
- C. Coordinate the layout so that adequate space is provided between items for relative motion. Provide additional supports and restraints between items of different systems when necessary to prevent seismic impacts or interaction.
- D. Design non-building structures in accordance with chapter 15 of ASCE 7-16; all designs utilizing chapter 15 shall include the design and anchorage of the entire non-building structure.
- E. Design anchorages of all elements of structures, nonstructural components, and equipment supported by structures, to resist static and dynamic operational loads, plus total seismic loads specified in the CBC, ASCE 7 Section 13.3.1, and as follows:
 - 1. For suspended equipment, multiply dead load by 1.2 and add 0.2SDS to account for vertical seismic effects in the downward direction.
 - 2. For anchorage uplift, multiply dead load by 0.9 and subtract 0.2SDS if used to reduce vertical seismic effects.
 - 3. Post-installed anchors installed in concrete shall be prequalified for seismic application in accordance with ACI 355.2.
- F. Design Basis and Coordination: Contractor shall note that the layout of the structure and equipment pads is based on the first named manufacturer and model for the equipment to be anchored.
 - 1. Contractor shall coordinate all attachments and related work and shall provide connections as noted in the favorably reviewed shop drawings.
 - 2. For all suppliers, if the dimensions required by the Contractor's submitted anchorage calculations deviate from those provided on the Contract Drawings, Contractor shall note the deviation in the submittal for review and provide the favorably reviewed pad at no additional cost to the Owner.
 - 3. If a model or manufacturer other than the first name supplier is submitted for use by the Contractor, Contractor shall coordinate all related work and deviations from the Contract Drawings.
 - 4. Where Contractor's specialty engineer proposes a deviation from the contract drawings for any manufacturer, and that deviation is favorably reviewed by the Engineer, Contractor shall provide that modification to the structure at no additional cost.

1.06 DESIGN REQUIREMENTS FOR PIPING, CONDUIT, AND DUCTS

- A. The Contractor is responsible for producing designs for support of piping, conduit, duct or other systems to resist total seismic forces based on the seismic design criteria coefficients shown on the Contract Documents. Except where the technical

specifications give specific exemption from resistance of seismic forces, all supports shall be designed to meet seismic criteria.

- B. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (e.g., copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to one-half of the spacing allowed for ductile material.

1.07 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Shop Drawings for non-building structures and contractor designed components: Submit signed and sealed structural calculations and detailed drawings for the following listed elements and where required in Divisions 2 through 17 of the primary structural system and their attachments, the secondary structural system and their attachments, permanent non-structural components and their attachments, and the attachments and anchorage for permanent equipment supported by the structure:
 - 1. Surge tank
 - 2. Compressed air system
 - 3. Pipe supports designed by Contractor
 - 4. Any components or equipment where contractor's Specialty Engineer had designed using chapter 15 of ASCE 7-16 (i.e. which are non-building structures rather than equipment)
- C. Shop Drawings for Anchorage Calculations: Where required in the equipment specifications in Divisions 2 through 17 or listed below, submit signed and sealed structural calculations and detailed drawings from the Contractor's Specialty Engineer.
 - 1. Required anchorage items include:
 - a. Surge tank
 - b. Compressed air system
 - c. Pipe supports designed by Contractor
- D. Structural calculations and detailed drawings shall be prepared by the contractor's Specialty Engineer.
- E. Structural calculations and detailed drawings shall clearly show the total design seismic forces which will be transferred from the elements of the structural system, non-structural components, and/or equipment and their attachments to the primary structure. Calculations must be reviewed by Engineer of Record for general conformance with the design criteria and building code and therefore calculations shall include:
 - 1. Seismic and wind load criteria used to determine design lateral and uplift forces. For external equipment, a statement should be made as to whether wind controls for all equipment.
 - 2. Derivation of forces used, including at least one complete sample calculation, showing the process used so that Engineer of Record may determine general compliance. Printouts of spreadsheets without explanation of calculations used to determine values are not acceptable.
 - 3. Adequacy of anchorage to concrete and masonry or attachment to the primary structure to transfer the design forces from the element.

- 4. Detail drawings shall note:
 - a. Required concrete strength,
 - b. Anchor type, dimensions, and materials. Coordinate material selection with Contract Drawings.
 - c. Edge distance, spacing, embedment depth, substrate thickness and any supplementary reinforcing required for anchors installed in concrete.
 - d. Required dimensions of equipment pads based on equipment size and edge distance. The Contractor shall coordinate dimensions of equipment pads, including any revisions required to meet the requirements of the favorably reviewed submittal by the Specialty Engineer at no additional cost to the Owner.
- F. The Engineer of Record's review of items within a Specification Section cannot be completed until all related items have been coordinated and submitted for review.
- G. Quality Assurance Submittals
 - 1. Test Reports: Submit test reports for tension testing of anchors.

1.08 QUALITY ASSURANCE

- A. Qualifications: The Contractor is responsible for submitting signed and sealed structural calculations and detailed drawings from a Specialty Structural or Civil Engineer licensed in the State where the project is being built.
- B. Regulatory Requirements: Comply with the California adopted and amended versions of the International Building Code (IBC) Section 1613, the referenced sections of ASCE 7 plus clarifications and additions specified in this Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Site Tests: Tension testing of expansion or adhesive anchors utilized for anchorage shall be done in the presence of the inspector and a report of the test results shall be submitted.
- B. Inspection: Special Inspection shall be provided for high strength bolting or bolts installed in concrete.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SUBMITTAL PROCEDURES

- A. Accompany each submittal with a Submittal form, General Provisions, Section 2-5.3 which contains the following information:
 - 1. Contractor's name and the name of Subcontractor or supplier who prepared the submittal.
 - 2. The project name and identifying number.
 - 3. Description of the submittal and reference to the Contract requirement or technical specification section and paragraph number being addressed.
- B. Follow the procedures described below or in other paragraphs in this Section. Provide submittals in electronic PDF searchable format.
 - 1. Designation of Superintendent: Submit for information. Include name, address, home telephone number and a brief resume.
 - 2. List of Subcontractors and Major Suppliers: Submit for information. Include address, telephone number and name of responsible party.
 - 3. Schedule of Values, in a form acceptable to the Engineer: Submit for information. No copy will be returned. See General Provisions, Section 3.2.4.1.
 - 4. Subcontractors'/Suppliers'/Manufacturers' Affidavits. Submit for items specified in the Technical Specifications.
 - 5. Environmental Protection Plan. Submit for information.

1.02 SCHEDULE OF SUBMITTALS

- A. Within 15 days after the Notice to Proceed, submit a Schedule of Submittals showing the date by which each submittal required for Product Review or Product Information will be made. Identify the items that will be included in each submittal (see paragraph 1.05 of this Section) by listing the item or group of items and the Specification Section and paragraph number under which they are specified. Indicate whether the submittal is required for Product Review of Proposed Equivalents, Shop Drawings, Product Data or Samples or required for Product Information only.

1.03 PLAN OF OPERATIONS

- A. Before beginning on site work, submit a plan showing Contractor's intended use of the site assigned to it. Show location of enclosing fence, access points and gates. Show location for Contractor's field office and parking. Show location of Contractor's and Subcontractor's work areas and storage areas.

1.04 CONSTRUCTION SCHEDULE

- A. Submit PDF for review. See General Provisions, Section 6-1.

- B. The form of Construction Schedule may be selected by the Contractor but the Schedule shall meet the minimum requirements of General Provisions, Section 6-1.
- C. If the Construction Schedule does not reflect the format requirements, the specified work, or the Contract Time, it will be returned to the Contractor for modification.
- D. Revise the Construction Schedule and resubmit within seven (7) days following any monthly meeting to review Contractor's Application for Payment when Contractor's work is fifteen (15) days or more behind schedule.
- E. Accelerated Work if Required to Meet Schedule: Give Engineer 3 days prior notice of construction that will take place outside of normal work hours or work days. Compensate Owner for extra inspection cost caused by Accelerated Work required to meet Schedule.
- F. Give Engineer 3 days prior notice of normal work days on which construction will not take place or of scheduled construction that will not take place. Compensate Owner for extra inspection cost resulting from failure to give notice.

1.05 SHOP DRAWING, PRODUCT DATA AND SAMPLES SUBMITTED FOR PRODUCT REVIEW

- A. This paragraph covers submittal of Shop Drawings, Product Data and Samples required for the Engineer's review referred to as Product Review submittals in the Technical Specifications (Division 2 through 17). Submittals required for information only are referred to as Product Information submittals in the Technical Specifications and are covered in paragraph 1.07 of this Section. See General Provisions, Section 2-5.3.1.
- B. Number and type of submittals:
 - 1. Shop Drawings: Submit a PDF file, which will be reviewed, marked and stamped. A single electronic copy will be returned to the Contractor.
 - 2. Product Data: Submit a PDF file. One copy will be marked, stamped and returned.
 - 3. Samples: Submit three labeled samples or three sets of samples of manufacturers full range of colors and finishes. Comply with requirements in Technical Specification Sections. One sample will be returned to Contractor.
- C. The Contractor shall make all Product Review submittals early enough to allow adequate time for the Engineer's review, for manufacture and for delivery at the construction site without causing delay to the Work. Submittals shall be made early enough to allow for unforeseen delays such as:
 - 1. Failure to obtain Favorable Review because of inadequate or incomplete submittal or because the item submitted does not meet the requirements of the Contract Documents.
 - 2. Delays in manufacture.
 - 3. Delays in delivery.
- D. Content of Submittals:
 - 1. Each submittal shall include all of the items and material required for a complete assembly, system or Specification Section.

2. Submittals shall contain all of the physical, technical and performance data required by the specifications or necessary to demonstrate conclusively that the items comply with the requirements of the Contract Documents.
 3. Include information on characteristics of electrical or utility service required and verification that requirements have been coordinated with services provided by the Work and by other interconnected elements of the Work.
 4. Provide verification that the physical characteristics of items submitted, including size, configuration, clearances, mounting points, utility connection points and service access points, are suitable for the space provided and are compatible with other interrelated items that are existing or have or will be submitted.
 5. Label each Product Data Submittal, Shop Drawing and Sample with the information required in paragraph 1.01A of this Section. Highlight or mark every page of every copy of all Product Data submittals to show the specific items being submitted and all options included or choices offered.
 6. Additional requirements for Product Review submittals are contained in the Technical Specification sections.
 7. Designation of work as "NIC" or "by others," shown on Shop Drawings, shall mean that the work will be the responsibility of the Contractor rather than the subcontractor or supplier who has prepared the Shop Drawings.
- E. Requirements for the Contractor's review and stamping of submittals prepared by the Contractor or by Subcontractors or suppliers prior to submitting them to the Engineer are covered in General Conditions paragraph 8.8.
- F. Submittals that contain deviations from the requirements of the Contract Documents shall be accompanied by a separate letter explaining the deviations. See General Provisions, Section 2-5.3. The Contractor's letter shall:
1. Cite the specific Contract requirement including the Specification Section and paragraph number for which approval of a deviation is sought.
 2. Describe the proposed alternate material, item or construction and explain its advantages and/or disadvantages to the Owner.
 3. State the reduction in Contract Price if any that is offered to the Owner.
- G. Engineer's Review Procedure and Meaning:
1. The Engineer will stamp and mark each Product Review submittal prior to returning it to the Contractor. The stamp will indicate whether or not the review was favorable and what action is required of the Contractor. Review categories "No Exceptions Taken" and "Make Corrections Noted" both indicate Favorable Review.
 2. The Engineer's Favorable Review is contingent on the Contractor's warranties and is subject to all of the limitations and conditions in General Provisions, Section 2-5.3. Favorable Review is also contingent on:
 - a. The compatibility of items included in a submittal with other related or interdependent items included in previous or future submittals.
 - b. Future submittal of items related to or required to be part of this submittal that were not included with this submittal.
 3. Favorable Review of a submittal does not constitute approval or deletion of items required as part of the submittal but not included with the submittal. Favorable Review of items included in the submittal does not constitute deletion of specified features, options or accessories that were not included in the submittal.

4. The action required by the Contractor for each category of review is as follows:
 - a. **NO EXCEPTIONS TAKEN.** NO RESUBMITTAL REQUIRED.
 - b. **MAKE CORRECTIONS NOTED:**
 - (1) **NO RESUBMITTAL REQUIRED.** The Contractor shall make corrections noted prior to manufacture.
 - (2) **PARTIAL RESUBMITTALS REQUIRED.** The Contractor shall submit related accessory or optional items as noted which are required but were not included with the submittal and/or shall resubmit unsatisfactory portions or attributes of items as noted. The Contractor may proceed to manufacture those portions of the submittal that will be unaffected by required resubmittals.
 - c. **AMEND AND RESUBMIT.** The Contractor shall amend and resubmit the submittal as noted or required to comply with the Contract Documents.
 - d. **REJECTED - RESUBMIT.** The item submitted does not comply with the Contract Documents in a major way. Resubmit items that comply with the requirements of the Contract Documents.
 5. The letter of transmittal accompanying the returned Product Review submittal may contain numbered notes. Marking a corresponding number on a Shop Drawing or Product Data submittal shall have the same affect as applying the entire note to the submittal.
- H. Re-submittals that contain changes that were not requested by the Engineer on the previous submittal shall be accompanied by a letter explaining the change.
- I. Favorable Review Required Prior to Proceeding: Do not proceed with manufacture, fabrication, delivery or installation of items prior to obtaining the Engineers Favorable Review of Product Review submittals.
- J. Intent and Limitation on Engineer's Review:
1. See General Provisions, Section 2-5.3.
 2. The Contractor has primary responsibility for submitting and providing work that complies with the requirements of the Contract Documents. That responsibility cannot be delegated in whole or in part to subcontractors or suppliers. Neither the Engineer's Favorable Review nor the Engineer's failure to notice or comment on deficiencies in the Contractor's submittals shall relieve the Contractor from the duty to provide work, which complies with the requirements of the Contract Documents.

1.06 PROPOSED EQUIVALENTS

- A. Submit Proposed Equivalent submittal form, General Provisions, Section 4-1.6 and comply with the submittal requirements for Shop Drawings, Product Data, and Samples submitted for Product Review in another paragraph of this Section.
- B. Time of Submittal:
1. Submittal of Proposed Equivalents must be within 35 days of the Notice to Proceed. The Engineer may agree to a later submittal date if requested in writing within 35 days of the Notice to Proceed. The request shall identify the item, give the Specification reference, and proposed manufacturer and model number of the item that will be submitted and the proposed submittal date.

2. The Engineer's agreement to a later submittal date shall be in writing and shall not be construed as Favorable Review or acceptance of the manufacturer or item proposed.
- C. Content of submittals shall be the same as that required for Product Data, Shop Drawings and Samples submitted for Product Review in another paragraph of this Section. In addition, the Contractor shall provide information on several recent similar installations of the item to verify its suitability. The information shall include the project name and location, the Owner's name, address, telephone number and name of a knowledgeable person to contact for information on performance of the product.
- D. When the Contractor has listed specific maker's products submitted with its Bid no changes will be permitted without submittal of acceptable evidence justifying the change and the Engineer's written approval.
- E. If a non-equivalent substitute is submitted for review, it shall be accompanied by a proposed reduction in Contract Price which shall include the increased cost of Engineering service required to evaluate the proposed substitute (which shall be paid to the Owner whether or not the substitute is accepted) plus the greater of
 - 1) the difference in price between the first specified item and the item submitted and
 - 2) the difference in value to the Owner between the two items.

1.07 PRODUCT INFORMATION SUBMITTALS

- A. Product Information submittals are required for the Owner's permanent records and will be used for future maintenance, repair, modification or replacement work. Product Information submittals will be examined only to verify that the required submittals have been made; they will NOT be reviewed for compliance with the Contract Documents.
- B. Make Product Information submittals prior to delivering material, products or items for which Product Information submittals are required.
- C. The Contractor has the sole and exclusive responsibility for furnishing products and work that meets the requirements of the Contract Documents.
- D. The Engineer reserves the right to comment on any submittal and to reject any product or work delivered, installed or otherwise at any time that the Engineer become aware that it is defective or does not meet the requirements of the Contract Document.

1.08 OPERATION AND MAINTENANCE MANUALS AND PARTS LISTS

- A. Submit three complete sets.
- B. Provide operation and maintenance manuals and parts list for all equipment furnished under this contract. Comply with the detailed requirements in Technical Specification sections. Include instructions for delivery, storage, assembly, installation, lubrication, adjusting, startup, operation and maintenance.
 1. For all equipment include:
 - a. Startup instructions

- b. Normal operation instructions.
 - c. Trouble shooting instructions.
 - d. Lubrication instructions.
 - e. Maintenance and reinstallation instructions.
 - f. Parts identification.
 - g. List of spare parts recommended to have on hand.
 - h. Operator safety instructions.
 - 2. For all Electrical Equipment, provide the following additional information:
 - a. Equipment ratings.
 - b. Calibration curves and rating tables if appropriate.
 - 3. For Complex Equipment provide in addition:
 - a. Alternate specified operating modes.
 - b. Emergency shutdown instructions.
 - c. Normal shutdown instructions.
 - d. Long-term shutdown instructions.
 - 4. Operation and maintenance manuals for systems composed of separate pieces of equipment shall include a system explanation of items 1, a, b, and c, and 3a through c, as well as the instructions for each separate piece of equipment.
- C. Submit at least 15 days prior to Facility Startup and Training specified in Section 01650, paragraph 1.05.
- D. Provide the number of copies specified in paragraph 1.01 of this Section. Bind each copy in one or more "D" ring, 8-1/2x11, 3-ring binders with clear view spine and cover, Avery E-Z –D View Binder; K&M; or equal. Prepare Titles for the spine and cover and a Table of Contents listing each piece of equipment. Organize the contents by Specification Section and paragraph number under which the equipment was specified. Provide labeled tab separators for each major item or group of smaller similar items. When standard manufacturers literature is used highlight or mark all copies to shop specific items and options provided.

1.09 MANUFACTURER'S CERTIFICATES

- A. Submit three copies.
- B. When specified in Technical Specification section, submit manufacturers' certificate to Engineer for review. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate. Certificates may be recent or previous test results on material or Product, but must be acceptable to the Engineer.

1.10 CONSTRUCTION PHOTOGRAPHS

- A. Each month submit photographs to Engineer with Application for Payment.
- B. Photographs: Submit digital copy in .jpg, .pdf format or similar preapproved by Engineer.
- C. Take two site photographs from different directions and five, interior/exterior photographs to show progress of the Work. Make photographs within 5 days of the Application for Payment Date.

D. Identify photographs with date, time, orientation and project identification.

END OF SECTION

SECTION 01650

FACILITY STARTUP

PART 1 - GENERAL

1.01 FACILITY STARTUP

- A. Commission all systems and equipment to verify performance, function, and correct operation by performing procedures to activate, startup, adjust, test, and demonstrate that the work is in operating order in accordance with these general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified. To ensure that the work is ready for full-time operation the procedures include verification, balancing, calibration, witness testing, documentation, inspection by equipment manufacturers and operator training where specified.
- B. Notification: Notify the Engineer five days prior to starting each system or piece of equipment.
- C. Coordination: During the startup period, coordinate the operation of the equipment with Engineer, subcontractors, Owner's operators, and manufacturer's representatives.
- D. Furnish test equipment, measuring devices and supplies required to conduct tests.
- E. Maintain the equipment until acceptance. Provide all lubricants, chemicals, and electricity necessary until acceptance.
- F. Furnish all expendable supplies, gas, water, etc., required for startup, demonstration and testing and dispose of all waste or used supplies, water, etc.

1.02 SUBMITTALS

- A. Startup Plan, Forms, and Schedule: Prepare a facility startup plan and schedule. The plan shall include test methods and procedures and sample forms for recording test data.
- B. Affidavit.
- C. Submit documentation of tests, balancing reports, and the like.

1.03 INITIAL STARTUP AND OPERATION OF FACILITIES

- A. The following listing is a general sequence of startup activity steps to be used in placing facility systems into operation:
1. Perform initial lubrication of equipment and have manufacturers check and adjust equipment. Provide all subsequent lubrication and maintenance, and such staff as required for test operation until the Owner assumes equipment maintenance responsibility after Step 14 below.
 2. Perform satisfactory testing of electrical work required prior to energizing of the electrical system.
 3. After completion of Step 2, perform satisfactory electrical testing required after energizing of the electrical system.
 4. Complete calibration of instruments.
 5. Satisfactorily complete system verification of instrumentation work.
 6. After completion of Steps 1 and 3, perform a rotational test of equipment and correct backward rotating drives.
 7. After completion of Steps 5 and 6, test operate the equipment by manually initiating the operation. Where manual operation bypasses alarm or safety monitoring, provide continuous supervision of such parameters. Perform this step using water in lieu of chemicals or other process liquids. Use dry air or nitrogen in lieu of hazardous gases.
 8. Concurrent with Step 7, perform instrumentation and control testing and adjustments as related to the equipment being tested.
 9. Concurrent with Step 7 and where possible at this stage of startup, complete the performance testing specified for the equipment.
 10. Concurrent with Step 7, perform adjustments of the electrical work as related to the equipment being tested.
 11. Repeat Steps 1 through 10 as required for other equipment items until all process components and utility systems are ready for total operation. It may be necessary for the Contractor to put portions of the newly constructed facility in service before constructing other portions of the facility or completing the Work as a whole.
 12. Notify the Owner and the Engineer 45 days before total operation is to occur so that the Owner may make arrangements for full time operation. This notification shall have an accuracy of plus or minus 7 days. Notify the Owner and Engineer again, exactly 7 days before total operation is to begin.
 13. Upon completion of all the above steps, the facility shall be started up and operated, in "Run" mode (simulating an emergency event which fills the basin) on a complete full time basis beginning on the indicated date for a period of seven (7) hours, continuously. The Owner will provide operating personnel and untreated water as required for testing purposes. For two consecutive days beginning with the start-up day, the Contractor shall have at the plant site, during the day shift, a mechanic, an electrician and an instrument engineer. Representatives of manufacturers of critical equipment shall also be present for these five days as needed or as required elsewhere in the specifications. The Contractor shall also provide these personnel, on a 24-hour per day, "on call" basis, if necessary, to adjust, repair, and correct deficiencies as required to keep the facilities in continuous "**Standby**" operation for a period of 30 days. The Contractor shall train the operators in the proper operation and the control of the new facilities. The Contractor shall also furnish all such mechanical and electrical workers as required to make adjustments to and perform all required

maintenance for the operating equipment until the end of the 30-day initial operation period. Maintenance of operating equipment shall include lubrication, adjustments, replacements, and modifications as required.

14. After successful completion of the 30-day initial operation period, the Owner will take over maintenance duties as well as operation and will begin to provide and pay for lubricants. If continuous process operation is interrupted for a period of four consecutive hours or more due to a failure of the equipment or work provided by the Contractor, then the counting of the 7 hour and/or 30-day periods, described in Step 13 above, shall be restarted at day one if these periods have not reached satisfactory completion.
15. Following the commencement of Step 13, satisfactorily complete equipment performance testing, electrical testing and adjustments, and instrumentation/control testing and adjustments to the extent that such testing and adjustments could not be made prior to full operation.
16. Complete the documentation of test, balancing reports, and the like commissioning for submittal during the startup process and before acceptance.

1.04 MANUFACTURER'S FIELD SERVICE AND AFFIDAVITS

- A. Field Service: Where specified, manufacturers of equipment shall provide field service. Field service shall be provided by an authorized factory-trained and qualified manufacturer's representative for the specific equipment. Equipment shall not be considered ready for full time operation until after the manufacturer's representative has checked and adjusted the equipment, and certified by written affidavit that the equipment has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full time operation.
- B. Affidavits: Acceptable affidavits shall be submitted prior to completion of the work.
 1. Affidavits shall contain the following specific wording:

"The complete and functioning hydraulic surge protection system has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full time operation. The installation has been inspected and has been found to be in conformance with the manufacturer's standards and requirements."
 2. No amplification, dilution, or modification of this specific wording will be permitted.

1.05 TRAINING

- A. Submit Operation and Maintenance Manuals and Parts Lists specified in Section 01300 at least 15 days prior to the first training session.
- B. Demonstrate the operation, maintenance and safety procedures for all systems and equipment to personnel designated by the Owner.
- C. In addition to overall training specified above, provide special demonstration and training for specific pieces of equipment specified in the Technical Specification Sections.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 FINAL CLEANUP

- A. Prior to Final Inspection clean the entire construction area and all other areas affected by the performance of work under this Contract. Perform cleaning using personnel specializing in and skilled in cleaning and maintenance work. Perform repair work using personnel skilled in executing the type of work being repaired. Perform all work to the highest trade standards applicable to that type of work.
 - 1. Remove all temporary construction, signs, tools, equipment, excess material and debris.
 - 2. Remove all lumps, splatters, spots and stains caused by paint, adhesive, asphalt, concrete, mortar, sealant or other foreign material from exposed or finished surfaces. Remove all temporary labels.
 - 3. Repair, patch or replace new or existing work including pavement, sidewalks, curbs, gutters, catch basins, gratings, manholes, covers, landscaping, plant materials and other items that have been damaged, broken, cracked or chipped as a result of performing this Work.
 - 4. Sweep clean and wash down all exterior pavement. Remove all hazardous material and material that may cause sediment in drainage systems prior to washdown. Remove all grease and oil stains on pavement caused by Contractor's equipment.

1.02 CONTRACTOR'S ACTION LIST OF ITEMS TO BE CORRECTED AND/OR COMPLETED

- A. During construction, the Contractor shall maintain an action list of items to be corrected and/or completed. The Contractor shall regularly add items and update the list as information becomes available or as requested by the Engineer. The Contractor shall deliver a current copy of the list to the Engineer at each progress meeting.

1.03 SEMIFINAL INSPECTION/SUBSTANTIAL COMPLETION

- A. See General Provisions, Section 6-8. When the Contractor considers the Work nearly complete, the Contractor shall review the Contract Documents, inspect the Work, and use the Contractor's action list to prepare a Contractor's Punch List of all deficient or uncompleted items. The Contractor shall complete or correct items on the Punch List. When the Work is Substantially Complete in accordance with General Provisions, Section 6-8, the Contractor shall notify the Engineer in writing that the Contractor has reviewed the Contract Documents, inspected the Work and believes that the Work is Substantially Complete and ready for Semifinal Inspection.
- B. See General Provisions, Section 6-8. On receipt of the Contractor's Punch List and notice that the work is ready for Semifinal Inspection, the Engineer will inspect the Work. The Engineer may add additional items to the Contractor's Punch List, may find that the work is not ready for inspection, is ready for inspection but not Substantially Complete or that the Work is Substantially Complete. When the

Engineer finds the Work is Substantially Complete, it will prepare a Final Punch List and a notice of Substantial Complete, which will state the date of Substantial Completion and the time agreed to by the Owner and the Contractor (not to exceed 30 days) in which the Work shall be fully complete and ready for Final Inspection.

1.04 FINAL INSPECTION, FINAL COMPLETION AND FINAL PAYMENT

- A. See General Provisions, Section 6-8. When the Contractor has completed or corrected all the items on the Engineer's Final Punch List, the Contractor shall give the Engineer written notice that the Work is ready for Final Inspection. When the Engineer finds the Work acceptable and fully complete in accordance with the Contract Documents, and upon receipt of a final Application for Payment and all final submittals, the Engineer will recommend that the Owner issue a Notice of Final Completion, make Final Payment and Accept the Work stating that to the best of the Engineer's knowledge, information and belief, and on the basis of the Engineer's observations and inspection, the Work has been fully completed in accordance with the terms and conditions of the Contract Documents.
- B. Final Submittals include:
 - 1. Operation and Maintenance Manuals and Parts Lists
 - 2. Record Drawings
 - 3. Extra Materials
 - 4. Special Guarantees
 - 5. Maintenance Contracts
 - 6. Insurance Certificate showing required continuation of coverage beyond Final Payment.
 - 7. Release of Liens.
 - 8. Waiver of Claims by Contractor. General Provisions, Section 9-3.2.
 - 9. And any other submittals required by the Contract Documents and not previously received.
- C. The Owner will record the Notice of Final Completion at the County Recorders Office in the County the project is located within 10 days after completion in order to limit the lien period to 30 days for Subcontractors and 60 days for prime contractors.
- D. The Owner will make Final Payment to the Contractor 35 days after recording the Notice of Final Completion.

1.05 RECORD DRAWINGS

- A. The Contractor shall maintain on the jobsite, a complete set of Contract Documents and a complete file of all addenda, contract modifications and favorably reviewed submittals. The Contractor shall prepare a set of Record Drawings concurrently with the construction of the Work and in accordance with General Provisions, Section 2-5.4 and the following:
 - 1. Show the invert elevation of all gravity piping and the top of pipe, top of conduit or top of protective concrete encasement for other utilities. Elevations shall be related to a permanent visible elevation benchmark set at the site by the Contractor.
 - 2. Show the horizontal location of underground utilities measured from permanent visible physical features such as face of building, face of tank, or centerline of manhole.

3. Comply with detailed requirements in technical specification sections describing the type of information required on Record Drawings. The Contractor's copy of Contract Documents, Contract modifications and Record Drawings shall be available to the Engineer for weekly verification that the records are being currently updated.

C. Submit Record Drawings and obtain acceptance prior to completion.

1.06 EXTRA MATERIALS

- A. Deliver specified extra materials and parts to Owner. Itemize all items on a transmittal letter in duplicate and obtain signature of receiving party. Submit copies of signed transmittals for all specified extra materials and parts prior to completion.

1.07 SPECIAL GUARANTEES

- A. General Provisions, Section 6-8 covers the Contractor's responsibility to remedy defects due to faulty workmanship and materials, which appear within one year from the date of Final Completion and acceptance by the Owner.
- B. Guarantees for more than one year when called for in various sections of the Specifications shall be evidenced by the Contract Documents and in the form of a special guarantee written on the letterhead of the Contractor, Subcontractor, or Supplier doing the work and/or supplying the item to be guaranteed, and countersigned by the Contractor as follows. Failure to provide the special guarantee on the letterhead shall not relieve the Contractor, Subcontractor, or Supplier from its obligations for the special guarantees.

1.08 TWELVE-MONTH INSPECTION

- A. Thirty (30) days prior to the expiration of the one-year guarantee period described in General Provisions, Section 6-8, the Contractor shall tour the project with the Engineer and/or the Owner to prepare a list of corrective work required under the 12-month guarantee. The Contractor shall correct all items found to be defective within 20 days of receipt of the list of items to be corrected.

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all demolition required to perform the work covered under this contract including without limitation:
 - 1. Remove existing construction shown to be removed.
 - 2. Remove and replace existing construction and/or finishes as required to provide access to perform other work included in this contract.
 - 3. Include removal of mechanical and electrical work that is to be abandoned and is contained in construction to be removed whether or not the mechanical and electrical work is shown. Disconnect and cap off utilities in accordance with applicable codes and safety regulations.
 - 4. Where utilities that are not shown pass through construction that must be removed, and those utilities serve other areas notify the Engineer before disrupting service. If rerouting is required to maintain service, the Owner may issue a Change Order to accomplish the required work.
 - 5. Store and protect items intended for reuse.
 - 6. Assume ownership of debris and unwanted materials, remove from the site and dispose of legally.
 - 7. Include the cost of removing and disposing of material as required to provide a complete working system and as shown on the drawings and called out in these specifications.

1.02 NOISE AND DUST CONTROL

- A. Perform work in accordance with requirements in Division 1. Particular attention is directed without limitation to paragraphs titled: Owner and Contractor's Use of Premises.
- B. Perform work in a manner to cause least disturbance to existing site and least damage to work to remain.
- C. Maintain adequate means of safe, clear egress for site occupants.
- D. Employ all available techniques for construction noise abatement. Use remote, well-muffled air compressors and newest noise suppressed pneumatic and electric tools.

1.03 WARNING

- A. The Contractor is advised that work under this Section may be hazardous. The Contractor is to take all necessary precautions to ensure the safety of workers and property. Removal of and/or working in areas containing even minor amounts of hazardous material including without limitation, asbestos, lead-based paint, PCBs or

other hazardous materials requires special precautions, knowledge and procedures. If hazardous material is suspected, notify the Engineer.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 REMOVAL OF CONSTRUCTION IN AREAS TO RECEIVE NEW WORK

- A. Protect mechanical and electrical work that serves other areas. Relocate concealed mechanical and electrical work that is required to preserve service to other areas.
- B. Remove structural work designated for removal. Take precautions not to damage structural work intended to remain. Where temporary shoring is needed, submit a design prepared by an appropriately licensed engineer for review before proceeding.
- C. If structural elements are encountered that were not shown, protect them from damage and report their presence to the Engineer.

3.02 REMOVAL OF LIMITED PORTIONS OF EXISTING CONSTRUCTION TO PERMIT MODIFICATIONS

- A. Provide careful, selective cutting and removal of existing construction as required to permit relocation or modification of manholes. Cut and remove the least amount of work possible except when a larger area needs to be removed to permit strengthening existing construction or when required to remove finishes to a natural break line such as a corner or change in material.
- B. Protect existing construction to remain with temporary coverings.
- C. Treat existing mechanical, electrical or structural work as described in other parts of this Section.
- D. When modifications are complete, replace removed work with new construction and finishes to match adjacent existing work. Standards of material and workmanship shall be in accordance with other portions of this Specification or if not covered then in accordance with current practice for this class of work. Salvaged materials may be used for replacement if in good condition.

3.03 REMOVAL OF EXISTING CONSTRUCTION TO PROVIDE ACCESS TO PERFORM WORK

- A. Provide careful selective cutting and removal of existing construction where required to permit installation of new concealed mechanical or electrical work, or installation of equipment, fixtures or devices.
- B. Treat existing mechanical, electrical or structural work as described in other parts of this Section.

- C. Replace and/or patch removed construction and finishes in accordance with other parts of this Section.

3.04 PROTECTION OF WORK TO REMAIN

- A. Protect all work to remain. Repair damage with materials, workmanship and finishes matching existing work when new.
- B. Most existing work will not be replaced in this contract. It is essential that existing work at the site be protected from any damage due to impact, dirt, abrasion, paints and solvents.

3.05 CUTTING HOLES IN CONCRETE AND/OR CONCRETE UNIT MASONRY

- A. The Contractor is cautioned that electrical conduits and reinforcing that are not shown on drawings may be concealed in concrete CMU construction. Use electronic detection equipment to locate concealed items before cutting holes. Take all required precautions to avoid damage to existing conduits or reinforcing.
- B. New openings in existing concrete walls or slabs may be saw cut to opening perimeter lines where drawings do not call for adding reinforcing trim bars to strengthen openings. Do not run saw kerfs past corners of openings. Complete concrete removal at opening corners by chipping and grinding. Take all required precautions to avoid water damage to existing construction or the Owner's property.
- C. Where drawings call for adding reinforcing trim bars to strengthen openings, limit saw cutting to a depth of 3/4-inch to avoid cutting existing reinforcing steel. Carefully chip out concrete to avoid damaging existing reinforcing steel which is to remain.
- D. Use chipping guns to chip out small holes for pipes or conduits. Proceed carefully to avoid damage to concealed conduits. Core drilling is permitted only at the Contractor's risk and only with the Engineer's permission. If core drilling is used, the Contractor shall: 1) use electronic detection equipment to locate conduit before drilling, 2) take precaution to avoid water damage to existing construction or the Owner's property, and 3) replace, at its own expense, any damaged electrical or signal wiring or conduits.

3.06 REMOVE UNWANTED FIXED EQUIPMENT

- A. Remove unwanted lockers, shelving, hoods, fixed and built-in equipment, machinery, machinery bases and similar items whether shown or not. Cut off protruding bolts or attachment devices flush with existing surfaces.

3.07 IF HAZARDOUS MATERIALS ARE ENCOUNTERED

- A. If hazardous materials are discovered, comply with paragraph 1.01 of this Section and all applicable laws.

3.08 REMOVAL AND DISPOSAL OF MATERIAL

- A. Store debris in suitable covered containers located where directed by the Engineer and remove from site when full. Burning on the site is not permitted.
- B. Removed material (other than material to be reused) shall become the property of the Contractor who shall remove it from the site and dispose of it in a legal manner.

END OF SECTION

SECTION 02302

EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Perform all excavation, shoring, dewatering, backfilling, compaction and grading necessary or required for the construction of the work as covered by these Specifications and indicated on the Drawings. The excavation shall include, without classification, the removal and disposal of all materials of whatever nature encountered, including water and all other obstructions that would interfere with the proper construction and completion of the required work.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. State of California, Department of Transportation, Standard Specifications (Standard Specifications).
- C. State of California, Department of Transportation, Manual of Test (California Test).
- D. American Concrete Institute, ACI 229 Controlled Low Strength Materials, ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete.

1.03 SUMMITTALS

- A. Submit in accordance with Section 01300.
- B. Submit the following:
 - 1. Sheeting and Shoring Plan: Refer to Paragraph 1.08 below.
 - 2. Potholing Report as described in Paragraph 3.02.
 - 3. Samples and Test Results: Furnish, without additional cost to the Owner, such quantities of import materials as may be required by the Engineer for test purposes. Cooperate with the Engineer and furnish necessary facilities for sampling and testing of all materials and workmanship. Submit test results for import materials. Tests shall be performed within 60 days of the submission. All material furnished and all work performed shall be subject to rigid inspection, and no material shall be delivered to the site until it has been favorably reviewed by the Engineer, or used in the construction work until it has been inspected in the field by the Engineer.
 - 4. Product Data of Material identified in Paragraph 2.01.
 - 5. Quality Submittals for Controlled Low Strength Material (CLSM):
 - a. Design Data: Submit a mix design for the material to be used.
 - b. Test Reports: Submit trial laboratory and testing data and cylinder breaks performed at 7, 14, and 28 days.
 - c. Certificates: Ready-mix plant certification.

1.04 QUALITY ASSURANCE

- A. Source Quality Control: Test import materials proposed for use to demonstrate that the materials conform to the specified requirements. Tests shall be performed by an independent testing laboratory.

- B. Field Quality Control:
 - 1. The Owner will:
 - a. Review and test materials proposed for use.
 - b. Inspect foundations, site grading and borrow operations.
 - c. Inspect placement and compaction of fill.
 - d. Test soils during placement of fill.
 - 2. Contractor shall excavate holes for in-place soil sampling. Contractor shall be responsible for costs of additional inspection and re-testing resulting from non-compliance.
- C. Testing Methods:
 - 1. Durability Index: Manual of Test, State of California, Department of Transportation.
 - 2. Specific Gravity: ASTM D854.
 - 3. Laboratory Compaction: ASTM D1557, Method A or C.
 - 4. In-Place Density: ASTM D1556 or ASTM D2922.
 - 5. Particle Size Analysis of Soils: ASTM D422.
 - 6. Plastic Limit and Plasticity Index: ASTM D4318.
 - 7. Soil Classification: ASTM D2487.
 - 8. In-Place Moisture Content: ASTM D3017.
 - 9. Concrete Aggregates: ASTM C33.
 - 10. Ready-Mix Concrete: ASTM C94.
 - 11. Slump of Hydraulic-Cement Concrete: ASTM C143.
 - 12. Portland Cement: ASTM C150.
 - 13. Air-Entraining Admixtures for Concrete: ASTM C260.
 - 14. Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete: ASTM C618.
 - 15. Preparation and Testing of Soil-Cement Slurry Test Cylinders: ASTM D4832.
- D. Import material shall conform to the California Department of Toxic Substances Control (DTSC) requirements date October 2001 *Information Advisory Clean Imported Fill Material*. Provided in information to bidders. Contractor shall collect representative discrete samples of Crushed Aggregate, Import Fill, and Top Soil materials from the supplier and submit the samples to a California-certified laboratory to composite before analyses. Engineer will reject any samples containing any non-naturally occurring chemical constituents or naturally occurring chemicals at levels above regulatory limits. In accordance with the DTSC Fill Advisory (2001) and depending on the source of the materials, Engineer may require the following laboratory analyses for the composite samples:
 - 1. volatile organic compounds (VOCs) using EPA Method 8260;
 - 2. semi-volatile organic compounds (SVOCs) and polycyclic aromatic hydrocarbons (PAHs) using EPA Method 8270;
 - 3. total petroleum hydrocarbons (TPH) quantified as gasoline (TPHg), diesel (TPHd), and motor oil (TPHmo) using EPA Method 8015M;
 - 4. Title 22 metals using EPA Methods 6020 and 7471;
 - 5. total cyanide using EPA Methods 9010B/9014;
 - 6. organochlorine pesticides (OCPs) using EPA Method 8081A; and
 - 7. polychlorobiphenyls (PCBs) (EPA Method 8082).
- E. Contractor shall perform trench excavation during periods of no precipitation, and keep trench excavation free from water, during construction. Backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the backfill material.

- F. Contractor shall not excavate or fill until all the required submittals have been reviewed and approved.
- G. Definition:
 - 1. Relative Compaction: In-place dry density divided by the maximum dry density laboratory compaction express as a percentage.

1.05 EXPLOSIVES

- A. The use of explosives will not be permitted on this project, unless specifically authorized, in writing, by the Engineer.

1.06 SUBSURFACE INVESTIGATIONS

- A. Geotechnical investigations for design purposes for this project were made for the the City of Carlsbad by Ninyo & Moore in a report dated January 24th, 2020.
- B. This report is attached for use in the specifics of this project. While the records of data obtained may be considered by the Contractor to be correct, any conclusions or recommendations made in the reports are for information to the Design Engineer and are not a part of the Contract Documents.
- C. Potholing was performed on several utilities along the alignment. A copy of the pothole report is in an Appendix to these Contract Documents. The potholing was performed based on an earlier version of the plans and therefore, the stationing is incorrect, but close.
- D. The bidders may make additional subsurface investigations at the site prior to the bidding of the project. Prior to making any drillings or excavations, the bidder shall secure permission from the Owner and property owners if on private property.

1.07 REFERENCE SPECIFICATIONS

- A. Whenever the words "Standard Specifications" are referred to, the reference is to the State of California, Department of Transportation, Standard Specifications latest edition.

1.08 ADDITIONAL SAFETY RESPONSIBILITIES

- A. The Contractor shall secure appropriate permits from the City of Carlsbad and San Diego County and notify Underground Service Alert prior to commencing with ground disturbing activities.
- B. The Contractor shall select, install and maintain shoring, sheeting, bracing, and sloping as necessary to maintain safe excavations. The Contractor shall be responsible for ensuring such measures: (1) comply fully with 29 CFR Part 1926 OSHA Subpart P Excavations and Trenches requirements, (2) provide necessary support to the sides of excavations, (3) provide safe access to the Engineer's sampling and testing within the excavation, (4) provide safe access for backfill, compaction, and compaction testing, and (5) otherwise maintain excavations in a safe manner that shall not endanger property, life, health, or the project schedule. All earthwork shall be performed in strict accordance with applicable law, including local ordinances, applicable OSHA, CalOSHA, California Civil Code, and California Department of Industrial Safety requirements. Shoring and braced excavations shall be designed in accordance with the requirements of the Geotechnical report provided by Ninyo & Moore.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed Rock: Class 2, 3/4-inch maximum aggregate base, Standard Specifications Section 26.
- B. Bedding Materials
 - 1. Sand: Standard Specifications, Paragraph 19-3.025B. Sand equivalent shall not be less than 50 per ASTM D2419.
- C. Import Backfill: Imported nonexpansive soil with liquid limit no greater than 40 and a plasticity index no greater than 15, free from clods or rocks larger than 3 inches in greatest dimension, and not more than approximately 30 percent larger than 3/4-inch, and free from organic material.
- D. Native Backfill: Native soil prepared as necessary to be free from clods or rocks larger than 2 inches in greatest dimension, and free from organic material.
- E. Slurry Backfill: Controlled Low Strength Material (CLSM) shall conform to the following:
 - 1. Concrete mix product certification: Submit certified laboratory test results that the mix proportions and materials comply with these Specifications. Submit certification on cementitious products and aggregates performed within the past 6 months.
 - a. Portland Cement: ASTM C150, Type V.
 - b. Aggregate: Comply with ASTM C33. Aggregate shall consist of fine aggregate, with or without coarse aggregate, with a minimum size of 1-inch, free of clay, organics, and other deleterious materials. Less than 10 percent by weight shall pass the No. sieve, and material passing the No. 40 sieve shall be nonplastic as determined in accordance with ASTM D4318
 - c. Fly Ash: ASTM C618, Class F unless otherwise approved.
 - d. Admixtures: Air entraining; ASTM C260. Air content limited to 6% unless demonstrated to avoid segregation. Provide liquid admixture such as DaraFill manufactured by W.R. Grace when air contents from 15-35% are required.
- F. Impervious Material: Clay with a minimum percentage of material passing the No. 200 sieve of 50%. The material shall be free of organics, rocks, or clods greater than 1 inch in diameter.
- G. Water: The water used shall be reasonably free of oil, objectionable quantities of silt, organic matter, alkali, salts and other impurities. Water quality must be acceptable to the Engineer.
- H. Aggregate Base: Refer to Section 02705.
- I. Warning Tape: 3-inch-wide, inert, fade-resistant plastic film resistant to acids, alkalis, and other components likely to be encountered in soil. Tape shall be blue, imprinted with "CAUTION WATER MAIN BELOW," Griffolyn Terra Tape; equivalent product, or equal.
- J. Detection Tape: Plastic metallic type consisting of a blue color coded polyethylene or melinex film, a solid core aluminum foil detection layer and other layers as

required. The tape shall be resistant to acids, alkalines and other components likely to be encountered in soils. It shall be designed for both conductive and inductive locating procedures. The tape shall be blue, imprinted with "CAUTION WATER MAIN BELOW." Terra Tape "D" by Griffolyn Company; Detectatape by Allen Systems; or equal.

2.02 MIX FOR CLSM BACKFILL

- A. Performance Requirements: The CLSM shall be proportioned to be a nonsegregating, free-flowing, self-consolidating, low-shrink slurry.
- B. Mix Design Certification: By an independent commercial testing laboratory, complying with ASTM C1077 and favorably reviewed by the Engineer. Mix design proportions shall be established on the basis of field experience and trial mixtures with the materials to be employed.
- C. Mix Design Requirements: The Contractor and its supplier shall determine the materials and proportions used to meet the requirements of the Specifications. The mix design shall be prepared for a range of aggregate gradations that are expected to be used.
- D. Mix Design Strength: The unconfined compressive strength at 28 days shall be 100 psi (+/- 50 psi) as per ASTM D4832.
- E. The mix slump shall be 7 inches (+/-) as per ASTM C143
- F. The mix density shall be between 115-145 lb/ft³.
- G. Minimum cement content: 185 lb/cy for slurry cement backfill.
- H. Mix, transport, and place CLSM in accordance with the methods and procedures in ACI 304 and ASTM C94.

PART 3 - EXECUTION

3.01 CONTROL OF WATER

- A. All excavations shall be kept free from water and all construction shall be in the dry.
 - 1. Water may be encountered on this project. It should be presumed that dewatering operations will be required. Furnish, install, maintain, and operate all necessary pumping and other equipment for dewatering all excavations. At all times, have on the project sufficient pumping equipment for immediate use, including standby pumps for use in case other pumps become inoperable.
 - 2. Provide a sufficient number of pumps so as to hold the groundwater level at an elevation of not less than 1 foot below the lowest elevation of the pipe, or other material to be placed.
 - 3. The Contractor is responsible for coordinating with the Owner and any other relevant authorities for dewatering water disposal to the sewer system. Prevent disposal of sediments to the sewer by employing whatever methods are necessary, including settling basins.
 - 4. The dewatering operation shall be continuous, so that the excavated areas shall be kept free from water during construction, while concrete is setting and achieves full strength, and until backfill has been placed to a sufficient height to anchor the work against possible flotation.

5. Continue dewatering during backfilling operations such that the groundwater is at least 1 foot below the level of the compaction effort at all times. No compaction of saturated materials will be allowed.
 6. Dewatering devices must be adequately filtered to prevent the removal of fines from the soil.
 7. The Contractor shall be responsible for any damage to the foundations or any other parts of existing structures or of the new work caused by failure of any part of the Contractor's protective works. After temporary protective works are no longer needed for dewatering purposes, they shall be removed by the Contractor.
 8. If pumping is required on a 24-hour basis, requiring engine drives, then engines shall be equipped in a manner to keep noise to a minimum. Refer to Section 01140 for noise control requirements.
- B. The Contractor shall be responsible for furnishing temporary drainage facilities to convey and dispose of surface water falling on or passing over the site.

3.02 EXISTING UTILITIES

- A. General: The known existing buried utilities and pipelines except building connections are shown on the Drawings in their approximate location. The Contractor shall exercise care in avoiding damage to all utilities as he will be held responsible for their repair if damaged. There is no guarantee that all utilities or obstructions are shown, or that locations indicated are accurate. Utilities are piping, conduits, wire, cable, poles, ducts, manholes, pull boxes and the like, located along the pipeline right-of-way.
- B. Check on Locations (Potholing):
1. Contact all affected utility owners and request they locate their respective utilities prior to the start of "potholing" procedures. The utility owner shall be given 7 days written notice prior to commencing potholing. If a utility owner is not equipped to locate its utility, the Contractor shall locate it.
 2. Clearly paint the location of all affected utility underground pipes, conduits and other utilities on the pavement or identify the location with suitable markers if not on pavement. In addition to the location of metallic pipes and conduits, non-metallic pipe, ducts and conduits shall also be similarly located using surface indicators and detection tape, if present, and shall then be similarly marked.
 3. After the utility survey is completed, commence "potholing" to determine the actual location and elevation of all utilities where crossings, interferences, or connections to the new pipelines are shown on the Drawings, marked by the utility companies, or indicated by surface signs. Prior to the preparation of piping shop drawings, or the excavating for any new pipelines or structures, the Contractor shall locate and uncover these existing utilities including services and laterals to a point 1 foot below the utility. Submit a report identifying each underground utility and its depth and station. Any variation in the actual elevations and the indicated elevations shall be brought to the Engineer's attention. Allow the engineer time to resolve the conflict. Negotiate the time to resolve with the engineer.
 4. Excavations around underground electrical ducts and conduits shall be performed using extreme caution to prevent injury to workmen or damage to electrical ducts or conduits. Similar precautions shall be exercised around gas lines, telephone and television cables.
 5. Pothole excavations shall have surface dimensions of no more than 18" x 18", unless approved by the Owner. Air spades and vacuum excavators shall be

used to limit the size of excavations and damage to adjacent facilities. Backfill each hole after completing potholing. In existing streets, pave with 1 inch of cutback. If out of the pipeline trench, backfill each hole with hot mix AC to match existing.

C. Interferences:

1. If interferences occur at locations other than shown on the Drawings, the Contractor shall notify the Engineer, and a method for correcting said interferences shall be supplied by the Engineer. Payment for interferences that are not shown on the plans, nor which may be inferred from surface indications, shall be in accordance with the provisions of the General Conditions. If the Contractor does not expose all required utilities prior to shop drawing preparation, he shall not be entitled to additional compensation for work necessary to avoid interferences, nor for repair to damaged utilities.
2. Any necessary relocations of utilities, whether shown on the Drawings or not, shall be coordinated with the affected utility. The Contractor shall perform the relocation only if instructed to do so in writing from the utility and the Engineer.

D. Shutdowns: Planned utility service shutdowns shall be accomplished during period of minimum use. In some cases this may require night or weekend work. Such work shall be at no additional cost. Program the work so that service will be restored in the minimum possible time, and shall cooperate with the utility companies in reducing shutdowns of utility systems to a minimum.

1. Disconnections: No utility shall be disconnected without prior written approval from the utility owner. When it is necessary to disconnect a utility, the Contractor shall give the utility owner not less than 72-hour notice when requesting written approval. The Contractor shall program his work so that service will be restored in the minimum possible time.

3.03 GENERAL CONSTRUCTION REQUIREMENTS

- A. Site Access: Access to the site will be over public and private roads. Exercise care in the use of such roads and repair at own expense any damage thereto caused by Contractor's operations. Such repair shall be to the satisfaction of the owner or agency having jurisdiction over the road. Take whatever means are necessary to prevent tracking of mud onto existing roads and keep roads free of debris.
- B. Traffic Regulation: Provide such flagmen, patrols, pilot cars, drivers, lighted barricades, flares, lights, warning signs, and safety devices as may be required for control of traffic adjacent to all areas of work.
- C. Barriers: Barriers shall be placed at each end of all excavations and at such places along excavations to warn all pedestrian and vehicular traffic of such excavations. Lights shall also be placed along excavations from sunset each day to sunrise of the next day until such excavation is entirely restored.
- D. Access: Free access must be maintained to all fire hydrants, water valves and meters, and private driveways.
- E. Open Trench Limitations: The Engineer shall have the authority to limit the amount of trench to be opened or left open at any one time.
- F. Demolition of Pavement: Where trenching or excavation occurs in paved areas, the pavement shall be saw-cut and broken ahead of the trenching or excavation

operation. The extent of paving removed shall be limited to the minimum necessary for the excavation.

- G. Dust Control: Take proper and efficient steps to control dust.
- H. Storage of Materials: Excavated materials unsuitable for backfill shall not be stored on existing streets, and shall be disposed of immediately. Neatly place excavated materials far enough from the excavation to prevent stability problems. Keep the materials shaped so as to cause the least possible interference with drainage or the normal use of adjacent properties, structures or roadways.
- I. Temporary Pavement: Place temporary pavement on trenches in existing streets within 24 hours after the trench has been backfilled. Maintain temporary pavement until permanent pavement is to be placed but not less than two weeks to allow any additional compaction settlement to occur.

3.04 TRENCH EXCAVATION

- A. Excavation for pipe shall be in open cut. The trench shall be as wide as necessary for sheeting and bracing and the proper performance of the work up to the maximum width permitted by the typical cross-sections shown on the Drawings. The sides of the trenches shall be vertical in existing streets. The bottom of the trench shall be constructed to the grades and shapes indicated on the Drawings. Should the Contractor desire to use other equivalent methods, he shall submit his method of construction to the Engineer for favorable review prior to its use.
- B. Take care not to overexcavate. Accurately grade the bottom of the trenches to provide uniform bearing and support for each section of the pipe at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints, and as hereinafter specified. Dig bell holes and depressions for joints after the trench bottom has been graded, and, in order that the pipe rest on the bedding for its full length, bell holes and depressions shall be only of such length, depth and width as required for properly making the joint. Remove stones as necessary to avoid point bearing.
- C. Backfill and compact overexcavations to 95% relative compaction with bedding material. There shall be no additional payment to the Contractor for overexcavations not directed by the Engineer. Remove unsatisfactory material encountered below the grades shown as directed by the Engineer and replace with 18" crushed rock wrapped in geotextile fabric, Mirafi 500X, or equal, for foundation stabilization. Payment for removal and replacement of such unsatisfactory material directed by the Engineer shall be made in accordance with the provisions of the General Conditions.
- D. Grade trenches so that they are uniformly sloped between the pipe elevations shown on the Drawings. Comply with the minimum and maximum trench widths shown on the Drawings. Notify the Engineer if the trench width exceeds the maximum allowable width for any reason.
- E. Contractor shall use proper equipment and exercise care to preserve material below and beyond the lines of excavations within 2-inches.
- F. Provide ladders for access to the trench by construction and inspection personnel in accordance with OSHA standards.

3.05 BACKFILL AND COMPACTION

- A. Place bedding and backfill materials true to the lines, grades, and cross-sections indicated on the Drawings and compacted to the degree specified on the Drawings. Place bedding and backfill materials in horizontal lifts not to exceed 6 inches in thickness measured before compaction. The difference in level on either side of a pipe shall not to exceed 4 inches. Bedding shall be placed to one foot over the top of the pipe prior to placing the backfill.
- B. The initial fill of bedding material shall not proceed above the springline of the pipe until the bedding has been compacted under the pipe haunches. Failure to perform compaction of the bedding under the haunches shall be deemed a defect and the contractor shall remove and reinstall the pipe prior to progress payment.
- C. Backfill material shall not be placed over the pipe until after it has been inspected by the Owner's Representative.
- D. It shall be incumbent upon the Contractor to protect the pipe from damage during the construction period. It shall be his responsibility to repair broken or damaged pipe at no extra cost. Tamping of backfill over the pipe shall be done with tampers, vibratory rollers and other machines that will not injure or disturb the pipe. Carefully place backfill around and over the pipe.
- E. Do not allow construction traffic nor highway traffic over the pipe trench until the trench backfill has been placed and compacted in accordance with the specifications and brought back even with existing grade.
- F. Add water to the backfill material or dry/aerate the backfill material as necessary to obtain moisture content within 2% of optimum. Employ such means as may be necessary to secure a uniform moisture content throughout the material of each layer being compacted and compact backfill to the designated criteria as shown on the Drawings or specified. After the material has been moisture conditioned, compact it with compaction equipment approved by the Engineer to achieve specified compaction. The Contractor shall be responsible for obtaining the densities specified. Should he fail, through negligence or otherwise, to compact to specified density, and to backfill and compact in accordance with these specifications to surface grade, thus permitting saturation of the backfill material from rains or from any other source, the faulty material shall be removed and replaced with approved material which shall be compacted to the specified density, and no additional payment will be made for doing such work or removal and replacement.
- G. Compaction by flooding, ponding or jetting will not be permitted.
- H. For all piping or conduits to be placed in any excavated and backfilled area, such as at manholes or for building connections, the structural backfill shall be first compacted to a level at least 3 feet from the top of the piping or conduit elevation and then retrenched to pipe grade.
- I. Testing Frequency:
 - 1. The Contractor shall retain the services of a licensed material testing firm to verify and control backfilling operations so that the backfill meets the requirements in these Specifications. Field density testing shall be completed at the rate determined by the testing firm in order to ensure that the backfill is placed in accordance with the Specification, but at the minimum, the Contractor shall perform the following:

- a. One (1) test for each lift within every 100 feet of trench length of each lift.
 - 2. The Contractor shall submit the testing results to the Engineer within 24 hours of taking the tests including any re-tests for areas that failed the compaction criteria.
- J. Compact backfill for structures to 95% relative compaction.

3.06 SUPPORT OF EXCAVATIONS

- A. Adequately support excavation for trenches and structures to meet all applicable requirements in the current rules, orders and regulations. Excavation shall be adequately shored, braced and sheeted so that the earth will not slide or settle and so that all existing structures and all new pipe and structures will be fully protected from damage. Keep vehicles, equipment and materials far enough from the excavation to prevent instability.
- B. Take all necessary measures to protect excavations and adjacent improvements from running, caving, boiling, settling, or sliding soil resulting from the high groundwater table and the nature of the soil excavated. Attention is directed to Section 832 of the Civil Code of the State of California relating to lateral and subjacent supports, and wherever structures or improvements adjacent to the excavation may be damaged by such excavation, the Contractor shall comply with this law.
- C. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. The support for excavation shall remain in place until the pipeline installation and initial backfill has been completed. During the backfilling of the pipeline or structure, the shoring, sheeting and bracing shall be carefully removed so that there shall be no voids created and no caving, lateral movement or flowing of the subsoils. Remove excavation support and protection systems completely and entirely.
- F. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems. This work shall include repairing all settlement-related damage to any and all structures and facilities.

3.07 EXCAVATION BENEATH STRUCTURES

- A. Excavate a minimum of twenty-four (24) inches below the bottom of the proposed structure until all existing fill has been removed and alluvium native soil is reached. Excavate sixty (60) inches laterally beyond the edge of the proposed structure, where attainable.
- B. The native material below the proposed structure shall be prepared as follows: the upper eight (8) inches shall be scarified and moisture conditioned and compacted to 95% relative compaction in accordance with ASTM D1557.
- C. Remaining excavation shall be replaced with CLSM below twelve (12) inches of crushed rock:

1. Site Verification of Conditions: CLSM batching, mixing, and placing may be started if the weather conditions are favorable and when the air temperature is 34 F and rising. At the time of placement, the CLSM must have a temperature of at least 40 F. Mixing and placing shall stop when the air temperature is 38 F or less and falling.
2. Subgrade on which CLSM is to be placed shall be free of disturbed or softened materials, debris, and water.
3. CLSM shall be placed in lifts not exceeding 6 feet in height, with a time interval of not less than 1 hour between lifts.

3.08 FINISH GRADING

- A. Except where shown otherwise in the Drawings, restore the finish grade to the original contours and to the original drainage patterns. Grade surfaces to drain away from structures. The finished surfaces shall be smooth and compacted.

3.09 FIELD QUALITY CONTROL

- A. Soil Field Testing and Inspections:
 1. Contractor shall hire an independent laboratory approved by the Engineer to perform field testing for compaction and moisture content of the base and subgrade. Field testing shall be performed in accordance with ASTM D2922 for in-place density and ASTM D3017 for in-place moisture content. The Engineer may conduct additional field testing. Provide 48 hours advance notice to Engineer for testing to occur without interrupting work.
 2. Contractor shall not proceed with placement of next lift or course of backfill without the approval of Engineer based upon review of compaction testing results and acceptance of the completed lift.
 3. In the event compacted material does not meet specified in-place density, material is to be recompact until specified results are obtained at no additional cost. Contractor shall be responsible for costs of additional inspection and re-testing resulting from non-compliance.
 4. Contractor shall demonstrate all subgrade, base, and finished grade elevations to Engineer.
 5. Contractor's third party testing engineer shall complete a daily compaction testing record form and compaction test location diagram of all backfill compaction testing performed during construction and shall submit a hardcopy of each to the Engineer at the end of each work day.
- B. CLSM Field Testing: Performed by the Contractor:
 1. After completion of the trial mix work, and prior to CLSM placement operations, the Contractor shall prepare field trial mixes. The initial mix shall be based on the design mix. Additional trial mixes may be made by varying the proportions as may be required to produce a dense, homogenous material with good workability.
 2. Manufacture of the field trial mixes shall be accomplished utilizing the equipment that will be used on the job.
 3. Compressive strength: A set of six standard 6 inch x 12 inch cylinders will be cast for each mix.
 - a. Making, storing, and initial cure of cylinders: ASTM C94. Provide site storage and initial cure, 16 hours minimum and 24 hours maximum.
 - b. Testing laboratory: Provided by Contractor.

- c. Final cure and tests of cylinders: ASTM D4832. Testing laboratory will transport cylinders from site, cure, test and provide report. Test one specimen at 7 days, one at 14 days, one at 21 days, and two at 28 days. One specimen shall be held as a "spare" and may be used in the event of questionable results from one of the scheduled tests.
- 4. Slump: Test will be performed on each 50 cubic yards or fraction thereof. Test each sample used for strength:
 - a. Testing: ASTM C143.
 - b. Results outside the limits indicate possible cause for rejection of concrete. The Engineer shall be the sole judge.

3.10 DISPOSAL OF EXCAVATED MATERIAL

- A. Dispose of unsuitable material or excavated material in excess of that needed for backfill offsite in accordance with the requirements of Section 01140.

END OF SECTION

SECTION 02303

BYPASS PUMPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes: Requirements for bypass pumping the existing Poinsettia Sewer Lift Station.

1.02 SUBMITTALS

- A. Connection and Bypass Pumping Plan (CBPP)
 - 1. Prepare a comprehensive CBPP within 45 calendar days after the Notice to Proceed that details how each connection to existing wastewater systems will be accomplished.
- B. Bypass Pumping
 - 1. The design, installation, and operation of any temporary pumping systems shall be the Contractor's responsibility. The Contractor shall employ the services of a qualified vendor who can demonstrate to the Owner that they specialize in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five references of projects of a similar size and complexity as this project performed within the last three years. The bypass pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction. The Contractor shall be responsible for all required permits.
 - 2. Provide a detailed plan for showing how bypass pumping will be performed. Provide the following items at a minimum:
 - a) Staging areas for pumps.
 - b) Sewer plugging method and the type of plug (if using existing valves, identify which valves will be used for isolation).
 - c) Number, size, material, location, and method of installation of the suction and discharge piping.
 - d) Bypass pump sizes, capacity, number of each size to be on site.
 - e) Number and size of portable power generators and the details of the noise suppression equipment (for both the power generator(s) and the bypass pump). At least one standby generator for each size shall be provided in the event of an emergency.
 - f) Downstream discharge plan.
 - g) Method of protecting downstream manholes from damage if applicable.
 - h) Plan showing the location of bypass pumping discharge piping. Show any paving drive over required and details.

- i) Schedule for installation and maintenance of bypass pumping system. Coordinate with the CBPP.
- C. Confined Space Entry Plan (CSEP) – Develop a CSEP to comply with all laws and regulations. Submit for project records. This plan will not be reviewed and approved. It is the Contractor's plan. Be informed that sewers may have methane gas, H2S gas, and low oxygen gas levels. Include appropriate portable gas safety monitors such as those manufactured by Mine Safety Appliances (<http://www.msanet.com>) for worker use in verifying the quality of air inside manholes.

1.03 SYSTEM DESCRIPTION

A. Design Requirements

- 1. The bypass pumping system shall be variable speed and have sufficient capacity to pump the flows listed below to match the capacity of the existing emergency bypass pump on site. The existing emergency lift station bypass pump has the following flow characteristics based on Owner measurements:

- a) Minimum Flow: 500 gpm
- b) Primary Point Flow: 1,375 gpm
- c) Maximum Flow: 1,500 gpm

The estimated total dynamic head (TDH) for the corresponding flows listed above are as follows:

- a) TDH @ Minimum Flow: 235 ft
- b) TDH @ Primary Point Flow: 245 ft
- c) TDH @ Maximum Flow: 250 ft

- 2. The suction lift range is anticipated to be 15 to 25 ft
- 3. Level control for on/off operation is required.
- 4. Visual and audible alarms shall be installed at the site during bypass pumping operations.

- B. The Contractor shall confirm the flow rates and TDH requirements with the Owner prior to bypass pump design.
- C. The Contractor shall provide noise suppression for the pump and portable power generation.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Pumps

1. All pumps shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps for priming. The pumps may be electric or diesel powered that comply with noise requirements. All pumps shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of sewage flows. Provide floats and stop start controls for each system.
- B. Discharge Piping: Provide discharge piping that is assembled with rigid piping, PVC or aluminum piping. Discharge hose will be allowed on a case-by-case basis. Restrained joints shall be used at fittings to prevent pipe movement.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the bypass pumping system in accordance with the approved plan. The bypass pumping system at Poinsettia Sewer Lift Station shall be tested for a minimum duration of 2 hours (unless otherwise noted by the Owner's inspector) and approved prior to demolition of existing piping.
- B. Perform leakage testing using potable water of the system prior to actual operation.
- C. Plugging and Blocking of sewage flows shall incorporate a primary and secondary plugging device. Remove the blockage when the piping modifications are accomplished. Coordinate the removal so that the blockage is removed immediately after the pumps have lowered the water level to minimum in the existing lift station primary wet well.
- D. Exercise caution when working inside a manhole, sump, or pipeline. Implement the CSEP on all entries.
- E. Restore the area to the condition prior to installation of the bypass pumping piping and equipment.
- F. Report any spills to the Engineer immediately. Contractor is responsible to pay any fines levied by any agency associated with a spill from the bypass pumping.
- G. The bypass pumping system shall be manned at all times, including any bypass pumping performed after normal work hours, weekends and holidays.

END OF SECTION

SECTION 02705

PAVING AND RESURFACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing all labor, material, equipment, tools, and services required for the placing and compacting of asphalt concrete pavement and aggregate surfacing for roadways, parking lots, and walkways to the lines, grades, and dimensions shown on the Drawings and as specified herein. Also included is the repair and resurfacing of existing roadway and area paving damaged or removed during construction.

1.02 REFERENCE SPECIFICATIONS

- A. Whenever the words "Standard Specifications" are referred to, the reference is to the State of California, Department of Transportation (CALTRANS), Standard Specifications dated 2015.
- B. ASTM International (ASTM):
 - 1. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - 2. D2922 Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Method (Shallow Depth)

1.03 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Submit the following under the Product Information category.
 - 1. Samples: Furnish, without additional cost to the Owner, such quantities of construction materials as may be required by the Engineer for test purposes. The Contractor shall cooperate with the Engineer and furnish necessary facilities for sampling and testing of all materials and workmanship. All materials furnished and all work performed shall be subject to rigid inspection, and no materials shall be used in the construction work until it has been inspected by the Engineer.
 - 2. Submit a signed verification from each source of supply for each construction material employed on this project indicating that the materials meet the Specification requirements.
 - 3. Mix design for asphalt concrete and test results of California Test 367.
 - 4. Submit manufacturer's certification of the actual volatile organic compound (VOC) content for all pavement paints and bituminous pavement sealers proposed for use on this project. Submit certification of the actual VOC content for coatings manufactured after 1 September 1987. For coatings manufactured before 1 September 1987, submit VOC content and date of manufacture. VOC content shall be measured in grams per liter by weight of coating as applied excluding water and color added to the tint base.
 - 5. Submit verification that bituminous pavement sealers and paint products furnished meet applicable regulations as to allowable VOC content for the time and place of application and use intended.

1.04 QUALITY ASSURANCE

- A. Comply with "Standard Specifications" of CALTRANS dated 2015.

1.05 REGULATORY REQUIREMENTS

- A. All work, material, procedures and practices under this Section shall conform with requirements of the California Air Resources Board (CARB) and the Air Pollution Control District (APCD) having jurisdiction.

PART 2 - PRODUCTS

2.01 PAVING MATERIALS

- A. Aggregate Base: Standard Specifications, Section 26. Class and size as indicated on the Drawings; or if not indicated on the Drawings, use Class 2, $\frac{3}{4}$ -inch maximum.
- B. Prime Coat: Liquid asphalt, Grade SC-70 or MC-70, Standard Specifications, Section 93.
- C. Tack Coat and Seal Coat: Emulsified asphalt, Grade SS-1 or SS-1h, Standard Specifications, Section 94.
- D. Asphalt Concrete: Type B, $\frac{1}{2}$ -inch maximum, medium grading, Standard Specification Section 39. Bitumin ratio shall be selected by the supplier in accordance with the Standard Specifications.

2.02 HEADERS

- A. At straight sections, wood headers shall be constructed of 2-inch by 6-inch construction heart redwood, held in place by 2-inch by 4-inch stakes, of the same materials, 2 feet long and set at 8-foot centers.
- B. At curved sections, wood headers shall be constructed of three $\frac{1}{2}$ -inch by 4-inch construction heart redwood bender boards. Boards shall be lapped at one-third of the length of individual boards, with no two boards lapped at the same place. Hold boards in place with stakes same as above.

2.03 PAVEMENT PAINT

- A. Comply with Section 84-3.02 of the Standard Specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. This Specification shall cover newly surfaced areas as well as restoration of existing surfacing.
- B. Adjust existing and new manholes, meter boxes, cleanouts, etc. to match the new grade.

3.02 PAVEMENT CUTTING

- A. After backfilling trenches and prior to paving, saw cut existing pavement parallel to the trench (using a concrete saw) to a minimum depth equal to or greater than one-half the thickness thereof.
- B. The pavement shall be cut back 6 inches on each side of the trench or excavation wall.
- C. Re-cut and restore any pavement damaged outside these lines at the expense of the Contractor.
- D. Should voids develop under the existing pavements during construction, those affected pavements shall be neatly saw cut in straight lines and replaced after the voids have been filled.

3.03 PLACEMENT OF AGGREGATE BASE

- A. Subgrade Preparation:
 - 1. Water or dry subgrade as required to bring the soil to within 2% of the optimum moisture content for proper compacting.
 - 2. Compact to a relative compaction of not less than 95% in the upper 6 inches.
 - 3. When compaction of the subgrade areas on fill and embankments has been properly obtained, only such additional rolling will be required as necessary to obtain a thoroughly compacted subgrade immediately prior to placing the aggregate base thereon.
- B. Aggregate Base Tolerance:
 - 1. Do not place the aggregate base before the subgrade is approved by the Engineer.
 - 2. The finished aggregate base shall not vary more than 0.05 foot above, nor 0.10 foot below, the planned grade.
- C. Aggregate Base Placing:
 - 1. Spread the aggregate base material on the prepared subgrade by means of suitable spreading devices.
 - 2. The aggregate base material may be dumped in piles upon the subgrade and spread by bulldozing ahead from the dumped material.
 - 3. Each layer shall not exceed 0.50 feet.
 - 4. Segregation of large or fine particles of aggregate shall be avoided, and the material as spread shall be free from pockets of large and fine material.
- D. Compaction:
 - 1. Compact each layer of aggregate base material to not less than 95% relative compaction as determined by Test Method Calif. No. 216 or ASTM D1556 (Sand Cone), or Calif. No. 231 or ASTM D2922 (Nuclear method when approved by the Engineer).
 - 2. Compaction shall be in accordance with Section 26-1.03 of the Standard Specifications.
 - 3. Water aggregate base after compaction as provided in Section 17 of the Standard Specifications. Paragraph 17-1.04 is not applicable.

3.04 ASPHALT CONCRETE INSTALLATION

- A. Apply prime coat at a rate of 0.15-gallon per square yard. Blot any excess which has not penetrated the base with sand. Remove any loose sand.

- B. Apply tack coat a rate of 0.05-gallon per square yard.
- C. Spread and compact asphalt concrete in accordance with Standard Specifications Section 39 to the thickness shown on the Drawings.
- D. Protect asphaltic concrete paving until surface has cooled sufficiently to permit traffic without damage.
- E. Immediately remove spilled and splattered materials from adjacent surfaces.

END OF SECTION

SECTION 09960

HIGH PERFORMANCE COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Section 09960 provides the requirements for; coating systems, surface preparation, coating application, and quality assurance/quality control relative to the equipment, structures listed in the Contract Drawings.
- B. Unless specified elsewhere, or shown on the Contract Drawings, the following shall not be coated:
 - 1. Metal completely embedded in concrete (except aluminum).
 - 2. Piping buried in ground or encased in concrete.
 - 3. Galvanized metal, including galvanized pipe supports.
 - 4. Plastic pipe, including: polyvinyl chloride, polyethylene, and polypropylene piping.
 - 5. Stainless steel.
 - 6. Black steel.
 - 7. Bronze, brass.
 - 8. Nameplates and grease fittings.
 - 9. Factory finished electrical panels.
 - 10. Factory fusion-bonded epoxy coated items.
 - 11. Aluminum or galvanized ductwork enclosed inside furred ceiling spaces.
 - 12. Aluminum handrail and aluminum guardrail.
 - 13. Fiberglass.
 - 14. Electrical conduit.
 - 15. Copper pipe.
- C. The Contractor's bid shall be based upon using the products specified. If the products specified are not available in formulations that meet applicable regulations for volatile organic compound (VOC) levels at time of application, the Contractor shall submit for review products of equivalent quality and function that comply with regulations in effect at that time. A reasonable difference in cost of material between the first named items specified and the products that are required to meet regulations that change after the bid date and are in effect at the time of application may be approved for payment by Change Order in accordance with the General Conditions.

1.02 DEFINITIONS

- A. Abrasive: Material used for blast-cleaning, such as sand, grit or shot.
- B. Abrasive Blast Cleaning: Cleaning/surface preparation by abrasive propelled at high speed.
- C. Anchor Pattern: Profile or texture of prepared surface(s).
- D. American National Standards Institute (ANSI).
- E. ASTM International (ASTM).

- F. Bug Holes: Small cavities, usually not exceeding 15 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.
- G. Coating/Lining Thickness: The total thickness of primer, intermediate and/or finish coats.
- H. Dewpoint: Temperature of a given air/water vapor mixture at which condensation starts.
- I. Dry Film Thickness (DFT): Depth of cured film, usually expressed in mils (0.001-inch). Use this definition as opposed to existing definition.
- J. Drying Time: Time interval between application and curing of material.
- K. Dry to Recoat: Time interval between application of material and ability to receive next coat.
- L. Dry to Touch: Time interval between application of material and ability to touch lightly without damage.
- M. Feather Edging: Reducing the thickness of the edge of paint.
- N. Feathering: Operation of tapering off the edge of a point with a comparatively dry brush.
- O. Field Coat: The application or the completion of application of the coating system after installation of the surface at the site of the work.
- P. Hold Point: A defined point, specified in Section 09960, at which work shall be halted for inspection.
- Q. Holiday: A discontinuity, skip, or void in coating or coating system film that exposes the underlying substrate.
- R. Honeycomb: Segregated condition of hardened concrete due to non-consolidation.
- S. ICRI: International Concrete Repair Institute.
- T. Incompatibility: Inability of a coating to perform well over another coating because of bleeding, poor bonding, or lifting of old coating; inability of a coating to perform well on a substrate.
- U. Laitance: A layer of weak, non-durable concrete containing cement fine that is brought to the surface through bleed water as a result of concrete finishing/over-finishing.
- V. Mil: 0.001-inch.
- W. National Association of Corrosion Engineers International (NACE).
- X. Overspray: Dry spray, particularly such paint that failed to strike the intended surface.
- Y. Owner: The awarding authority or entity that manages/operates the facility where the specified work will be performed. For the purposes of Section 09960, the term "Owner" may also refer to designated representatives such as the Design Engineer, The Construction Manager, or an Independent Consultant.
- Z. Pinhole: A small diameter discontinuity in a coating or coating system film that is typically created by outgassing of air from a void in a concrete substrate resulting in exposure of the substrate or a void between coats.

- AA. Pot Life: Time interval after mixing of components during which the coating can be satisfactorily applied.
- BB. Resurfacer/Resurfacing Material: A layer of cementitious and/or resin-sed material used to fill or otherwise restore surface continuity to worn or damaged concrete surfaces.
- CC. Shelf Life: Maximum storage time for which a material may be stored without losing its usefulness.
- DD. Shop Coat: One or more coats applied in a shop or plant prior to shipment to the site of the work, where the field or finishing coat is applied.
- EE. Spreading Rate: Surface area covered by a unit volume of paint at a specific film thickness.
- FF. The Society for Protective Coatings (SSPC).
- GG. Stripe Coat: A separate coat of paint applied to all weld seems, pits, nuts/bolts/ washers, and edges by brush. This coat shall not be applied until any previous coat(s) have cured and, once applied, shall be allowed to cure prior to the application of the subsequent coat(s).
- HH. Surface Saturated Dry (SSD): Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.
- II. Tie Coat: An intermediate coat used to bond different types of coatings. Coatings used to improve the adhesion of a succeeding coat.
- JJ. Touch-Up Painting: The application of paint on areas of painted surfaces to repair marks, scratches, and areas where the coating has deteriorated to restore the coating film to an unbroken condition.
- KK. Technical Practice Committee (TPC).
- LL. VOC Content: The portion of the coating that is a compound of carbon, is photo chemically reactive, and evaporates during drying or curing, expressed in grams per liter (g/l) or pounds per gallon (lb/gal).
- MM. Immersion: Refers to a service condition in which the substrate is below the waterline or submerged in water or wastewater at least intermittently if not constantly.
- NN. Weld Spatter: Beads of metal scattered near seam during welding.
- OO. Wet Film Thickness (WFT): The primer or coating film's thickness immediately following application. Wet film thickness is measured in mils or thousandths of an inch (0.001-inch) and is abbreviated WFT.

1.03 REFERENCES

- A. Section 09960 contains various guide documents, technology reports, and other industry standards relative to surface preparation, coating application, and testing methods. They are a part of Section 09960 as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of Section 09960 shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Invitation to Bid. If referenced documents have been

discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

C. Standards and References are included as Appendix A.

1.04 SUBMITTALS

A. Provide in accordance with Section 01300:

1. Submit a list and description of all surfaces for which there is a question about what standard coating system to apply as part of the work covered by Section 09960 through a Request for Information.
2. Submit a Complete Finish Schedule including the specified Finish Schedule included in paragraph 2.02 and any additional surfaces to be coated by products submitted under this Section 09960. Denote the specific products and specific manufacturers for each item (structure, equipment, or substrate plus the manufacturer's brand name, product name, and designation number for each coat of each system to be used).
 - a. If materials other than those listed are submitted, provide information to justify and define the proposed substitution. The Owner may further require the Contractor to furnish additional test results from an independent paint laboratory comparing the proposed substitution with one of the named products, at no additional cost to the Owner.
 - b. Submit a color card or fan deck for each manufacturer and each coating product submitted.
3. Prior to ordering material, confirm the items included in the Complete Finish Schedule and submit the Complete Finish Schedule plus the Owner approved colors for each location (structure, equipment, substrate).
4. Current printed recommendations and product data sheets for coatings/coating systems including:
 - a. VOC data.
 - b. Storage requirements.
 - c. Surface preparation recommendations.
 - d. Primer type, where required.
 - e. Maximum dry and wet mil thickness per coat.
 - f. Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - g. Curing time before submergence in liquid.
 - h. Thinners/solvents for reduction and cleaning.
 - i. Ventilation requirements.
 - j. Minimum and maximum atmospheric application conditions.
 - k. Allowable application methods.
 - l. Maximum allowable moisture content (concrete substrates).
 - m. Maximum shelf life.
5. Manufacturer's Certification that the submitted coatings meet applicable Air Quality Management District regulations as to allowable VOC content for the place of application and use intended.
6. Qualifications for Quality Control personnel to be provided on site by the Contractor including, but not limited to, the inspector's NACE and SSPC

Certification numbers for the certifications requested in paragraph 1.05.E.2 of this Section 09960.

7. Material Safety Data Sheets (MSDS) for all materials to be delivered to the job site, including coating system materials, solvents, and abrasive blast media.
8. A minimum of five project references, including current contact name, address, and telephone number where the submitted materials have been successfully applied, in similar exposures, within the past 5 years. This submittal is only required if products not listed in Section 09960 are submitted.
9. A letter from the selected and approved coating manufacturers for the project that verifies that the applicator meets the quality assurance requirements of paragraph 1.05.C of Section 09960 including application personnel training requirements.
10. Information that defines the end date for field coating application for all equipment, machinery, and piping to ensure that the maximum recoat time for the shop applied primers will not be exceeded when field applied coatings are installed.
11. Provide written confirmation by the shop and field applied coating manufacturers that compatibility between the shop and field applied coatings has been checked and approved by those manufacturers.

1.05 QUALITY ASSURANCE

A. Environmental Regulatory Requirements:

1. All work, material, procedures, and practices under Section 09960 shall conform to requirements of the local Air Resources Board or Air Quality Management District having jurisdiction. Prime or finish coat painting done in locations other than the project site shall be in accordance with air quality regulations in effect at the place the coating is applied. Products specified herein are, to the best of the Design Engineer's knowledge, in compliance with the applicable VOC levels allowable at the date these Specifications were issued for bid.
2. The Air Resources Board or Air Quality Management District having jurisdiction may prohibit the sale or application of paints and enamels containing more than the stipulated quantities of volatile organic compounds manufactured after a stated date. Provide material meeting applicable regulations effective at the date of manufacture, or if not available, provide top of the line materials developed as replacements for specified materials and meeting applicable regulations as to VOC content.
3. If the Contractor applies coatings that have been modified or thinned other than as recommended or approved by manufacturer, the Contractor shall be responsible for any fines, costs, remedies, or legal actions that may result.
4. Surface preparation activities that result in the generation of airborne emissions shall be performed in accordance with applicable Federal, State, County, or Local regulations and ordinances. The Contractor shall be responsible for securing any and all licenses and permits required, at no additional cost to the Owner.
5. All debris (liquid or solid) generated from surface preparation or coating activities shall be disposed offsite in accordance with applicable Federal, State, County, or local regulations and ordinances. The Contractor shall be responsible for all required testing, licenses, permits, and fees, at no additional cost to the Owner.

- B. Coating Manufacturer's Qualifications:
 - 1. All protective coatings furnished under Section 09960 shall:
 - a. Be of a manufacturer who has been regularly engaged in the manufacture of protective coatings with a minimum of 10 years of successful experience.
 - b. Demonstrate to the satisfaction of the Engineer successful performance on comparable projects.
- C. Coating Applicators Qualifications:
 - 1. The application company or entity must demonstrate with written references as required in 1.04 A. 7. and 8. a minimum of five (5) years of practical experience in the application of the specified coatings and the successful completion of a minimum of five (5) projects of similar size and complexity within the last five (5) years. This must be verified in writing by the selected coating system manufacturer.
 - 2. For the application company's or entity's personnel: employ only those persons on the project trained in the application of the specified protective coatings. Written confirmation of this must be provided by the approved coating systems manufacturer.
- D. Contractor Quality Control Requirements:
 - 1. The Contractor is responsible for ensuring that the surface preparation and coating activities meet the requirements of this specification. Inspections by the Owner, or a representative of the coating manufacturer, will not relieve or limit the Contractor's responsibilities.
 - 2. The specified quality control tasks shall be performed by an individual who has been properly trained and has a minimum of 5 years experience.
 - 3. Coatings application shall conform to requirements of this specification and the standards referenced in paragraph 1.03.B. Changes in the coating system installation requirements will be allowed only with the written authorization of the Owner before work commences.
 - 4. Contaminated, outdated, diluted materials, and/or materials from previously opened containers shall not be used.
 - 5. For repairs, the Contractor shall provide the same products, or products recommended by the coating manufacturer, as used for the original coating.
 - 6. The Contractor shall identify the points of access for inspection by the Owner.
 - 7. The Contractor shall provide ventilation, ingress and egress, and other means necessary for the Owners' personnel to safely access the work areas.
 - 8. The Contractor shall conduct the work so that the coating system is installed as specified and shall inspect the work continually to ensure that the coating system is installed as specified. Coating system work that does not conform to the Specifications or is otherwise not acceptable shall be corrected in accordance with the coating manufacturer's written procedures.
 - 9. Acceptance criteria for each Quality Control test shall be as indicated on the Coating Detail Sheets, the manufacturer's published data, or elsewhere in this specification, whichever is more stringent.

1.06 ILLUMINATION

- A. Provide the following minimum illumination during all phases of work:
 - 1. General work area: 25-Foot Candles.
 - 2. Surface preparation and coating application: 30-Foot Candles.

3. Inspection: 50-Foot Candles.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all coating materials in unopened containers with manufacturer's label, which must include name, batch number, manufacturer date, shelf life, and VOC content.
- B. Store in an assigned area onsite with concurrence from the coating manufacturers. Maintain storage area clean and fire safe. Dispose of used rags, thinner and buckets daily. Store solvents in closed approved storage containers.

1.08 WARNINGS

- A. Be advised that application of paint, epoxy, and protective coating materials may be hazardous. Take all necessary precautions to ensure the safety of workers and property.
- B. Be advised that as a part of this work abrasive blasting is required. This may require the use of special equipment. Become familiar with the existing site conditions and take all steps necessary to protect adjacent facilities and personnel, at no additional cost to the Owner. In addition, abrasive blasting and painting is called for in, on or around mechanical equipment, which may be damaged by grit, dust, or painting overspray. Mask, wrap, enclose, and provide all protection required to safeguard this equipment at no additional cost to the Owner.
- C. Perform abrasive blasting activities in a manner that will not cause nuisance to operations, and adjacent public and private property and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The Coating Detail Sheets in Appendix B refer to specific manufacturers and have been provided as levels of quality as well as jurisdictional VOC compliance for the specified substrate and exposure conditions. Although not stated on the Coating Detail Sheets, the term "or approved equal" is applicable.
- B. Coatings used in each coating system shall be the products of a single coating manufacturer. Mixed manufacturer coating systems are prohibited.
- C. Alternate coating systems submitted for consideration must be of the same generic type as those specified.
- D. Coatings shall not contain heavy metals that exceed the regulated levels of the jurisdiction in which the coatings will be applied.
- E. Colors are to be factory mixed, using light-fast colorants proportioned by accurate measurement into proper type base.
- F. Abrasive Media:
 - 1. Shall not be classified as a health or environmental hazard.
 - 2. Shall be delivered to the site in sealed bag or containers.
 - 3. Shall be kept clean and dry while stored on site.
 - 4. Shall not be reused for abrasive blasting unless specifically manufactured for reuse and appropriate recycling equipment is utilized.

5. Shall be of an appropriate size, shape, and hardness to produce the specified surface profile(s).

2.02 COATING SYSTEMS

- A. System Designations and Related Requirements:
 1. The following table provides a general list of the coating systems by both substrate and exposure conditions. Additional information regarding surface preparation, application, dry film thicknesses, and approved products by manufacturer is provided on the Coating Detail Sheets in Appendix B.
 2. It shall be the Contractor's responsibility to ensure that there is chemical compatibility between all shop applied primers or coatings on all machinery and equipment provided for the project and any field applied coatings. Compatibility shall mean that there is no chemical reactivity or physical property of the shop or field applied coatings which will cause or promote intercoat adhesion problems or proper cure problems for the shop or field applied coatings on machinery or equipment or piping. The Contractor shall provide written confirmation by the shop and field applied coating manufacturers that compatibility has been checked and approved by those manufacturers. The rework to correct any compatibility problem between shop and field applied coatings shall be solely the responsibility of the Contractor at no additional cost to the Owner.

System Identification	Substrate	Exposure
System No. 2: Zinc-Epoxy-Urethane	Metal (Ductile Iron Pipe)	Atmospheric Exterior Direct Sunlight Non Immersion Mildly Corrosive

- B. Coating System Detail Sheets:
 1. Coating System Detail Sheets (CDS) are included in Appendix B.
- C. The Contractor shall provide 1 unopened gallon container of each color and type of coating and solvent/thinner applied during the course of the project to the Owner upon completion of the project.

PART 3 - EXECUTION

3.01 COATINGS

- A. General:
 1. Coating application shall not proceed until the Owner has received the VOC certifications specified in paragraph 1.04.A.4, the Owner has inspected the materials, and the coating manufacturer has trained the Contractor in the surface preparation, mixing and application of each coating system.
- B. Shop and Field Coats:
 1. Shop applied prime coat: Except as otherwise specified, prime coats may be shop-applied or field-applied. Shop-applied primer shall be compatible with the specified coating system and shall be applied at the minimum dry film

thickness recommended by the coating manufacturer. Product data sheets identifying the shop primer used shall be provided to the on-site coating application personnel. Adhesion tests shall be performed on the shop primer as specified in paragraph 3.01.B.3. Damaged, deteriorated, and poorly applied shop coatings that do not meet the requirements of Section 09960 shall be removed and the surfaces recoated. If the shop prime coat meets the requirements of this Section, the field coating may consist of touching up the shop prime coat and then applying the finish coats to achieve the specified film thickness and continuity.

2. Field Coats: Field coats shall consist of one or more prime coats and one or more finish coats to build up the coating to the specified dry film thickness. Unless otherwise specified, finish coats shall not be applied until other work in the area is complete and until previous coats have been inspected.
3. Adhesion Confirmation: The Contractor shall perform an adhesion test after proper cure in accordance with ASTM D3359 to demonstrate that: (1) the shop applied prime coat adheres to the substrate; and (2) the specified field coatings adhere to the shop coat. Test results showing an adhesion rating of 5A on immersed surfaces and 4A or better on other surfaces shall be considered acceptable for coatings 5 mils or more in thickness (Method A). Test results showing an adhesion rating of 5B on immersed surfaces and 4B or better on other surfaces shall be considered acceptable for coating thicknesses less than 5 mils.

C. Application Location Requirements:

1. Equipment, Non-immersed: Items of equipment, or parts of equipment which are not immersed in service, shall be shop primed and then finish coated in the field after installation with the specified or acceptable color. If the shop primer requires top coating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation. If equipment removal and reinstallation is required for the project, touch-up coating work shall be performed in the field following installation.
2. Equipment, Immersed: Items of equipment, or parts and surfaces of equipment which are immersed when in service, with the exception of pumps and valves, shall have surface preparation and coating work performed in the field. Coating systems applied to immersed equipment shall be pinhole free.

3.02 PREPARATION

A. General:

1. Surface preparations for each type of surface shall be in accordance with the specific requirements of each Coating System Detail Sheet (CDS) and the manufacturer's requirements. In the event of a conflict, the more stringent requirement shall take precedence.
2. Surfaces to be coated shall be clean and dry. Before applying coating or surface treatments, oil, grease, dirt, rust, loose mill scale, old weathered coatings, and other foreign substances shall be removed. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the adhesion of the coatings. The air used for blast cleaning shall be sufficiently free of oil and moisture to not cause detrimental contamination of the surfaces to be coated.

3. Cleaning and coating shall be scheduled so that dust and spray from the cleaning process shall not fall on wet, newly coated surfaces. Hardware, hardware accessories, nameplates, data tags, machined surfaces, sprinkler heads, electrical fixtures, and similar uncoated items which are in contact with coated surfaces shall be removed or masked prior to surface preparation and painting operations. Following completion of coating, removed items shall be reinstalled. Equipment adjacent to walls shall be disconnected and moved to permit cleaning and painting of equipment and walls and, following painting, shall be replaced and reconnected.
 4. Containment: The Contractor shall erect and maintain protective enclosures as required to ensure that surface preparation debris, including dust, is contained within the immediate work area. All costs associated with containment shall be paid by the Contractor.
 5. Dust and Contaminants: Protect substrate from excessive dust and airborne contaminants during coating application and curing. Use temporary dust barriers to close off areas being painted from areas where other work is being performed.
- B. Abrasive Blast Cleaning:
1. When abrasive blast cleaning is required to achieve the specified surface preparation the following requirements for blast cleaning materials and equipment shall be met:
 - a. Used or spent blast abrasive shall not be reused on this project.
 - b. The compressed air used for blast cleaning shall be filtered and shall contain no condensed water and no oil. Moisture traps shall be cleaned at least once every 4 hours or more frequently as required to prevent moisture from entering the supply air to the abrasive blasting equipment.
 - c. Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. These shall be checked on the same frequency as the moisture traps as defined in Item 2 above.
 - d. Regulators, gauges, filters, and separators shall be in use on compressor air lines to blasting nozzles times during this work.
 - e. An air dryer or desiccant filter drying unit shall be installed which dries the compressed air prior to blast pot connections.
 - f. The air dryer shall be used and maintained for the duration of surface preparation work.
 - g. The Contractor shall provide ventilation for airborne particulate evacuation (meeting pertinent safety standards) to optimize visibility for both blast cleaning and inspection of the substrate during surface preparation work.
 - h. If between final surface preparation work and coating system application, contamination of prepared and cleaned metallic substrates occurs, or if the prepared substrates' appearance darkens or changes color, re-cleaning by water blasting, re-blasting and abrasive blast cleaning shall be required until the specified degree of cleanliness is reclaimed.
 - i. The Contractor is responsible for dust control and for protection of mechanical, electrical, and other equipment adjacent to and surrounding the work area.

- C. Solvent Cleaning:
1. Any solvent wash, solvent wipe, or cleaner used, including but not limited to those used for surface preparation in accordance with SSPC SP-1 Solvent Cleaning shall be of the emulsifying type which emits no more than 340 g/l VOCs for AIM regions, 250 g/l for CARB regions and 100 g/l for SCAQMD regions, contains no phosphates, is biodegradable, removes no zinc, and is compatible with the specified primer.
 2. Clean white cloths and clean fluids shall be used in solvent cleaning.
- D. Ferrous Metal Substrates:
1. Ferrous surfaces shall be prepared in accordance with applicable surface preparation specifications of SSPC/NACE specified for each coating system. Specific surface preparation requirements are stated on the CDS. The profile depth of the surface to be coated shall be in accordance with the CDS requirements and shall be measured by Method C of ASTM D4417. Blast particle size shall be selected by the Contractor to produce the specified surface profile. The solvent in solvent cleaning operations shall be as recommended by the coating manufacturer.
 2. Preparation of ferrous metal surfaces shall be based upon comparison with SSPC-VIS1, and as described in the CDS for each coating system. If dry abrasive blast cleaning is selected and to facilitate inspection, the Contractor shall, on the first day of cleaning operations, abrasive blast metal panels to the standards specified. Plates shall measure a minimum of 8-1/2 inches by 11 inches. Panels meeting the requirements of the specifications shall be initialed by the Contractor and the Owner and coated with a clear non-yellowing finish. One of these panels shall be prepared for each type of abrasive blasting and shall be used as the comparison standard throughout the project.
 3. Blast cleaning requirements for steel and ductile-iron substrates are as follows:
 - a. Ferrous steel piping shall be prepared in accordance with SSPC SP-6 and primed before installation.
 - b. Ductile-iron piping surfaces including fittings shall be prepared in accordance with NAPF 500-03, NAPF 500-03-04, and NAPF 50.
 - c. Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products or embedded abrasive from substrate by vacuum cleaning prior to coating application.
 - d. Care must be taken to prevent contamination of the surface after blasting from worker's fingerprints, deleterious substances on workers' clothing, or from atmospheric conditions.
- E. Thermoplastic Surfaces:
1. Prepare thermoplastic surfaces of polyethylene, PVC, CPVC, or FRP by sanding to establish uniform surface roughness and to remove gloss from the substrate. Vacuum clean substrate to remove loose dust, dirt, and other materials. Next, solvent clean using clean white rags and allow solvent to completely evaporate before application of coating materials.

3.03 APPLICATION

- A. Workmanship:
1. Coated surfaces shall be free from excessive runs, sags, drips, ridges, waves, laps, and brush marks. Coats shall be applied to produce an even film of uniform thickness completely coating corners and crevices. Minor and

infrequent runs and sags which are within the total specified D.F.T. plus a few mils (no more than 10% more mils than the specified total D.F.T.) will be acceptable. However, frequent runs or sags which exceed these limits or otherwise will be detrimental to coating system performance shall not be accepted.

2. The Contractor's spray equipment shall be designed for application of the materials specified. Compressors shall have suitable traps and filters to remove water and oils from the air. Spray equipment shall be equipped with mechanical agitators, pressure gages, and pressure regulators, and properly sized spray tips.
3. Each coating application be applied evenly and sharply cut to line. Care shall be exercised to avoid overspray or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and installations shall be protected by taping, drop cloths, or other suitable measures.
4. Coating applications method shall be as recommended by the coating manufacturer.
5. Allow each coat to cure or dry thoroughly, according to the coating manufacturer's printed instructions, prior to recoating.
6. Vary color for each successive coat for coating systems when possible.
7. When coating complex steel shapes, prior to overall coating system application, stripe coat welds, edges of structural steel shapes, metal cut-outs, pits in steel surfaces, or rough surfaces with the prime coat. This involves applying a separate coat using brushes or rollers to ensure proper coverage. Stripe coat via spray application is not permitted.

B. Coating Properties – Mixing and Thinning:

1. Coatings, when applied, shall provide a satisfactory film and smooth even surface. Glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Coating materials shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings consisting of two or more components shall be mixed in accordance with the coating manufacturer's instructions. Where necessary to suit the conditions of the surface, temperature, weather and method of application, the coating may be thinned as recommended by the coating manufacturer immediately prior to use. The VOC of the coating as applied shall comply with prevailing air pollution control regulations. Unless otherwise specified, coatings shall not be reduced more than necessary to obtain the proper application characteristics. Thinner shall be as recommended by the coating manufacturer.
2. Mixing of partial "kits" is strictly prohibited unless authorized in writing by the coating manufacturer and the Owner. This prohibition also applies to coatings mixed for touchup or repairs. If authorized to mix partial kits, the Contractor shall utilize containers with appropriate graduated markings/calibrated weight scales.

C. Environmental Conditions:

1. Provide adequate heat, ventilation, and dehumidification to ensure that the coating manufacturer's environmental requirements are met and to ensure no loss of production days due to failure to meet coating manufacturer's environmental requirements.

2. Provide sufficient and continuous ventilation and air movement across coated substrates to remove volatile constituents (solvent) throughout the manufacturer's published curing period.
 3. Air and surface temperatures: Prepare surfaces, apply and cure coatings within air and surface temperature range recommended by coating manufacturer.
 4. Relative humidity: Prepare surfaces, apply and cure coatings within relative humidity range in accordance with coating manufacturer's instructions.
 5. Dew Point: Do not apply coatings unless the temperature of the dew point is 5°F or greater than the temperature of the substrate.
 6. Precipitation: Do not apply coatings in rain, snow, fog, or mist.
 7. Wind: Do not spray apply coatings when the wind direction and velocity are such that overspray may result in property damage.
- D. Protection of Coated Surfaces:
1. Items which have been coated shall not be handled, worked on, or otherwise disturbed, until the coating is completely dry and hard. After delivery at the site, and upon permanent erection or installation, shop-coated metalwork shall be recoated or retouched with specified coating when it is necessary to maintain the integrity of the film.
- E. Film Thickness and Continuity:
1. WFT of the first coat of the coating system and subsequent coats shall be verified by the Contractor, during application of each coat.
 2. Coatings shall be applied to the minimum dry film thickness specified as indicated on the CDS. Dry film thickness shall be determined using the appropriate industry standard for the substrate (SSPC-PA 2, SSPC-PA 9, or ASTM D1400). Coatings determined to be above the maximum dry film thickness as indicated on the CDS or the coating manufacturer's product data sheet, will be removed at the Owner's discretion.
 3. In testing for continuity of coating about welds, projections (such as bolts and nuts), and crevices, the Owner shall determine the minimum conductivity for smooth areas of like coating where the dry mil thickness has been accepted. This conductivity shall be the minimum required for these rough or irregular areas. Pinholes and holidays shall be recoated to the required coverage.
 4. The ability to obtain specified film thickness is generally compromised when brush or roller application methods are used and, therefore, more coats may be needed to be applied to achieve the specified dry film thickness.
 5. For concrete substrates, the Contractor shall apply a complete skim coat of the specified filler-surfacer material over the entire substrate prior to application of the coating system. This material shall be applied such that all open air voids and "bug holes" in the concrete substrate are completely filled prior to coating application.

- F. Soluble Salt Contamination of Metal Substrates:
1. Contractor shall test in accordance with SSPC Guide 15 metal substrates to be coated that have been exposed to sea water or coastal air or to industrial fallout of particulate or other sources of soluble chlorides (such as waste water exposure). If testing indicates chloride levels in excess of 25 ppm exist after the surface preparation has been completed, the Contractor shall re-clean and prepare these surfaces until chloride levels are below 25 ppm.

3.04 INSPECTION AND TESTING BY AN INDEPENDENT THIRD PARTY

- A. The Owner reserves the right to engage the services of an independent third party to provide quality control inspection. Third party inspection is in addition to any inspection required to be performed by the Contractor and does not limit the Contractor's responsibility for quality workmanship or quality control as specified.
- B. Third party inspection will be performed in a manner which limits interference / inhibits the Contractor's operations. Whenever feasible, the third party inspections will be performed concurrently with the Contractor's required inspections.
- C. Testing Discrepancies: In the event that discrepancies occur relative to test methods or test results, the findings of the Independent Third Party shall be final. The Contractor shall not be entitled to additional monies for rework/additional work necessary to satisfy the requirements of the specification as a result of the Independent Third Parties findings.

3.05 FINAL INSPECTION

- A. Contractor shall conduct a final inspection to determine whether coating system work meets the requirements of the Specifications.
- B. The Owner will subsequently conduct a final inspection with the Contractor to determine the work is in conformance with requirements of the contract documents.
- C. Any rework required shall be marked. Such areas shall be re-cleaned and repaired as specified at no additional cost to the Owner.

3.06 CLEANUP

- A. Upon completion of the work, the Contractor shall remove and dispose of surplus materials, protective coverings, spent abrasive, and accumulated rubbish.
- B. All surfaces shall be thoroughly cleaned and any damage resulting from surface preparation or coating application shall be repaired.

END OF SECTION

SECTION 09960

APPENDIX A - STANDARDS AND REFERENCES AND MANDATORY QUALITY CONTROL TESTING

I. STANDARDS AND REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI/NSF 61 Drinking Water System Components
- B. ASTM International (ASTM):
 - 1. ASTM D16-11a Standard Terminology for Paint, Related Coatings, Materials and Applications
 - 2. ASTM D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
 - 3. ASTM D4262 Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
 - 4. ASTM D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
 - 5. ASTM D4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages
 - 6. ASTM D4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - 7. ASTM D4541 Standard Test Methods for Pull-Off Strength of Coatings on Metal Substrates Using Portable Adhesion Testers
 - 8. ASTM D4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
 - 9. ASTM D5162 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
 - 10. ASTM D7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Adhesion Testers
 - 11. ASTM E337 Standard Test Method for Measuring Humidity With a Psychrometer
 - 12. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- C. Federal:
 - 1. FS 595b: Federal Standard Colors
- D. International Concrete Repair Institute (ICRI):
 - 1. ICRI 310.2 Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
- E. National Association of Corrosion Engineers International (NACE):
 - 1. NACE Standard SP0188 Standard Recommended Practice – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
 - 2. NACE Standard RP0288 Standard Recommended Practice, Inspection of Linings on Steel and Concrete
 - 3. NACE Standard SP0892 Standard Recommended Practice, Linings Over Concrete in Immersion Service
 - 4. NACE Publication TPC2 Coatings and Linings for Immersion Service

- F. National Association of Pipe Fabricators (NAPF):
 - 1. NAPF 500-03 Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
- G. Occupational Safety and Health Administration (OSHA):
 - 1. OSHA Title 29, Part 1926 Safety and Health Standards for Construction
- H. Society for Protective Coatings (SSPC) ⁽¹⁾:
 - 1. SSPC-PA COM Paint Application Specifications and Guides (Commentary)
 - 2. SSPC-AB 1 Mineral and Slag Abrasives
 - 3. SSPC-PA 1 Shop, Field, and Maintenance Painting of Steel
 - 4. SSPC-PA 2, Level 3 Measurement of Dry Coating Thickness with Magnetic Gages
 - 5. SSPC-PA 9 Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages
 - 6. SSPC Technology Guide 6 Guide for Containing Debris Generated During Paint Removal Operations
 - 7. SSPC Technology Guide 7 Guide to the Disposal of Lead-Contaminated Surface Preparation Debris
 - 8. SSPC-PA Guide 10 A Guide to Safety and Health Requirements for Industrial Painting Projects
 - 9. SSPC-PA Guide 11 Protecting Edges, Crevices, and Irregular Steel Surfaces by Stripe Coating
 - 10. SSPC Technology Guide 12 Guide for Illumination of Industrial Painting Projects
 - 11. SSPC-PA Guide 15 Field Methods for Retrieval and Analysis of Soluble Salts on Steel and other Non Porous Substrates
 - 12. SSPC-PA Guide 17 Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
 - 13. SSPC-PA Guide 19 Guide to Selecting Coatings for Use Over Galvanized Steel Substrates
 - 14. SSPC SP1 Solvent Cleaning
 - 15. SSPC SP2 Hand Tool Cleaning
 - 16. SSPC SP3 Power Tool Cleaning
 - 17. SSPC SP5 White Metal Blast Cleaning
 - 18. SSPC SP6 Commercial Blast Cleaning
 - 19. SSPC SP7 Brush-Off Blast Cleaning
 - 20. SSPC SP10 Near-White Blast Cleaning
 - 21. SSPC SP11 Power Tool Cleaning to Bare Metal
 - 22. SSPC SP 13 Surface Preparation of Concrete
 - 23. SSPC SP 14 Industrial Blast Cleaning
 - 24. SSPC SP 15 Commercial Grade Power Tool Cleaning
 - 25. SSPC SP 16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
 - 26. SSPC-TR 2/NACE 6G198 Wet Abrasive Blast Cleaning

- | | | |
|-----|---------------------|--|
| 27. | SSPC-TR3/NACE 6A192 | Dehumidification and Temperature Control During Surface Preparation, Application, and Curing for Coatings/Linings of Steel Tanks, Vessels, and Other Enclosed Spaces |
| 28. | SSPC-TU-3 | Overcoating |
| 29. | SSPC-VIS 1 | Visual Standard for Abrasive Blast Cleaned Steel |
| 30. | SSPC-VIS 3 | Visual Standard for Power and Hand – Tool Cleaned Steel |
| 31. | SSPC-VIS 4 | Visual Standards (Waterjetting) |
| 32. | SSPC-VIS 5 | Visual Standards (Wet Abrasive Blast Cleaning) |
| 33. | SSPC-WJ 1,2,3,4 | Water Jetting Surface preparation Standards |

II. MANDATORY QUALITY CONTROL TESTS

Test Requirement	Reference Standard	Interval / Frequency
Measure and Record Ambient and Surface Temperatures	N/A	During coating application and initial cure. Every 3 hours.
Measure and Record Relative Humidity and Dew Point	ASTM D 337	During coating application and initial cure. Every 3 hours,
Abrasive Cleanliness	SSPC AB-1 SSPC AB-2 ASTM D 4940	Each day abrasive blasting is performed. Immediately prior to start of abrasive blasting.
Compressed Air Cleanliness	ASTM D 4285	Each day compressed air is utilized for abrasive blasting, paint application, or to remove surface contamination; immediately prior to any of the indicated operations.
Levels of Soluble Salt Contamination (steel and other nonporous substrates)	SSPC Technology Guide 15	Each day coating application is performed; immediately prior to coating application.
Surface pH (concrete or metal)	ASTM D 4262 (use 6.1 and 6.2 for metal)	Each day coating application is performed; immediately prior to coating application.
Measurement of Surface Profile (metal substrates)	ASTM D 4417	Each day surface preparation is performed. Upon completion of shift or task.
Measure and Record Material Temperatures (all components)	N/A	Each day coating application is performed. Immediately prior to coating application.
Wet Film Thickness	ASTM D 4414	Each day coating application is performed. Hourly during coating application.

Test Requirement	Reference Standard	Interval / Frequency
Dry Film Thickness (ferrous metal/magnetic substrates)	SSPC-PA 2	After coating has properly cured. After each layer (component) of the specified coating system.
Adhesion Testing (metal substrates)	ASTM D 4541	After coating system has properly cured. Number of tests proportionate to surface area.

SECTION 09960

APPENDIX B – COATING DETAIL SHEETS

HIGH PERFORMANCE COATINGS

Coating Detail Sheet:	System No. 2
Coating Material:	Zinc-Epoxy-Polyurethane System
Surface:	Metal
Service Condition:	Exterior, exposed to direct sunlight, mildly corrosive, non-immersed.
Surface Preparation:	
General:	Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-3 (Power Tool Cleaning) and recoated with the primer specified. For System No. 2 over factory coated or shop primed pumps, tanks, or other equipment, delete the zinc rich primer and use a compatible primer as recommended by the coating manufacturer.
Ferrous Metal:	Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning) 2.5 – 3.0. Ductile iron surfaces to be coated shall be abrasive blast cleaned in accordance with Section 09900, paragraph 3.02.D. Ferrous metal with rust bleeding shall be cleaned in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal). Areas of rust penetration shall be spot blasted to SSPC SP-10 (Near White Blast) and spot primed with the specified primer.
Galvanized Metal:	Damaged galvanized steel areas with exposed ferrous metal and/or rusted shall be cleaned in accordance with SSPC SP-5 (White Metal Blast Cleaning) or Power Tool Cleaned to Bare Metal in accordance with SSPC SP-11 to achieve a uniform 1.0 to 1.5 mil profile and spot primed with the primer specified. Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-16 to impart a 1.0 to 2.0 mil profile to the galvanized steel surfaces. Where this cannot be performed, prepare by abrading in accordance with

Coating Detail Sheet:**System No. 2**

SSPC SP-3, Power Tool Cleaning to impart a 1.0 to 1.5 mil profile uniformly to the galvanized steel surfaces.

For System No. 2 over galvanized steel, delete the zinc rich primer.

Application:

Field

General:

Prime coat may be thinned and applied as recommended by the coating system manufacturer, provided the coating as applied complies with prevailing air pollution control regulations.

Ferrous Metal:

Prime coats shall be a zinc rich epoxy or polyurethane primer compatible for use with urethane finish coats and applied in accordance with written instructions of the coating manufacturer or in the case of CARB or SCAQMD applications, prime with specified primer that is not zinc rich. In these cases, only a two-coat system is applied.

System Thickness:

Minimum of; 3 to 4 mils of zinc rich primer, one intermediate or primer epoxy coat at 5 to 6 mils and one finish coat of polyurethane at 2 to 3 mils DFT.

Coatings:

Primer:

One coat at the coating manufacturer's recommended dry film thickness per coat to meet the specified minimum thickness.

Intermediate:

One coat at the coating manufacturer's recommended dry film thickness per coat to meet the specified minimum thickness.

Finish

One coat at the coating manufacturer's recommended dry film thickness per coat to meet the specified minimum thickness.

Approved Manufacturers:

1. All of California (California Air Resources Board) except SCAQMD:

System Manufacturer	First / Prime Coat(s)	Intermediate Coat(s)	Finish Coat(s)
PPG	Amercoat 68HS	Amerlock 400 VOC	Amershield VOC
Carboline	859 VOC	Carboguard 890 VOC	Carbothane 134MC
Sherwin Williams	Zinc Clad III HS Primer	Macropoxy 646 100	Hi Solids Polyurethane 100
Tnemec	Series 94 H ₂ O	Series V69	Series 1075

END OF SYSTEM NO. 2

SECTION 11001

GENERAL EQUIPMENT AND MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: The general requirements for all of the Equipment and Mechanical work in the scope of the Project, included in Divisions 11, 13, and 15, and elsewhere wherever specifically mentioned in these Specifications.
- B. Direct the attention of all subcontractors and suppliers of equipment and related appurtenances for the work to the applicable provisions in the Contract Documents wherever they may occur.

1.02 REFERENCES

- A. American Gear Manufacturers Association (AGMA).
- B. American Institute of Steel Construction (AISC).
- C. California Code of Regulations, Title 8 Industrial Relations (CAL/OSHA).
- D. Hydraulic Institute.
- E. National Electrical Manufacturers Association (NEMA).
- F. Occupational Safety and Health Act (OSHA)

1.03 STANDARDS FOR THE WORK

- A. Complete Systems: Provide pipe, fittings, wiring and supports to produce complete, operable systems with all elements properly interconnected. If a specific dimensioned location is not shown for interconnections or smaller system elements, select appropriate locations and show them on Shop Drawing submittals for review.
- B. Provide equipment and material new and without imperfections. Erect in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. Locate oil and lubrication fittings clear of and away from guards, base, and equipment and within reach from the operating floor. Coordinate location of all engine connections in order to properly orient encased electrical conduits. In order to meet these requirements with equipment as furnished, minor deviation from the Drawings may be made as favorably reviewed by the Engineer.

- C. The recommendations and instructions of the manufacturers of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Shop Drawings: Submit Shop Drawings to the Engineer and receive favorable review prior to fabrication, construction or delivery to the project site in accordance with Section 01300 of these Specifications. Show sizes and arrangement of equipment, foundations and anchor bolts required, performance characteristics, pump curves, control diagrams, wiring diagrams, engine data sheets, methods of assembly, pipe hanging details, and connections to other work. Date and sign drawings as certified for use in construction of this project. The arrangement of mechanical equipment and appurtenant piping shown on the Drawings may be varied as necessary to fit the favorably reviewed certified manufacturer's installation drawings. However, manufacturers' drawings shall not deviate in substance from the Contract Drawings and Specifications as to location, size, type and design of equipment.

The following minimum requirements shall accompany all equipment submissions:

1. Overall dimensions.
 2. Mounting arrangement and dimensions.
 3. Description of materials.
 4. Connection sizes and orientation.
 5. Capacity and location of lifting eyes.
 6. Engine arrangement showing location of electrical connections.
 7. Rating data - Mechanical and Electrical as applicable.
 8. Detail electrical wiring diagrams, showing component designation and rating.
 9. Seismic design certifications and anchorage descriptions as required by Section 01190.
 10. Engine data.
 11. List of special tools and/or spare parts to be furnished, if any.
- C. Each piece of equipment, for which certified witnessed or non-witnessed performance tests are required, shall be accompanied by a completed form containing at least the following information:
 1. Owner's name and location of project.
 2. Contractor's name and subcontractor if applicable.
 3. Name of item being submitted.
 4. Specification reference by section, paragraph and page.
 5. Data on item (manufacturer, general descriptive data, dimensions, size of connections, speeds, performance curves, serial number). A specific list of the test results plus a list, which shows the values that differ from Specifications.
 6. Engine data, type, electrical information: voltage, frequency, phase and full load amperes, starting method, frame size, enclosure insulation type (NEMA Code letter), dimensions, service factor, serial number.
 7. Date and signature of person certifying the performance.

- D. Instruction Manuals: Prepare and submit instruction manuals covering installation, operation and maintenance of all equipment and machinery specified in Divisions 11, 13, and 15. Refer to Section 01300, paragraph 1.08.
- E. Manufacturers' Affidavits: Where called for in the Specifications, each equipment manufacturer, or his authorized representative, shall submit an affidavit conforming to the requirements of Section 01650, paragraph 1.04.

1.05 RESPONSIBILITY AND CARE OF EQUIPMENT

- A. The Contractor shall be responsible for the equipment included in this Contract until it has been finally inspected, tested and accepted in accordance with the requirements of these Specifications.
- B. The Contractor shall make his own provisions for properly storing and protecting all material and equipment against theft, injury or damage from any and all causes. Damaged material and equipment shall not be used in the work.

PART 2 - PRODUCTS

2.01 DESIGN

- A. General: Design all equipment for the service intended, of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection and during continuous or intermittent operation. Adequately stay, brace and anchor, and install equipment in a neat and workmanlike manner. Give consideration to appearance and safety, as well as utility, in the design of details. Use cathodically compatible materials of construction.
- B. Seismic: Refer to Section 01190 of the Specifications and to the Contract Drawings for the seismic design criteria.
- C. Controls: Unless noted otherwise, the design of the electric control of any equipment system and/or equipment package shall be the responsibility of the manufacturer of the equipment system and/or equipment package. The elementary control diagrams as shown on the Electrical Drawings and the diagrams shown on the Instrumentation Drawings are illustrative of control and monitoring requirements pertaining to various equipment of this project. The manufacturers shall design their own functional electric control devices and circuitry, in consultation with the specific elementary control diagrams and other project specifications, to meet the equipment control requirements. All such systems and package controls shall be furnished by the equipment manufacturer, except that controls shown in engine control centers and process controllers, remote control devices, and their interconnecting wiring shall be provided under Divisions 16 and 17.

2.02 MATERIALS AND STANDARD SPECIFICATIONS

- A. Materials: Design, fabricate and assemble equipment and systems with new materials and in accordance with acceptable modern engineering and shop practices. Manufacture individual parts to standard sizes and gauges so repair parts can be installed in the field.

- B. Uniformity: Unless otherwise specified, equipment or material of the same type or classification used for the same purpose shall be the product of the same manufacturer and shall be the same model.

2.03 LUBRICATION

- A. Provide lubricants of types recommended by equipment manufacturers, in quantities sufficient for consumption prior to completion, testing and final acceptance.

2.04 SAFETY GUARDS

- A. Cover belt or chain drives, fan blades, couplings, nip points, exposed shafts and other moving or rotating parts on all sides with safety guards conforming to all Federal, State, and local codes and regulations pertaining; conform to the most restrictive requirement. Design guards for easy installation and removal, complete with necessary supports, accessories, and fasteners, all hot-dip galvanized. Design guards in outdoor locations to prevent entrance of rain and dripping water. Provide tachometer test opening in line with ends of shafts. Typically guards shall be expanded metal on a structural steel frame except that outdoor guards may be of solid material. Provide hinged doors with latch for service and lubrication access.
- B. Cover all pipes, manifolds, heaters, and other surfaces which have a surface temperature sufficient to burn human tissue with a thermal insulating material or otherwise guard against contact.
- C. Guards to comply with *CAL/OSHA 3940 through 3944*.

2.05 LIFTING EYES

- A. Supply all equipment weighing over 100 pounds with lifting eyes. Parts of equipment assemblies which are normally serviced separately, such as motors, to have lifting eyes of their own.

2.06 DRIVES

- A. General: Provide all drive units with a AGMA rating and service factor suitable for 24 hours per day operation under the operating load.
- B. V-Belt Drives: Equip each V-belt drive with suitable tension adjustment. Provide drives having a service factor of at least 1.6 with arc length correction at maximum torque using nameplate rating of driving motor.

2.07 NAMEPLATES

- A. Manufacturer's Nameplate: Furnish each piece of equipment and its driver with a corrosion-resistant metal nameplate fastened to the item in a readily readable position. This nameplate to contain the manufacturer's name, equipment rating, capacity, size, model, serial number and speed. All information written or printed to be in English.

- B. Direction of Rotation: Furnish each piece of rotating equipment with a direction of rotation arrow.
- C. Functional Identification: Label each piece of equipment using a plastic laminate label with the functional name and number of the equipment.
 - 1. Fasten labels to the equipment, its base or other acceptable location:
 - a. Letters: At least 1/2-inch high with the border trim on all sides not less than 1/4-inch.
 - b. Color: Green background with white letters.
 - c. Fasteners: Brass or stainless steel screwed into inserts, anchor shields or tapped holes in equipment or base.

2.08 PROTECTION AGAINST ELECTROLYSIS

- A. Where dissimilar metals are used in conjunction with each other, provide suitable insulation between adjacent surfaces so as to eliminate direct contact and any resultant electrolysis. Connections of dissimilar piping materials shall utilize dielectric unions, flanges, couplings or bushings.

2.09 SPECIAL TOOLS

- A. For each type of equipment to be furnished, provide a complete set of all special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation and maintenance of such equipment.

2.10 FINISHES

- A. Factory Painting: On pumps, engines, drives, starters, control panels and other similar self-contained or enclosed components, apply a factory protective paint system unless otherwise noted. Paint or otherwise protect surfaces that are inaccessible after assembly by a method which provides protection for the life of the equipment.
- B. Shop Priming: Except where field sandblasting is required, apply one or more shop coats of metal primer on surfaces to be finish painted at the site, of sufficient thickness to protect surfaces until finished. Primer shall be compatible with finish coat.
- C. Rust Preventive: Coat machined, polished, other ferrous surfaces, and non-ferrous surfaces which are not to be painted with rust preventive compound.

2.11 NOISE AND VIBRATION

- A. Mechanical and electrical equipment, as installed in this project, shall not create sound levels that are in excess of that permitted by CAL/OSHA for 8 hours per day worker exposure unless otherwise noted for the specific piece of equipment involved. If the required sound level cannot be achieved by bare equipment in its designated environment, provide sound attenuating enclosures. Sound attenuating enclosures shall have necessary ventilation to prevent equipment overheating and shall be constructed for easy removal to permit maintenance. Devices necessary

for day-to-day operation shall pierce the enclosure or otherwise be accessible without need to remove the enclosure.

- B. Equipment which when operating has obvious excessive vibrations shall be repaired or replaced as directed by the Engineer. Baseline vibration measurements shall be made where specified.

2.12 FACTORY TESTS

- A. Perform factory tests for each piece of equipment where specifically called for in the section specifying that equipment. Note that factory tests are inherent in many reference standards. The requirement for a factory test in a referenced standard is hereby made a part of these Specifications. Conduct factory tests at the same speeds and other conditions at which the equipment will operate in the field, except as noted.
- B. Where specifically noted, performance tests may be witnessed by the Engineer or his representative. Inform the Engineer in sufficient time to allow arrangements to be made for witness of such tests. When non-witnessed tests are performed, supply certified results.
- C. Perform factory testing of pumps in accordance with the requirements and standards of the Hydraulic Institute.
- D. Tests of other equipment shall conform to the requirements set forth in these Specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Inspect each item of equipment for damage, defects, completeness, and correct operation before installing.

3.02 PREPARATION

- A. Prior to installing equipment, ensure that the areas are clean. Maintain the areas in a broom-clean condition during installation operations. Clean, condition, and service equipment in accordance with the approved Instruction Manuals and specific recommendations of the equipment manufacturer.

3.03 INSTALLATION

- A. Equipment: Conform to approved Instruction Manuals. Employ skilled craftsmen experienced in installation of the types of equipment specified. Use specialized tools and equipment, such as precision machinist levels, dial indicators, gauges, and micrometers, as applicable. Produce acceptable installations free of vibration or other defects. Align and pin to common bedplate equipment and drivers connected by flexible couplings.

3.04 EQUIPMENT STARTUP AND ADJUSTMENT

- A. Conform to Section 01650.
- B. Arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation and adjust and test the equipment furnished before the acceptance of the work by the Owner. Said representative shall be experienced and knowledgeable of the equipment being tested. Furthermore, he shall assist and instruct the operating staff in adjusting and operating the equipment during the initial plant operation period.
 - 1. Provide initial lubrication for all equipment.
 - 2. Test and demonstrate to the Owner's representative that all equipment operates properly and specified performance has been attained. Furnish any test equipment or measuring devices required which are not part of the permanent installation.
 - 3. In addition, demonstrate that the entire surge tank and air compressor system are in full operating condition prior to the acceptance of the work. Should any equipment or part thereof fail to operate as intended, immediately remove and replace it, all at the Contractor's expense. Pay for all tests involved in this Section.
 - 4. Pressure test equipment and connections thereto as required by these Specifications.

3.05 PERFORMANCE TESTS

- A. Upon completion of the work, and after all systems are set and balanced, conduct performance tests in accordance with Division 1 and other applicable sections of these Specifications. Submit test conditions, test data and results to the Engineer for review.

3.06 SOUND LEVEL TESTING

- A. Measure the sound level developed by all mechanical and electrical equipment provided. Perform testing of such equipment during the final operation test program with all equipment operating. Use OSHA approved instrument and record the highest sound level developed when measured according to OSHA standards. Deliver a copy of records to the Owner.

3.07 TOOLS, LOOSE PARTS, AND LUBRICANTS

- A. Tools and Loose Parts Supplied: Provide an inventory of tools and loose parts required to be supplied under the project. Turn over inventory and parts to the Owner. The Owner's written acknowledgment of receipt is required for project completion. Loose parts are defined as items such as special tools, keys, safety equipment, and portable equipment. Refer to Section 01700 and relevant technical sections of these Specifications for additional instructions.
- B. Recommended Spare Parts: Furnish a complete list of recommended spare parts and supplies for each piece of equipment furnished with current prices and a source of supply.

C. Provide a list of all recommended lubricants not listed in the O&M Manuals.

END OF SECTION

SECTION 11372
COMPRESSED AIR SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Base-mounted Reciprocating Air Compressor
 - 2. Miscellaneous Accessories

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME).
- B. National Electrical Manufacturers Association (NEMA).
- C. National Electric Code (NEC).
- D. Rubber Manufacturer's Association (RMA)
- E. Underwriters' Laboratories (UL).
- F. Instrument Society of America (ISA).

1.03 SUBMITTALS

- A. Shop Drawings and Product Data.
 - 1. Submit the following as a complete initial submittal in accordance with Section 01300 in the Product Review category:
 - a. Tank-mounted Air Compressor System.
 - b. Prototype compressor pressure-volume-horsepower performance curves at 70°F.
 - c. Compressor technical information including mechanical layout (scaled), process and instrumentation diagram.
 - d. Motor technical specifications, including type, size, speed, and motor nameplate information.
 - e. Elementary and connecting wiring diagrams showing external connection to other equipment.
 - f. Compressor accessories including air receiver, piping, valves (manual and automated), pressure switches, and other miscellaneous instrumentation. Anchoring details shall be included.
 - g. Refer to Section 01190 of the Specifications for seismic design requirements of anchor bolts.
- B. Performance Testing:
 - 1. Submit certified non-witnessed factory performance test results. Receive favorable review of test results prior to shipment.
 - 2. Submit field test report upon completion of specified field tests.

- C. Manuals: Furnish manufacturer's installation, operation and maintenance manuals, including recommended spare parts lists.
- D. Affidavits: Furnish affidavits from the manufacturer certifying that the equipment has been properly installed and tested and is ready for full time operation. Include Manufacturer's warranty terms and conditions.

1.04 QUALITY ASSURANCE

- A. All equipment furnished under this Section shall be of a manufacturer who has been regularly engaged in the design and manufacture of the equipment for at least 5 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to the equipment made by those manufacturers named herein.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The compressed air system shall provide air to the Surge Tank, as shown on the Drawings and as specified herein.
- B. The compressed air system shall include a simplex air compressor, drive system, and an air receiver.
- C. Refer to the Process and Instrumentation Drawing (P&ID) for compressor details.

2.02 BASE-MOUNTED RECIPROCATING AIR COMPRESSOR

- A. The compressed air system shall be mounted on a formed steel base mounted on an air receiver tank, completely prepiped, prewired requiring only single point connections of incoming power, and outgoing air.
- B. Air Compressors (Simplex):
 - 1. Performance - The air compressor shall have the following performance:

(Free Air) Piston Displacement	5.6 CFM @ 125 psig
Operating Temperature	50° - 100° F
Normal Operating Air Pressure	106 PSIG
Maximum Operating Air Pressure	175 PSIG, minimum
Actual Delivery @ max. pressure	4.2 CFM
Motor Horsepower	2.0 hp

Notes: The above brake horsepower and performance figures include all belt losses.

2. Compressor Construction: The air compressor shall be, heavy duty, splash-lubricated, air-cooled, single-stage, single acting reciprocating type featuring two cast iron cylinders in a V-configuration. The air compressor shall be provided with an overcurrent protective device. The air compressor shall be equipped with the following components:
 - a. Heavy-duty cast-iron frame
 - b. Dry type inlet filter silencer
 - c. Stainless steel finger valves
 - d. Non-adjustable, single piece connecting rods
 - e. Oil splash lubrication system
 - f. Heavy duty nodular iron crankshaft
 - g. Protective, replaceable crankshaft bushing
 - h. Balanced four ring piston with rings
 - i. Heavy duty, non-adjustable long life, ball bearings
 - j. Oil fill cap
 - k. Low oil level switch in a NEMA 4 enclosure
3. Motors:
 - a. Horizontal, totally enclosed fan-cooled, air receiver tank-mounted on a steel frame
 - b. Horsepower: 2 hp
 - c. Power Supply: 480V/3ph/60Hz
 - d. Motor Speed: 1800 rpm
 - e. For additional specifications, see Section 11002.
4. V-Belt Drives: supplied by manufacturer, designed to RMA standard.
5. Compressor Integral Control Panel:
 - a. Input voltage of 480V/3ph/60Hz
 - b. NEMA rated full-voltage starter to control air compressor
 - c. Inclusion of control power transformer to derive the 120V control circuit
 - d. NEMA 4 or 12 enclosure

C. Integral Air Receivers: Air receiver shall be ASME Code labeled and National Board registered. Accessories shall include:

1. Support legs for vertical mounting as shown on the Drawings, designed to resist overturning from seismic forces.
2. Tank NPT connections as shown on the Drawings, including inspection plugs, and for any devices required by the compressor.
3. "No air loss" electric drain valves. Ingersoll Rand ENL; Atlas Copco EWD; or equal.

4. ASME NPT connection type safety valve located on the top of the tank and rated for full flow of the compressor.
5. NPT connection type liquid filled pressure gauge. Range shall be 0 to 200 psi unless noted otherwise.

D. Manufacturers (or equal):

1. Champion, Model BR1
2. Quincy Compressor, QTS Series

2.03 ACCESSORIES

A. Supply the compressor assembly with the following accessories:

1. OSHA-approved safety guards for each compressor drive system.
2. Intake filter silencers (3 to 5 micron) for each compressor.
3. Grounding lug at motor junction box

B. Provide the following accessories, shipped loose for onsite installation:

1. Coalescing Air Filter
 - a. The air filter shall be ingersoll-rand filter Model HE64 (or equal), high efficiency filter that is designed to remove liquids and solids from compressed air. The filter shall remove particles down to 0.01 micron-liquids down to 0.01 mg/m³ w at 21° c (0.01 ppm w at 70° f). The initial dry pressure drop at rated inlet air pressure and rated flow shall not exceed 1 psig, where as the initial wet pressure drop shall not exceed 3 psig.
 - b. The air filter shall utilize the coalescing method for removing contaminants. The filter elements shall be constructed of multi-layered borosilicate microfiber media; glass filled nylon end caps, and perforated stainless steel inner and outer support cores.
 - c. The housing shall be constructed of pressure die-cast aluminum. The filter shall have an automatic drainage system for constant removal of contaminants. It shall also have a differential pressure indicator visible from both sides for ease of installation.
 - d. The element inner and outer cores shall withstand sudden pressure surges of up to 100 psig. The element top end cap shall have an over molded seal and tapered location that ensures a perfect seal.
2. Flexible hose at compressor discharge, See Section 15050, para. 2.04.F
3. One (1) discharge check valve
4. One (1) low air pressure and High Temperature alarm switches

PART 3 - EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, any applicable building and plumbing codes. Adequate clearance should be maintained around the equipment to allow adequate cooling. Refer to the Drawings for compressor layout.

1. Mount air compressor assembly on existing concrete slab.
2. Install pressure-reducing stations consisting of pressure reducing valve, particle filter, valved bypass, pressure gauge on inlet and outlet, and pressure relief valve.

3. Isolate air supply from system piping with wire braid reinforced metal hose.
4. Pipe drain connections from air compressor and after cooler to floor drain.
5. Provide intake air piping from outside building to air compressor.

3.02 FIELD QUALITY CONTROL

- A. The equipment manufacturer shall supply a competent field service engineer to thoroughly check and inspect the compressor system after installation, place the compressor in operation, make necessary adjustments, calibrate instruments, and conduct field tests. The services required shall also include on-the-job training of operators including safety procedures, operating instructions, and preventive maintenance procedures. Furnish a minimum of two man-days of field services.
- B. Furnish all equipment and labor necessary for quality assurance tests. Tests shall be witnessed by the Owner.

END OF SECTION

SECTION 13210

SURGE TANK

PART 1 – GENERAL

1.01 SUMMARY

- A. This section provides specifications for the design and construction of the surge tank that will be used to balance pressure fluctuations on the sewer force main as shown on the Drawings, and as specified herein.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME)
 - 1. Boiler and Pressure Vessel Code, Section VIII – Rules for Construction of Pressure Vessels, 2001 edition.

1.03 SUBMITTALS

- A. Initial Submittal:
 - 1. Submit two sets of complete shop drawings and descriptive literature for review. Drawing shall include all critical dimensions and show locations of all fittings and appurtenances. Drawings shall also show details that are necessary for proper fabrication of the vessel and appurtenances.
 - 2. Submit procedures for welding of tank joints and welder qualifications.
 - 3. Submit Inspector Qualifications (verification of compliance with Section UG-91 of the Boiler and Pressure Vessel Code.
 - 4. Submit surge tank anchor bolt size and anchoring details as outlined in Section 01190 of the Specifications.
- B. One set of the reviewed shop drawings will be returned to the Contractor, authorizing the tank fabricator to proceed with the fabrication of the vessel.
- C. With the delivery of the vessel, the Contractor shall supply in accordance with Standard Specifications and Special Provisions:
 - 1. Final shop drawings (revised if corrections were made on the reviewed set of drawings).
 - 2. Reports certifying that all materials, tests, and fabrication are in accordance with Section UG-120 of the Boiler and Pressure and Vessel Code.

1.04 QUALITY ASSURANCE

- A. Vessel shall be fabricated by a company with experience in the construction of steel pressure vessels. All welding shall be done by experienced, skilled operators familiar with the methods and materials to be used. Engineer shall have final approval over selection of the vessel fabricator. Surge tank system shall be by Pulsco, Blacoh, or equal.
- B. Regardless of any approvals given by the Engineer, the Vendor shall be solely responsible for the work and material fulfilling in every respect to the requirements of ASME code specified herein.

PART 2 - MATERIALS

2.01 PRESSURE VESSEL

A. Tank Shell:

1. The hydropneumatic pressure tank shall be of a vertical, cylindrical configuration as indicated on the Drawings. The vessel shall be constructed of 316SS and fabricated in accordance with the provisions of Section VIII of the latest ASME "Boiler and Pressure Vessel Code" and shall be ASME code certified and stamped.
2. Vessel shall have an outer diameter of 4'-0" and shell length of 5'-0", semi-elliptical heads with a capacity of approximately 565 gallons, with a minimum 175 psi rated design working pressure. Vessel will handle untreated sewage at ambient outdoor temperature (40°F minimum and 105°F maximum. The tank is exposed to direct sunlight)

B. Tank Appurtenances:

1. Vessel shall have one 12"x16" elliptical access opening at one side of the vessel, one 12 inch 150# flanged inlet/outlet at the bottom of the vessel, with five ½" NPT couplings at the top of the vessel, two ½" NPT coupling at the bottom of the vessel, one nameplate bracket at one side of the vessel, and two lifting lugs on the top of the vessel as indicated on the Drawings.
2. Provide Reflex-type flat glass gauge suitable for use in sewage/solids applications Carbon Steel construction, 1/2-inch NPT connection, with angle valves. Jerguson (Clark Reliance) Series 300L, John C. Ernst Model 482, or approved equal.
3. Vessel is to be placed on four legs as indicated on the Drawings. Vessel design and its support system shall incorporate the design stress factors seismic loading indicated in Section AD-150 of the Boiler and Pressure Vessel Code.
4. Nozzles shall be flush internally to facilitate coating.
5. ½" Safety Pressure Relief Valve
6. Level transmitter (differential pressure) to provide a 4-20 mA signal
7. Solenoid Valves and a muffler for adding and venting air. Solenoid valves to be ASCO redhat model or equal.

C. Tank Level Control Panel:

1. A PLC based tank level control panel is to be provided with a 304 SS NEMA 4X rated enclosure.
2. The panel shall provide automatic level control.
3. Controller shall be equipped with a door mounted 12" HMI touch screen display with a built in proximity sensor that will put the display to sleep if no movement is detected for several minutes.
4. HMI shall contain screens that have continuous indication of water level and corresponding tank water volume in real time that displays current water level in relation to solenoid and alarm level set points.
5. HMI shall contain screens that display and allow changes to current solenoid and alarm level set points and timers.
6. A button on the HMI shall be provided that rests all values to pre-programmed O&M values.
7. Vent and Add air solenoid control shall be selectable from hand, off, and auto from the controller display.

8. HMI shall contain an alarm screen that lists the alarms that have occurred and the number of occurrences that each alarm has had.
9. Controller shall log and save locally all alarms and input signals for a minimum of 3 months.
10. The controller shall provide the following output signals:
 - General alarm (relay contact)
 - Level (analog; 4-20 ma DC)
11. All field wiring to the controller shall be done through heavy duty connectors. There shall be no field wiring to components inside of the controller.
12. Multiple heavy duty connectors shall be provided to separate AC and DC voltages.
13. Electrical surge suppression devices shall be installed on all analog input signals.
14. Dry contacts shall be available for all alarm and solenoid relays.
15. The Contractor shall provide a fabricated shade cover over the control panel to ensure that the control panel and HMI are protected from sun exposure.
16. The Contractor shall fabricate and install a support and mounting structure for the control panel.

PART 3 – EXECUTION

3.01 FABRICATION

- A. Backing rings shall not be used for a permanent part of the fabrication. All interior joints and connections shall be seal welded. There shall be no voids in the interior of this vessel.
- B. Nozzles shall be flush internally.
- C. Intermittent welds shall not be used on the vessel assembly. All welds to be continuous to eliminate any voids.

3.02 SHOP INSPECTION AND TESTING

- A. The tank shall be inspected in accordance with Sections UG-90, and UG-92 through UG-97 of the Boiler and Pressure Vessel Code by an Inspector employed by an ASME accredited Authorized Inspection Agency.
- B. The tank shall be subject to Hydrostatic Testing as outlined in Section UG-99 of the Boiler and Pressure Vessel Code.

3.03 DELIVERY

- A. After final inspection at the fabrication site, all opening(s) in the vessels shall be plugged or sealed with metal or wooden covers for shipping. Vessel shall be delivered to the jobsite.

3.04 INSTALLATION

- A. The tank supports shall be anchored to its mounting pad as indicated on the Drawings and as outlined in Section 11001 of the Specifications.

END OF SECTION

SECTION 15050

PIPING, VALVES AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Provide all piping, including fittings, valves, supports, and accessories as shown on the Drawings, described in the Specifications and as required to completely interconnect all equipment with piping for complete and operable systems, including equipment drains.

1.02 REFERENCES

- A. ASTM International (ASTM)
- B. American Society of Mechanical Engineers (ASME)
- C. American National Standards Institute (ANSI)
- D. American Water Works Association (AWWA)
- E. American Welding Society (AWS)
- F. Cast Iron Soil Pipe Institute (CISPI)
- G. U.S. Department of Transportation (DOT)
- H. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- I. National Fire Protection Association (NFPA)

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Verify by excavation, inspection and measurement all installation conditions, including existing utilities and structures, for all pipe before preparation of Shop Drawings. Submit field measurements and photos with Shop Drawings where exposed conditions are significantly different than indicated on the Drawings. See also paragraph 3.02, Existing Utilities of Section 02301.
 - 2. Layouts and Schematics: Submit detailed installation drawings of all piping. Schematics may be submitted for piping 4 inches and smaller. The Drawings and schematics shall include: pipe support locations and types, fittings, valves, other appurtenances. (Product Review)
 - 3. Submit data to show that the following items conform to the Specification requirements:
 - a. Pipe, fittings and accessories (Product Review).
 - b. Fabricated pipe supports and other pipe supports (Product Review).
 - c. Pipe couplings and flexible pipe pieces (Product Review).
 - d. Valves and Accessories (Product Review).
 - 4. Submit samples of gaskets and other materials where required by the detailed specifications.
 - 5. Submit certified test reports as required herein and by the referenced standard specifications (Product Information).

- B. Manuals: Furnish manufacturer's installation and operation manuals, bulletins, and spare parts lists for the following items:
 - 1. Valves 4 inches and larger.
- C. Field test reports as required in Part 3.

1.04 QUALITY ASSURANCE

- A. Materials and equipment furnished under this Section shall be of manufacturers who have been regularly engaged in the design and manufacture of the materials and equipment for a period of at least 5 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to the materials and equipment made by the manufacturers specifically named herein, if an alternate manufacturer is proposed.
- B. Factory Quality Control: The Contractor shall test all products as noted herein and by the reference specifications.
- C. Field Quality Control:
 - 1. The Contractor shall:
 - a. Perform leakage tests.
 - b. Be responsible for the costs of additional inspection and retesting by the Owner resulting from noncompliance.

1.05 POTHOLING (CHECK ON LOCATIONS)

- A. Do not prepare any shop drawings for, or make final order for, or design any pipe materials for any particular section of pipeline until all utilities in that section of pipeline have been exposed, as specified in paragraph 3.02 of Section 02301 and until such time as no interferences are found between said existing utilities and the proposed pipeline alignment. If interferences are found in any particular section of pipeline, do not prepare any shop drawings for, or make final order for, or design any pipe materials for that particular section of pipeline until the pipeline alignment has been modified by the Engineer to eliminate all such interferences.

1.06 APPURTENANCES

- A. Furnish and install all necessary guides, inserts, anchors and assembly bolts, washers and nuts, hangers, supports, gaskets, couplings and flanges; all other appurtenant items shown on the Drawings, specified or required for the proper installation and operation of the piping; devices included in or on the piping equipment; and piping accessories.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Pipe and valve sizes are nominal inside diameter unless otherwise noted.
- B. Construct vents of materials specified for the pipe system for which they serve.
- C. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

- D. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

2.02 GENERAL MATERIAL REQUIREMENTS

- A. Gaskets: Except where specified otherwise, gaskets shall be SBR rubber.
- B. Bolts: Unless specified otherwise herein, flange bolts and nuts, coupling bolts and nuts, and other hardware shall be as follows:
1. Exposed: Electroplated zinc or cadmium steel.
 2. Submerged: Type 316 stainless steel, minimum tensile strength: 60,000 psi.
 3. Buried: Type 304 stainless steel, minimum tensile strength: 60,000 psi.
 4. Apply an anti-gauling compound to the threads of stainless steel bolts.

2.03 PIPING MATERIALS

- A. Pipe and Fitting Designation: Piping materials are identified by a "Type" designation in these Specifications. The "Type" designation identifies not only the pipe itself but the associated fittings and appurtenances and the installation and test procedures described for that "Type." The designation of a particular type shall indicate a complete installation including fittings, joints, cleaning and testing. The pipe and fitting materials for each type designation shall be as specified herein and summarized in the Pipe Type Schedule.
- B. Piping Schedule: Piping systems and their corresponding piping and valve systems are listed on the Drawings.
- C. Pipe Type Schedule: Pipe material, joints and fittings shall be as summarized below. A detailed specification of each pipe type follows. (The detailed specification supersedes the schedule in case of any conflicts.)

Pipe Type	Pipe Description	Field Joints	Fittings
DIP	Ductile Iron Flanged Pipe	Flange or Mech. Groove Coupling	DI
BS40	Black Steel, Schedule 40	Thread or Weld	Steel
PET	Polyethlyene Tube	Compression	Compression

- D. DIP Pipe:
1. Pipe: Flanged or grooved end ductile iron.
 - a. Flanged Pipe: AWWA C115 including Appendix A, minimum thickness Class 53.
 - b. Grooved End Pipe: AWWA C151 with grooves in accordance with AWWA C606, Table 3, for rigid joints. Provide minimum thickness classes in accordance with AWWA C606.
 2. Joints: Where flanges are shown on the Drawings, provide mechanical rigid grooved couplings up to 24-inch or flanges, at the Contractor's option, except where grooved couplings are required in the Drawings. Provide flanges where required to connect to valves, equipment or certain pipe supports.
 3. Flanges: Ductile iron, plain faced, AWWA C115. Submit certification that flanges comply with AWWA C115. Provide insulating flanges with two cathodic test stations for buried ductile iron to steel connections.

4. Mechanical Grooved Couplings: AWWA C606, minimum pressure rating of 150 psi.
 5. Fittings:
 - a. Flanged: Ductile iron, AWWA C110 or AWWA C153.
 - b. Grooved End: Ductile iron, AWWA C110 for materials, dimensions and pressure ratings. Grooves shall be in accordance with AWWA C606, Table 3, for rigid joints.
 - c. Special Fittings: Special fittings not available in ductile iron may be fabricated of fusion epoxy lined and coated welded steel pipe with a design pressure of 450 psi. Submit design and wall thickness to the Engineer for review.
 - d. Buried bolts and nuts for flanged and grooved end joints shall be Type 304 stainless steel.
 6. Lining: Standard thickness cement mortar lining for pipe and fittings, AWWA C104, except where noted otherwise in the Drawings or in the Piping Identification Schedule. Cement mortar lining shall be seal coated.
 7. Coating: Buried pipe shall receive asphalt coating per AWWA C115. Exposed or submerged pipe requiring protective coating per Section 09960 shall be shipped bare or shall be factory primed compatible with selected field paint system.
 8. Protection for buried pipe: Polyethylene encasement, black, AWWA C105. Single-wrap pipe, double-wrap flanged fittings, mechanical joints, or other appurtenances with significantly different outside diameters from the pipe. Tape to seal seams and over laps at least 2 inches wide.
 9. Gaskets:
 - a. Flanged: Full face, 1/8-inch-thick SBR rubber, AWWA C115, Appendix A.
 - b. Mechanical Grooved Coupling: SBR rubber, AWWA C606.
 10. Flange Bolts: See paragraph 2.02.
 11. Field Closure Connections for Restrained Joints: Pipe cut in the field where necessary and when favorably reviewed by the Engineer shall be connected by one of the following methods:
 - a. Series 3800 Mega-Coupling by EBAA Iron, Inc.; or equal.
 - b. Mechanical Joint Sleeve with two Series 1100 Megalug Restraints by EBAA Iron, Inc.; or equal.
- E. BS40:
1. Pipe: Schedule 40 black steel, ASTM A53, Grade B, butt weld or seamless.
 2. Joints: Butt welded or socket welded, except where otherwise shown on the Drawings and where screwed or flanged accessories or valves are required.
 3. Fittings: Forged steel, butt weld type, same Schedule as pipe conforming to ASTM A234, or 2,000 psi forged steel socket weld fittings conforming to ASTM A105.
 4. Flanges: *Where required to connect to flanged equipment or valves, shall be* slip-on or weld-neck type conforming to ASTM A105 or ASTM A181. Flange drilling and facing shall match that of the flanged valves or equipment to which the pipe connects.
 5. Coating: Above ground black steel pipe shall receive corrosion protective coating. Coating shall be Rust Grip by Superior Coating Solutions, or approved equal.

- F. PET Polyethylene Tube:
1. Tube: Polyethylene for compressed air, ASTM F1282 and F1974.
 - a. Buried: with 3" PVC sleeve. All PVC sleeve elbows shall be long-radius elbows.
 2. Fittings: Compression
 3. Minimum Pressure Rating: 200 psi
 4. Each tube shall be marked with a code for identification at 2-inch intervals
 5. Polyethylene tubes shall be rated for compressed air service. Manufacturer: Maxline by Rapid Air, or equal.

2.04 PIPE COUPLINGS AND FLEXIBLE PIPE PIECES

- A. General: For typical pipe joints refer to pipe material specifications.
- B. Flexible Couplings and Flange Coupling Adaptors:
1. Sleeve: Cast iron or fabricated steel.
 2. Followers: Cast iron, ductile iron, or steel.
 3. Sleeve Bolts: ASTM A325, Type 3; malleable iron; or equivalent, except for buried and submerged, which shall be Type 304 stainless steel and Type 316 stainless steel, respectively.
 4. Coating: Fusion epoxy line and coat sleeve and followers.
 5. Pressure Rating: The test pressure of the applicable service or 50 psi, whichever is greater.
 6. Performance: Longitudinal movement and angular deflection capabilities shall meet AWWA C219.
 7. Flanged Coupling Adaptor Flanges: Match mating flanges. If required by connecting valve or other device, provide flanges with inside diameter equal to nominal pipe diameter.
 8. Buried Flexible Coupling Sleeve: Long barrel; Smith-Blair 442, Dresser Style 40; or equal.
 9. Manufacturers:
 - a. Flexible Couplings:
 - 1) Connecting Pipe with Identical Outside Diameters: Smith-Blair 411 or 441; Dresser Style 38 or 138; or equal.
 - 2) Connecting Pipe with Slightly Different Outside Diameters: Smith-Blair 413, 462 or R441; Dresser Style 62; or equal.
 - b. Flange Coupling Adaptors: Smith-Blair 912 or 913; Dresser Style 128-W; or equal.
 10. Gaskets: SBR rubber.
 11. Joint Restraint: Provide joint harnesses (tie rod lug or attachment plate assemblies) designed for the test pressure or 50 psi, whichever is greater, across all flexible couplings and flange coupling adaptors, except where specifically indicated otherwise on the Drawings. Anchor studs may be used on flange coupling adapters for pipe up to 12 inches in diameter.
 12. Protection for Buried Couplings and Adaptors:
 - a. The entire flexible coupling or flange coupling adapter including mated flanges shall be protected. The pipe and coupling or adaptor shall be cleaned and primed in accordance with the manufacturer's instructions. Apply a filler to form a smooth, continuous surface and spiral wrap with tape, overlapping by at least 50%.
 - b. Filler: Denso Mastic; or equal.

- c. Tape: Denso Tape; or equal.
- C. Mechanical Groove Couplings:
 - 1. Application: Mechanical couplings (segmental clamp joints) shall be used wherever shown on the Drawings.
 - 2. Grooves:
 - a. Ductile Iron Pipe where Mechanical Groove Couplings are shown on the Drawings: Flexible Joint, Table 2 (AWWA C606).
 - b. Ductile Iron Pipe where Flanges are shown on the Drawings: Rigid joint, Table 3 (AWWA C606).
 - 3. Gaskets: EPDM.
- D. Service Saddles:
 - 1) Materials: Ductile iron saddle with electro-galvanized straps and hardware for aboveground and bronze or 304 stainless steel for buried, and nitrile or neoprene gaskets.
 - 2) Type: For ductile iron pipe 4 inches and less, single strap saddles may be used. For pipe greater than 4 inches, double strap saddles shall be used.
 - 3) Manufacturers: Smith-Blair; equivalent by Mueller; or equal.
- E. Flexible Connectors:
 - 1. Up to 12-inch-Diameter:
 - a. Type: Filled, arch-type (unless otherwise shown on Drawings) rubber expansion joints with full rubber flanges and retainer rings.
 - b. Materials: Neoprene cover over nitrile tube, reinforced with nylon or polyester body and galvanized steel retainer rings or protect cover with Hypalon paint where exposed outdoors.
 - c. Pressure Rating: 190 psi.
 - d. Manufacturers:
 - 1) Standard: Proco Series 230; Holz Type 200; Garlock Style 200HP; or equal.
 - 2) Concentric Reducers: Proco RC Series; Holz 200TC
 - 3) Eccentric Reducers: Proco RE Series; Holz 200TE
 - 4) For connections to plastic piping systems provide connectors with additional flexibility as recommended by the manufacturer. Proco Series 261R; Holz Type 320EZ; or equal.
 - 2. Restraint: Provide galvanized steel control rod-compression sleeve assemblies for all flexible spools, except where pipelines cross structural expansion joints or where specifically omitted by note in the Drawings. Number and size of control rods shall be as required for the test pressure of the pipe system or 50 psi, whichever is greater.
 - 3. Provide full-size intermediate metal pipe flanges where rubber spool connects with wafer style valves, lug style valves or other pipeline items that do not have full-face metal flanges.

2.05 VALVES AND ACCESSORIES

- A. Valve and Accessory System Designation: Most valves and accessories to be furnished and installed are identified by a valve and accessory system. See the pipe schedule in the Drawings.

- B. General Requirements for Valves:
1. All valves of each type shall be the product of one manufacturer.
 2. All exposed valves shall be furnished with operators, handwheels, levers, or other suitable type wrench including handles as specified herein or as shown on the Drawings. All buried valves shall be provided with 2-inch-square operating nut and valve boxes.
 3. All threaded stem valves shall open by turning the valve stem counter-clockwise.
 4. All exposed valves and valve operators shall have a non-bleeding shop coat, unless otherwise specified. Buried valves and operators shall be painted as specified in Section 09960.
- C. Valve and Accessory Systems:
1. System B: Valve and Accessory for System B Sludge, drainage, sewage and wastewater at working pressures to 150 psig.
 - a. Plug valves 2-inch and larger:
 - 1) Rating: 175 psi through 12-inch.
 - 2) Type: Resilient faced eccentric plug, lever operated 4-inch and smaller, worm geared handwheel operated 6-inch and larger, or pneumatically actuated as shown on the Drawings. Valves shall provide driptight shutoff in both directions.
 - 3) Connections: Flanged, 125-pound ANSI, except screwed connections may be used for 2-inch valves.
 - 4) Materials: Cast iron body, welded nickel seat, NBR or Buna-N coated plug, NBR or Buna-N packing or U-cup stem seal. Valves shall have interior and exterior metal surfaces other than the plug and valve seat coated with two coats of high-solids epoxy with total dry film thickness 12 mils minimum.
 - 5) Manufacturers: DeZurik PEC, Milliken, Clow Eccentric Plug Valve, or equal.
 - 6) Installation: Unless otherwise necessary for proper installation or permitted by Engineer, all eccentric plug valves shall be installed with shaft horizontal and with plug in upper half of body. Valves in sewage lines shall be installed with seat on upstream end.
 - b. Swing Check Valves 2-inch through 12-inch:
 - 1) Rating: 175 psi
 - 2) Type: Swing, metal seats, outside spring and lever, AWWA C508.
 - 3) Connections: Flanged, 125-pound ANSI.
 - 4) Materials: Cast iron, bronze trim.
 - 5) Accessories: Oil Buffer
 - 6) Manufacturers: Crispin, Dezurik Apco, or equal.
 2. System I: Valve and Accessory System for compressed air to 200 psig
 - a. Check Valves ½-inch to 2-inch:
 - 1) Rating: 300 psi.
 - 2) Type: Lift check with dash pot or spring control.
 - 3) Material: Bronze body and stainless steel disc.
 - 4) Manufacturer: Jenkins Figure 54, Crane No. 366E, or equal.

- b. Moisture Trap and Drainer:
 - 1) Rating: 200 psi.
 - 2) Type: Snap action float.
 - 3) Material: Metallic body; stainless steel or rubber float.
 - 4) Manufacturer: Armstrong, No. 71A, Wilkerson 5100-4, or equal.
 - c. Ball Valves:
 - 1) Rating: Class 300.
 - 2) Materials: Carbon steel body and ball, Teflon seats.
 - 3) Manufacturer: Neles-Jamesbury, Type 5300; or equal.
 - d. Flexible Connectors: American BOA Type BCT; or equal.
 - e. Solenoid Valves for compressed air, with a gastight enclosure:
 - 1) Rating: 200 psi, 250°F.
 - 2) Type: Two-way straight through pattern, manual operator, NEMA Type 1 solenoid enclosure with ½-inch conduit adapter, normally closed holding coil, conforming to ARI 760, UL listed.
 - 3) Connections: Solder end.
 - 4) Materials: Forged brass, Teflon seat.
- D. Miscellaneous Valves and Accessories:
- 1. Valve Tags: Plastic, fiberglass, or plastic material, 2-inch square with grommited hole. The tags shall be attached to valves with a brass jack chain. For buried installations use a nylon strap. Lettering shall be stamped or cut into the tag at least 3/16-inch high.
 - 2. Link-Type Seals: Link-type seals shall be interlocking synthetic rubber links connected by stainless steel bolts and nuts to form a continuous belt. Tightening of the bolts shall expand the rubber to form a watertight seal of the annular space between a pipe and the hole or sleeve in the wall.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

- A. General Handling and Placing:
 - 1. Exercise great care to prevent injury to or scoring of the pipe lining and coating, as applicable, during handling, transportation or storage. Handle fusion epoxy coated pipe and ceramic epoxy lined pipe in accordance with AWWA C213. Do not store pipe on rough ground and do not roll the pipe on the coating. Any damaged pipe sections, specials, or fittings shall be repaired or replaced at the expense of the Contractor as satisfactory to the Engineer.
 - 2. Carefully inspect each pipe, fitting, valve and accessory before installation to insure there is no defective workmanship or obstructions. Inspect the interior and exterior protective coatings and patch all damaged areas in the field or replace to the satisfaction of the Engineer.
 - 3. Place or erect all piping to accurate line and grade and backfill, support, hang, or brace against movement as specified or shown on the Drawings, or as required for proper installation. Remove all dirt and foreign matter from the pipe interior prior to installation and thoroughly clean all joints before joining.
 - 4. Use reducing fittings where any change in pipe size occurs. Do not use bushings unless specifically noted on the Drawings. Use eccentric reducing fittings wherever necessary to provide free drainage of lines.

5. Cast all metallic pipes and sleeves 6-inch and larger into concrete walls without blockout. Maintain at least ½-inch clearance between reinforcing steel and metal pipe in penetrations.
- B. General Buried Piping Installation:
1. Trenching, bedding, and backfill for buried piping shall be as shown on the Drawings and as specified in Section 02302.
 2. Where pipe grade elevations are shown on the Drawings, install the pipe with straight grades between the indicated elevations.
 3. Where no pipe grade elevations are shown on the Drawings, install buried piping with at least 3 feet of cover to finished grade. Where piping crosses under buried electrical ducts, provide at least 4 feet 6 inches of cover. Provide 12 inches minimum separation between the buried pipes and ducts.
 4. All new sewer lines must cross at a minimum of 18 inches below existing potable waterlines.
 5. Provide each pipe with a firm, uniform bearing for its full length in the trench except at field joints. Do not lay pipe in water or when trench conditions or weather are unsuitable for such work.
 6. Protect buried piping against thrust by use of restrained pipe joints and/or thrust blocks. All exposed free pipe ends shall be securely braced. Cap or plug pipe ends that are left for future connections as shown on the Drawings and in a manner favorably reviewed by the Engineer.
 7. Where piping leaves a structure or concrete encasement, provide a joint capable of angular deflection within 12 inches of the structure for pipes 12-inch and smaller. Conform to details on the Drawings where such details are shown.
 8. Coat bolts on buried flanges or other buried appurtenances in accordance with Paint System 8 in Section 09960. Wrap the appurtenance with polyethylene encasement and tape the encasement tightly closed to the pipe.
- C. General Exposed Piping Installation:
1. Unless shown otherwise, install piping parallel to building lines, plumb and level.
 2. Install piping without springing or forcing the pipe in a manner that would set up stresses in the pipe, valves, or connected equipment.
 3. Set all pipe flanges level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes.
 4. Flexibility and Expansion: Provide flexible couplings, flexible hose, or flexible spools for all piping connections to engine driven equipment and where otherwise shown. The Contractor may install additional flexible couplings at favorably reviewed locations to facilitate piping installation, provided that he submits complete details describing location, pipe supports, and hydraulic thrust protection. Anchor piping subject to expansion or contraction in a manner permitting strains to be evenly distributed. Sleeves for branches through walls from adjacent mains shall be of sufficient size to allow for free side motion of covered pipe in sleeves.
 5. Install unions or flexible connections where shown on the Drawings, and at all non-engine-driven equipment to facilitate removal of the equipment.
- D. Installation Specifics:
1. DIP Pipe:

- a. Flanged Joints: Flanged joints shall be made up tight with care being taken to avoid undue strain in the flanges, fittings, and other accessories. Bolt holes shall be aligned for each flanged joint. Bolts shall be full size for bolt holes; use of undersize bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Adjoining flange faces shall not be out of parallel to such a degree that the flanged joint cannot be made watertight without overstraining the flange. Any flanged pipe or fitting whose dimensions do not allow the making of a proper flanged joint as specified herein shall be replaced by one of the proper dimensions. Clean flanges prior to making joints. Buried flanged pipe connections shall be made with the smallest practical "bell" hole. After the joint is completed take special care to completely fill the "bell" hole under and around the pipe with compacted backfill.
- b. Mechanical Grooved Couplings: Install in accordance with the manufacturer's instructions.
- 2. BS40 Pipe:
 - a. Install and weld in accordance with ANSI B31.1.
 - b. Threaded joints shall have connections metal-to-metal tight. Remove all burrs from the ends of the pipe and clean threads of all oil and chips. Coat male threads with a joint lubricant.
- 3. PET Tubing:
 - a. Install in accordance with the tube and fitting manufacturers' instructions.

3.02 COUPLING INSTALLATION

- A. Flexible Couplings and Flange Coupling Adaptors: Prior to installation, thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket. Wipe gaskets clean before they are installed. If necessary, flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's recommendations. Tighten bolts progressively, drawing up bolt on opposite sides a little at a time until all bolts have a uniform tightness. Workers tightening bolts shall be equipped with torque-limiting wrenches or other favorably reviewed type. Anchor studs on restrained flanged coupling adaptors shall be installed so as to lock into holes drilled through the pipe wall in accordance with manufacturer's recommendation.
- B. Tie Rods: Except where double-nutting is required, install the nuts snug. Tighten the nuts gradually and equally at opposite sides of the pipe until snug to prevent misalignment and to ensure that all rods carry equal loads. If double-nutting is required, double-nut each end of each tie rod. The space between the pairs of nuts shall be ½-inch greater than the distance between the lugs. Provide double-nutting at buried locations and where otherwise required on the Drawings.
- C. Flexible Rubber Spools:
 - 1. Install in accordance with manufacturer's instructions. Unless otherwise shown on the Drawings, install flat with one-half the maximum expansion.
 - 2. Connect rubber spools only to full-face metal flanges.
 - 3. Install control rod-compression sleeve assemblies with control rod nuts snug, to relieve stress on adjacent pipe, except at buried locations. Comply with manufacturer's instructions.

3.03 INSTALLATION OF VALVES AND ACCESSORIES

- A. Wrap buried valve bodies as specified for flexible couplings and flanged coupling adapters.
- B. Use reducing fittings where any change in pipe size occurs between valves or accessories and the attached pipeline. Bushings shall not be used, unless specifically noted on the Drawings. Use eccentric reducing fittings wherever necessary to provide free drainage of lines.
- C. Install valves and accessories such that all parts are easily accessible for maintenance and operation. Provide valve boxes for buried valves.
- D. Where valve handwheels are shown on the Drawings, valve orientation shall be as shown. Where valve handwheels are not shown, orient valves to permit easy access to the handwheels or handles and to avoid interferences.
- E. Rigidly support pressure switches and connect them to piping and equipment using a suitable flexible linkage that will not permit transmission of vibrations from the piping or equipment to the pressure switches.
- F. Provide a shutoff valve below each pressure gauge, protective device or air valve unless otherwise specified.
- G. Connections between ferrous and non-ferrous piping, valves, accessories or pipe supports shall be made using a dielectric coupling, union, or flange.
- H. Where valves or other pipeline items require metal full-face connecting flanges, provide intermediate flanges if the connecting flange is not adequate.
- I. Provide a suitable chrome plated escutcheon on pipes passing through walls, floors, ceilings and partitions in finished areas.
- J. Install link-type seals in cast-in-place metal sleeves or in smooth core drilled holes. Grout both sides flush with non-shrink grout unless otherwise shown on the Drawings.

3.04 PIPE AND VALVE IDENTIFICATION

- A. General: Identify all exposed piping in this project by painting, banding, system name labels, and direction arrows. The color and banding shall be as selected by the Engineer. Identify all buried and exposed valves with tags as specified below.
- B. Exposed Pipe Identification: Before painting, banding and labeling, pipes shall be identified by the Contractor with temporary wired-on cardboard tags showing the proposed marking for review by the Engineer.
- C. Piping: Paint all exposed pipes with the appropriate paint system
- D. Valves: Provide each buried valve with a valve tag identifying the pipeline contents, and either its valve number, or the area or item served by the valve for valves without a valve number.

3.05 FIELD QUALITY CONTROL

- A. Factory Quality Control: The Contractor shall test all products as required herein and by the reference specifications.
- B. The Contractor shall
 - 1. Perform leakage tests.

2. Be responsible for the costs of additional inspection and retesting by the Owner resulting from non-compliance.

3.06 CLEANING

- A. Prior to testing, thoroughly clean the inside of each completed piping system of all dirt, loose scale, sand and other foreign material. Cleaning shall be by sweeping, flushing with water or blowing with compressed air, as appropriate for the size and type of pipe. Flushing shall achieve a velocity of at least 3 feet per second. The Contractor shall install temporary strainers, temporarily disconnect equipment or take other appropriate measures to protect equipment while cleaning piping. Cleaning shall be completed after any pipeline repairs.

3.07 FIELD TESTING

- A. General: Perform leakage tests on all pipe installed in this project. Furnish all equipment, material, personnel and supplies to perform the tests and make all taps and other necessary temporary connections. The test pressure, allowable leakage and test medium shall be as specified and as shown in the following Paragraphs. Test pressure shall be measured at the highest point on the line, except that pressure at lowest point shall not exceed pipe manufacturer's rated test pressure, unless specifically noted otherwise. Leakage tests shall be performed on all piping at a time agreed upon and in the presence of the Engineer. All visible leaks shall be repaired, regardless of the test results. The Contractor may purchase water for construction, cleaning, testing, and disinfection of the pipelines from the City at a fire hydrant designated by the City. At any connection to the City water system, the Contractor shall provide an air-gap or reduced pressure backflow valve system to prevent backflow into the water source.
- B. Buried Piping: The leakage test for buried piping shall be made after all pipes are installed and backfilled. However, the Contractor may conduct preliminary tests prior to backfill. If the Contractor elects to conduct preliminary tests, provide any necessary temporary thrust restraint.
- C. Exposed Piping: All supports, anchors and blocks shall be installed prior to the leakage test. No temporary supports or blocking shall be installed for final test.
- D. Accessories: It shall be the responsibility of the Contractor to block off or remove equipment, valves, gauges, etc., which are not designed to withstand the full test pressure.
- E. Testing Apparatus: Provide pipe taps, nozzles and connections as necessary in piping to permit testing including valves to isolate the new system, addition of test media, and draining lines and disposal of water, as is necessary. These openings shall be plugged in a manner favorably reviewed by the Engineer after use. Provide all required temporary bulkheads.
- F. Correction of Defects: If leakage exceeds the allowable, the installation shall be repaired or replaced and leakage tests shall be repeated as necessary until conformance to the leakage test requirements specified herein have been fulfilled. All visible leaks shall be repaired even if the pipeline passes the allowable leakage test.
- G. Reports: The Contractor shall keep records of each piping test, including:
 1. Description and identification of piping tested.

2. Test pressure.
 3. Date of test.
 4. Witnessing by Contractor and Engineer.
 5. Test evaluation.
 6. Remarks, to include such items as:
 - a. Leaks (type, location).
 - b. Repairs made on leaks.
 7. Test reports shall be submitted to the Engineer.
- H. Venting: Where not shown on the Drawings, the Contractor may install valved "tees" at high points on piping to permit venting of air. Valves shall be capped after testing is completed.
- I. Testing Specifics: Piping shall be tested as indicated below. All other piping systems shall be tested as required for the pipe type used. Unless specified otherwise, test each system for four hours.
1. Allowable leakage is generally none; for PVC, use the following formula:

$$L = \frac{N D P^{1/2}}{7400}$$

Where:

L = allowable leakage, gallons per hour

N = number of joints being tested

P = pressure, psi

D = nominal pipe diameter, inches

END OF SECTION

SECTION 15060

PIPE SUPPORTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Provide all pipe supports as shown on the Drawings, described in the Specifications.

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC), Manual of Steel Construction
- B. American Society of Mechanical Engineers (ASME), ASME B31 Code for Pressure Piping
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- D. ASTM International (ASTM)
- E. Manufacturers Standardization Society (MSS):
 - 1. MSS SP-58: Pipe Hangers and Supports - Materials, Design, and Manufacture
 - 2. MSS SP-69: Pipe Hangers and Supports - Selection and Application
 - 3. MSS SP-89: Pipe Hangers and Supports - Fabrication and Installation Practices
- F. American National Standards Institute (ANSI)
- G. American Water Works Association (AWWA)
- H. National Fire Protection Association (NFPA)
- I. SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Layouts and Schematics: Submit detailed installation drawings of all piping. Schematics may be submitted for piping 4 inches and smaller. The Drawings and schematics shall include: pipe support locations and types, fittings, valves, other appurtenances. (Product Review)
 - 2. Submit data to show that the following items conform to the Specification requirements:
 - a. Fabricated pipe supports and other pipe supports (Product Review).
 - 3. Submit certified test reports as required herein and by the referenced standard specifications (Product Information).
- B. Provide seismic anchorage design for Contractor designed pipe supports in accordance with Section 01190 of the Specifications, including layout and calculations, signed and sealed by a Professional Civil or Structural Engineer registered in the State of California.

1.04 QUALITY ASSURANCE

- A. Materials and equipment furnished under this Section shall be of manufacturers who have been regularly engaged in the design and manufacture of the materials and equipment for a period of at least 5 years. Demonstrate to the satisfaction of the Engineer that the quality is equal to the materials and equipment made by the manufacturers specifically named herein, if an alternate manufacturer is proposed.

1.05 APPURTENANCES

- A. Furnish and install all necessary anchors and assembly bolts, washers and nuts, hangers, and supports; all other appurtenant items shown on the Drawings, specified or required for the proper installation and operation of the pipe supports.

1.06 PIPE SUPPORTS

- A. General:
 - 1. Piping 6 Inches and Larger: Pipe supports are shown on the Drawings for piping 6 inches and larger in diameter, where the piping is shown on layout drawings. Each pipe support used is designed to resist seismic loading except where the support is of the sliding type for thermal expansion. Other supports are provided to resist axial seismic loading of pipes designed for thermal expansion. Pipe supports that are considered seismic resistant are so noted on the pipe support detail sheets on the Drawings. The location and types of supports and braces are indicative and may be modified by the Contractor to suit field conditions, provided the modified support system conforms to the design criteria stated herein, and receives the favorable review of the Engineer. Where piping is shown schematically only, it shall be the Contractor's responsibility to support all such piping in accordance with the design criteria stated herein and using support details shown on the Drawings. Pipe supports have been designed assuming flanged joints on ductile iron pipe and steel pipe, unless otherwise indicated on the Drawings. If groove type mechanical couplings are used as an alternative, provide additional supports where required, particularly to resist rotation. Shop drawings of these additional supports shall be favorably reviewed by the Engineer prior to installation.
 - 2. Piping Less Than 6 Inches: Pipe supports are generally not shown for piping less than 6 inches in diameter. Where supports are not shown, it shall be the Contractor's responsibility to support all such piping in accordance with the design criteria stated hereinafter and the support details shown on the Drawings. Piping 2 ½ inches and larger and all piping for hazardous chemicals shall be supported with pipe supports designed to resist seismic loads. Piping smaller than 2 ½ inches with non-hazardous contents may be supported with non-seismic resistant supports.
 - 3. Where not detailed or otherwise indicated, pipe support types and spacing shall be in accordance with the Manufacturer's Standardization Society (MSS) Standard Practice No. SP 58 and No. SP 69, except as superseded by the requirements of these Specifications. Hangers and supports used as components of a fire protection system shall comply with NFPA Standard No. 13 and be listed and labeled by UL and FM.
- B. Pipe Support System Design:
 - 1. Design Loads: Pipe suspension shall be such as to prevent excessive stress or excessive variation in supporting force while system is in operation. Pipe

supports shall support the sum of the weight of the pipe, fittings, appurtenances, and contents. In addition, the pipe shall be anchored to resist internal pressure forces tending to separate any unrestrained joint at pressures 1-½ times the maximum working pressure for the applicable service.

2. Seismic Loads: Refer to Section 01190 of the Specifications.
3. Location: All piping shall be supported in a manner that will prevent undue strain on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, adjacent to flexible couplings, at all non-rigid joints, at hose bibbs, and where otherwise shown. Where piping connects to equipment, it shall be supported by a pipe support and not by the equipment.

a. Maximum support spacing shall conform to the following table:

Pipe Size Inches	Pipe Material	Maximum Spacing Feet
1-inch and smaller	Iron or Steel	6
	Copper	4-1/2
	Plastic	continuous
	Tubing	continuous
1-¼-inch to 2-inch	Iron or Steel	8
	Copper or Plastic	5
2-½-inch to 4-inch	Iron or Steel	10
	Copper or Plastic	6
6-inch to 8-inch	Iron or Steel	12
	Plastic	8
10-inch and larger	Iron or Steel	15

- b. Piping penetrations through concrete walls and slabs are considered to resist seismic loading, provided penetrations for pipes 3 inches in diameter and larger are complete with a wall flange.
- c. Branch piping is not considered to provide resistance to seismic forces.
4. Anchors: Anchors for connecting pipe supports to concrete shall be in accordance with the Contract Drawings.
5. Thermal Expansion Allowance:
 - a. Provide one rigid pipe support for each straight run of pipe and between each pair of flexible couplings, flexible connectors, or expansion loops for pipes listed below. Provide other supports at the required spacing that allow sliding or rolling, as noted, along the pipe axis:
 - 1) PVC pipe larger than 1 inch in diameter (sliding inside PVC sleeve).
 - 2) Building heating hot water (rolling).
 - 3) Domestic hot water (rolling).
 - 4) Liquid Oxygen.
 - 5) Aeration Air, Airwash Air, Compressed Air.
 - b. Provide vertical support only, that is, no lateral support, within 4 feet of an angle or tee for pipes listed above.

PART 2 - PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

- A. Unless specified otherwise herein bolts, nuts, and other hardware shall be as follows:
 - 1. Exposed: Electroplated zinc or cadmium steel.
 - 2. Submerged or Buried: Type 316 stainless steel, minimum tensile strength: 60,000 psi.
 - 3. Concrete Encased: Type A307 Standard Carbon Steel.
 - 4. Apply an anti-galling compound to the threads of stainless-steel bolts.

2.02 PIPE SUPPORTS

- A. Manufacture and Design: Pipe supports shall, to the maximum extent possible, be standard factory fabricated units conforming to the typical supports and braces shown in the Drawings and as specified below. Where required support cannot be provided by standard factory fabricated units, and is not detailed on the Drawings, the Contractor shall provide special pipe supports. Provide $\frac{3}{4}$ inch chamfer on corners of all support elements and file or grind smooth. Supports designated to allow axial pipe movement shall have smooth and even contact surfaces.
- B. Manufacturers:
 - 1. Anvil International
 - 2. Eaton B-Line
 - 3. Or equal.
- C. The shield shall consist of an insulation layer encircling the entire circumference of the pipe and a steel jacket encircling
- D. Materials: All support systems shall be galvanized steel except those that are submerged or that are located within a tank, channel, or other structure designed to hold water, below the top of surrounding walkway elevation or tank wall top, or otherwise called out on the Drawings, shall be Type 316 stainless steel. Trays for continuous support of plastic pipe or tubing shall be made of 20 gauge galvanized steel.
- E. Provide plastic caps with rounded corners on all exposed ends of channels.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE SUPPORTS

- A. General:
 - 1. Install and adjust supports for each pipeline such that the pipeline is true to the indicated line and grade.
 - 2. Locate anchors and braces for any single support on a continuous structure; that is, not on two sides of a structural expansion joint.
 - 3. Tighten clamps to develop full friction along the pipeline except where loose fitting clamps are called for.
 - 4. Adjust hangers and supports to obtain required pipe slope and elevation. Shims made of material that is compatible with the piping material may be used. Adjust stanchions prior to grouting their baseplates.

- B. Electrolytic Protection: Pipe supports serving copper pipe or tubing shall be dielectrically insulated from the pipe by dielectric sleeves or plastic pipe wrap at the point of contact.

END OF SECTION

SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work Included:

1. Provide all required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, or required for a complete and fully operating facility. In addition, provide wiring for the equipment that will be provided under other Divisions of these Specifications.
2. Provide conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions. Coordinate with the supplier of electrical equipment specified under other Divisions.
3. Provide all conduit, wiring and terminations for all field-mounted instruments furnished and mounted under other Divisions, including process instrumentation primary elements, transmitters, local indicators and control panels. This also includes lightning and surge protection equipment wiring at process instrumentation transmitters if required. Contractor shall install vendor furnished cables specified under other Divisions.
4. Provide a complete raceway system for the specialty cable systems. Install the specialty cable systems in accordance with the system manufacturer's installation instructions. Review of the raceway layout, prior to installation, with the system supplier and cable manufacturer to ensure raceway compatibility with the system and materials being furnished. Where redundant cables are furnished, install them in separate raceways.
5. Provide raceway and power wiring for all heating, ventilation and air conditioning equipment furnished under other related Divisions. Refer to HVAC drawings and related specifications for power requirements. .
6. Auxiliary Devices: Provide conduit and wire for power and control for all auxiliary devices such as solenoid valves, pressure switches, and instruments that are included as part of a manufacturer's packaged system (i.e., all systems specified in Divisions 11 through 15). Contractor shall be responsible for conduit and wire to these auxiliary devices even if not specifically shown on the Drawings or specified herein.
7. Provide concrete, excavation, backfill and steel reinforcement required for encasement, installation or construction of the WORK of the various Sections of Division 16 as a part of the WORK under the respective Sections, including duct banks, manholes, handholes, equipment housekeeping pads and light pole bases.

B. Work Specified in Other Divisions:

1. Section 11001: General Equipment and Mechanical Requirements – equipment supports and foundations
2. Section 11372: Compressed Air Systems - providing electric motor
3. Division 17: Providing instruments and other process control equipment.

- C. Safety: Conduct operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.

1.02 CODE COMPLIANCE AND REFERENCE STANDARDS

- A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
 - 1. National Electrical Safety Code (NESC)
 - 2. Occupational Safety and Health Administration (OSHA)
 - 3. National Fire Protection Association (NFPA)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. American National Standards Institute (ANSI)
 - 6. Insulated Cable Engineers Association (ICEA)
 - 7. Instrument Society of America (ISA)
 - 8. Underwriters Laboratories (UL)
 - 9. Factory Mutual (FM)
 - 10. Institute of Electrical and Electronics Engineers
 - 11. American Society of Testing Materials (ASTM)
 - 12. Local Telephone Company requirements
 - 13. Local Utility Company requirements
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- C. All materials and equipment for which a UL standard exists, shall bear a UL label. No such material or equipment shall be brought onsite without a UL label affixed.
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Owner/Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

1.03 SUBMITTALS

- A. Shop Drawings shall be custom prepared for this project and submitted as listed in each of the Electrical Specification Sections. Shop drawings shall include the following:
 - 1. Complete materials list stating manufacturer, brand name and catalog number of each item or class of material.
 - 2. Shop drawings for grounding work not specifically indicated on the drawings but required under the NEC.
 - 3. Front, side and rear elevations along with top views with required dimensional data.
 - 4. Location of conduit entrances and access plates.
 - 5. Catalog cuts defining component data.

6. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size and cable numbers.
 7. Method of anchoring, seismic requirements and weight.
 8. Types of materials and finish.
 9. Nameplates.
 10. Temperature limitations, as applicable.
 11. Voltage requirements, phase and current, as applicable.
 12. Front and rear access requirements.
 13. Test reports.
- B. O&M Manuals and other documentation shall be submitted in accordance with these contract documents. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc. to instruct operating and maintenance personnel unfamiliar with such equipment. All manuals and other documentation shall be submitted as listed in each of the Electrical Specification Sections and include the following:
1. A comprehensive index.
 2. A complete "As-built" set of approved shop drawings.
 3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.
 4. A table listing of the "as left" settings for all timing relays and alarm and trip set points.
 5. System schematic drawings "As-Built", illustrating all components, piping and electrical connections of the system supplied under this Section.
 6. Detailed service, maintenance and operation instructions for each item supplied.
 7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
 8. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
 9. Complete parts list with stock numbers, including spare parts.
- C. Record Drawings shall be promptly furnished when the equipment installation is complete. Payment may be withheld until Record Drawings have been furnished and approved.
- D. At the time of delivery of the equipment, the Contractor shall have an approved shop drawing in his possession for the Owner's Inspector and/or Owner's Engineer for verification.
- E. As-Built Drawings: As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called "As-Built Drawings". The As-Built Drawings and specifications shall be kept up to date throughout the project. As-Built Drawings shall accurately show the installed condition of the following items at a minimum:
1. One-line Diagram(s).
 2. Raceways and pullboxes.
 3. Conductor sizes and conduit fills.
 4. Panelboard Schedule(s).
 5. Control Wiring Diagram(s).
 6. Underground raceway and duct bank routing including manhole/handhole locations.

7. Plan view, sizes and locations of switchgear, switchboards, distribution transformers, motor control centers and panelboards.

1.04 TESTS

- A. The Contractor shall be responsible for factory and field tests indicated in Division 16, as required by the Engineer and as required by other authorities having jurisdiction.
- B. Furnish necessary testing equipment
- C. Pay the costs of the tests, including replacement parts and labor due to damage resulting from damaged equipment or from testing and correction of a faulty installation.
- D. Reporting
 1. Where test reporting is indicated, submit proof-of-design test reports for mass-produced equipment with the Shop Drawings.
 2. Submit factory performance test reports for custom-manufactured equipment for approval prior to shipment.
 3. Submit field test reports for review prior to Substantial Completion.
- E. Remove and replace equipment or material that fails a test, or, if the Engineer approves, repair and retest for compliance.
- F. Connections to equipment or materials with a factory warranty shall be as recommended by the manufacturer and shall be performed in a manner that does not void the warranty.

1.05 PERMITS AND INSPECTIONS

- A. Obtain permits and pay all fees required for permits inspections.
- B. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- C. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.
- D. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

1.06 DEMOLITION AND RELATED WORK

- A. General
 1. Perform electrical demolition work as indicated.
 2. The Contractor is cautioned that demolition work may also be indicated on non-electrical Drawings.
 3. Coordinate with all trades regarding electrical de-energization, disconnection and removal, and the overall sequence of construction.
- B. Electrical Requirements for Removed Equipment
 1. Remove dedicated wiring and exposed conduits back to the source.
 2. Abandon in place wiring that shares conduit with other equipment wiring, except power wiring.

3. Remove power wiring from the power source to the first pullbox or manhole remote from the panel and abandon in place the remaining wiring.
 4. Abandon in place wiring routed through encased conduits and cut encased conduits flush to the floor and grout flush with the floor.
 5. Remove remote mounted starters, disconnect switches, circuit breakers, sensors and transmitters
- C. Junction Boxes
1. Wiring and conduits indicated to be extended shall be terminated in a new junction box with terminal strips.
 2. Provide a junction box with a NEMA rating in accordance with the area in which it is located and sized as required by the NEC.
 3. Properly identify wires and terminals before disconnection.
- D. Identification
1. Where switchgear, motor control centers, switchboards or panelboards are indicated to have components, assemblies or circuits removed and/or reconnected, provide the affected equipment compartments with new engraved nameplates matching the existing. Modify panelboard schedule(s) to indicate revised circuits.
 2. Pencil or magic marker markings directly on equipment will not be acceptable.

1.07 COORDINATION

- A. Coordinate the electrical work with the other trades, code authorities, and the Owner.
- B. Where connections must be made to existing installations, properly schedule all the required work with the Owner, including the power shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the plant and privately owned facilities.
- C. Submit a written sequencing request indicating the sequence and duration of activities to be performed during the plant shutdown.
- D. Switching, safety tagging and other project related tasks required for shutdown or to isolate existing equipment, shall be performed by the Contractor.
- E. In no case shall the Contractor begin any work in, on or adjacent to existing equipment without written authorization from the Engineer.
- F. Modifications
1. Perform modifications or alterations to existing electrical facilities as required to successfully install and integrate the proposed electrical equipment as indicated.
 2. Perform modifications to existing equipment, panels and cabinets in a professional manner. Repair coatings of existing equipment to match existing
 3. The costs for modifications to existing electrical facilities that are required for a complete and operable system shall be included as part of the Work.
- G. Existing Utilities
1. Exercise extreme caution when digging trenches to not damage existing underground utilities.
 2. The cost of repairs of damages caused during construction shall be included as a part of the Work.

- H. Field Verifications
 1. Visit the site before submitting a Bid to become better acquainted with the Work of this Contract.
 2. The lack of knowledge will not be accepted as justification for extra compensation to perform the Work.
 3. The Contractor shall be responsible for identifying available existing circuit breakers in lighting panel for the intended use as required.
 4. The Contractor shall be responsible for field verifying the available space in switchgear, switchboards and/or motor control centers to integrate new overcurrent protective devices meeting the requirements of these Specifications.
 5. The cost for the above field verifications shall be included as part of the Work.
- I. Installation of Temporary Power
 1. To facilitate the continuous operation of existing equipment, provide temporary equipment as indicated.
 2. Submit installation and connection details for favorable review and acceptance by the Engineer.
 3. Costs associated with these temporary installations shall be included as part of the Work.
 4. Temporary wiring and equipment shall remain the property of the Contractor unless indicated otherwise.

1.08 LOCATIONS

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph B. herein.
- B. Definitions of Types of Locations:
 1. Dry Locations: All those indoor areas which do not fall within the definitions below for Wet, Damp, or Corrosive Locations and which are not otherwise designated on the Drawings.
 2. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.
 3. Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Drawings.
 4. Corrosive Locations: Areas where chlorine or sulfur dioxide gas under pressure, sulfuric acid, or liquid polymer are stored or processed. These areas are shown on the Drawings.
- C. Unless otherwise specified herein or shown on the Drawings, electrical enclosures and associated installations shall have the following ratings:
 1. NEMA 1 gasketed or 12 for dry, non-process indoor above grade locations
 2. NEMA 3R for outdoor installations identified not to be corrosive.
 3. NEMA 4X enclosures of Type 304 or 316 stainless steel in corrosive areas except in chlorine and HFS areas where non-metallic enclosures shall be provided.

1.09 PHASE BALANCING

- A. The Drawings do not attempt to balance the electrical loads across the phases. Circuits on motor control centers and panelboards shall be field connected to result in evenly distributed loads across all three phases.

- B. Field balancing of circuits shall not alter the conductor color coding requirements defined in Section 16120.

1.10 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.
- B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure the tilting does not impair the functional integrity of the equipment.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.
- B. It is the intent of these Specifications and Drawings to secure high quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses, which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.
- C. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service. Light-duty, fragile and competitive grade devices of doubtful durability shall not be used.
- D. Where a NEMA enclosure type is indicated in a non-hazardous location, use that type of enclosure despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.
- E. Temperature Ratings of Equipment Terminations and lugs shall be rated for use with 75-degree C conductors. Wire sizes in the Contract Documents are based on NEC ampacity tables using the 75-degree C ratings.

2.02 MOUNTING HARDWARE

- A. Miscellaneous Hardware
 - 1. Provide nuts, bolts and washers constructed of stainless steel.
 - 2. Provide threaded rods for trapeze supports constructed from continuous threaded galvanized steel, 3/8-inch diameter minimum.
 - 3. Struts

- a. Construct struts for mounting of conduits and equipment of stainless steel.
 - b. Where contact with concrete or dissimilar metals may cause galvanic corrosion, use suitable non-metallic insulators in order to prevent such corrosion.
 - c. Strut manufacturer shall be Unistrut, B-Line or approved equal.
4. Provide plastic protective end caps for all exposed strut ends. End caps shall be manufactured by Unistrut P2860-33 or approved equal
5. Provide stainless steel expansion anchors for attaching equipment to concrete walls, floors and ceilings. Expansion anchors shall be manufactured by Power Fasteners, Inc and be the "Power-Bolt" or "Power-Stud" series or approved equal.

2.03 NAMEPLATES

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using fasteners constructed of brass, cadmium plated steel or stainless steel and screwed into inserts or tapped holes as required. Where no inscription is indicated on the Drawings, furnish nameplates with an appropriate inscription furnished by the Engineer upon prior request by the Contractor.
- C. Provide engraved characters of the block style, with no characters smaller than 1/8 inch top to bottom.
- D. Each control device, including pushbuttons, 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.

2.04 PAINTING

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish, which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.
- B. Wiring System: Paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed. Paint finishes shall include proper surface preparation, prime coat and a final finish coat, and shall conform to Section 09960.

PART 3 - EXECUTION

3.01 REQUIREMENTS

- A. All electrical installations shall conform to the codes and standards outlined in this Section.

3.02 WORKMANSHIP

- A. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
- B. Perform all labor using qualified craftsmen, who have had experience on similar projects. Provide first-class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improperly fit installations at no additional expense to the Owner.
- E. Provide materials and incidental required for a complete and operable system, even if not required explicitly by the Contract Documents.
- F. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

3.03 EXCAVATION AND BACKFILL

- A. Provide the excavations for electrical equipment foundations and trenches for conduits as shown on the Drawings.
- B. Exercise caution during all excavation work and avoid damage to existing underground pipes. Exercise extreme caution when working near existing electrical conduits and facilities. Field verify the location of all electrical facilities before proceeding with any nearby work.
- C. Refer to Division 2, Earthwork, of these Specifications for all excavation and backfilling work.

3.04 CONCRETE

- A. Where shown on the Drawings or specified, provide the required concrete installations for conduit encasement and equipment foundations.
- B. Refer to Division 3, Concrete, of these Specifications for all concrete work.

3.05 CONDUCTOR IDENTIFICATION

- A. Identify all wires and cables in conformance with the requirements of Sections 16120 and 16124. This requirement applies to all equipment provided under this contract, regardless of Division, as well as to all conductors provided or worked on during this contract.

3.06 CONCRETE HOUSEKEEPING PADS

- A. Provide concrete housekeeping pads for indoor floor-standing electrical equipment.
- B. Install all floor-mounted equipment on 4-inch high reinforced concrete pads. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels, motor control centers, and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.

- C. Provide concrete housekeeping curbs 3-inches above the finished floor or grade for conduit stub-ups in indoor locations that are not concealed by equipment enclosures.

3.07 CUTTING, DRILLING, AND WELDING

- A. Provide any cutting, drilling, and welding that is required for the electrical construction work.
- B. Structural members shall not be cut or drilled, except when favorably reviewed by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.
- C. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel.
- D. Perform patch work with the same materials as the surrounding area and finish to match, as specified in Division 3 of these Specifications.

3.08 METAL PANELS

- A. Mount all metal panels which are mounted on or abutting concrete walls in damp locations or any outside walls 1/4 inch from the wall, and paint the back sides of the panels with a high build epoxy primer. Film thickness shall be 10 mils minimum.

3.09 PROTECTIVE DEVICE COORDINATION

- A. Provide the services of a recognized independent testing laboratory or coordination analysis consultant for the proper system coordination of the protective devices furnished on this project. Submit the name and the qualifications of the laboratory or consultant for review by the Engineer; qualifications must include professional registration of proposed personnel as electrical engineers.
- B. The protective device on the line side closest to the fault or abnormal conditions shall isolate the problem portion of the system and minimize damage in that portion. The rest of the system shall be maintained in normal service. The coordination shall be in conformance with the recommendations of latest IEEE Standard 242.
- C. Submit the analysis that shall include impedance and short circuit calculations, list of any assumptions made in the analysis, the recommended settings of the protective devices, and the system time/current characteristic curves. The submittal shall be made so as to allow time for review and resubmittal, if necessary, before the implementation of final settings and adjustments by the testing laboratory.

3.10 FIELD TESTS

- A. Perform tests in accordance with applicable procedures as described in NETA Acceptance Testing Specifications.
- B. Give 2-week notice to the Owner/Engineer prior to any test to permit witnessing the test.
- C. Provide the services of a recognized independent testing laboratory and pay all costs of performing the inspections and tests as specified herein.

- D. The testing laboratory shall provide all materials, equipment, labor and technical supervision to perform such tests and inspections. It is the intent of these tests to ensure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with the Contract Documents and manufacturer's instructions. The tests and inspections shall determine the suitability for energization.
- E. The testing laboratory shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907. Membership in the International Electrical Testing Association (NETA) constitutes proof of meeting such criteria. The testing laboratory shall submit proof of these qualifications to the Engineer for review. Testing laboratory shall be Electrical Testing and Controls, Electro-Test, Power Systems, or approved equal.
- F. The testing laboratory shall have a calibration program, which maintains all applicable test instrumentation within, rated accuracy. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain. Instruments shall be calibrated in accordance with the following frequency schedule:
 - 1. Field instruments: 6 months maximum
 - 2. Laboratory instruments: 12 months
 - 3. Leased specialty equipment: 12 monthsDate calibration labels shall be visible on all test equipment.
- G. Where testing pursuant to NETA requirements is required in these specifications, submit a test report which includes the following:
 - 1. Name of project, name of person performing test, and date of test
 - 2. Description of equipment tested
 - 3. Description of test
 - 4. List of test equipment used and calibration date
 - 5. Test results
 - 6. Conclusions and recommendations
 - 7. Appendix, including appropriate test formsThe test report shall be bound, and its contents certified. Submit the completed report directly to the Engineer no later than thirty (30) days after completion of the test unless directed otherwise. Number of reports to be submitted for review shall be the same as the number required for shop drawing submittals.
- H. Safety practices shall include, but are not limited to, the following requirements:
 - 1. Occupational Safety and Health Act of 1970, OSHA.
 - 2. Accident Prevention Manual for Industrial Operations, Seventh Edition, National Safety Council, Chapter 4.
 - 3. Applicable state and local safety operating procedures.
- I. All field tests shall be performed with apparatus de-energized except where otherwise specifically required by Section 7 of the latest Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems published by NETA. The testing laboratory shall have a designated safety representative who shall be present on the project and supervise operations with respect to safety. Circuits operating in excess of 600 volts between conductors shall have conductors shorted to ground by a hot-line grounded device approved for the purpose. In all cases, work shall not proceed until the safety representative has determined that it is safe to do so. The testing laboratory shall have available sufficient protective barriers and warning signs to conduct specified test safely.

- J. Electrical equipment and materials furnished and installed by the Contractor, and the testing equipment listed below shall be tested in accordance with the "Inspection and Test Procedures" and "System Function Tests" (Section 7) of the latest Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems published by NETA. Tests shall not include any tests listed as optional in the aforementioned NETA Specifications unless specifically noted in respective equipment specifications for this project.
- K. Retesting will be required for all unsatisfactory tests after the equipment or system has been repaired. Retest all related equipment and systems if required by the Engineer. Repair and retest equipment and systems, which have been satisfactorily tested but later, fail, until satisfactory performance is obtained.
- L. Putting Equipment and Cables into Service: Submittal and favorable review of the specified factory and field tests shall occur before the Contractor is permitted to place the respective equipment or cable into service.
- M. Miscellaneous Tests
 - 1. Insulation Resistance, Continuity, Rotation: Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment including all motors 1/2 horsepower and larger prior and in addition to tests performed by the testing laboratory specified herein. Supply a suitable and stable source of test power to the test laboratory at each test site. The testing laboratory shall specify requirements. Notify the testing laboratory when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling. All testing shall be performed in the presence of the Engineer. The testing laboratory shall be responsible for implementing all final settings and adjustments on protective devices and tap changes. Any system material or workmanship that is found defective on the basis of acceptance tests shall be reported directly to the Engineer. The testing laboratory shall maintain a written record of all tests and upon completion of project, assemble and certify a final test report.
 - 2. Motor Current: Measure and record current in each phase for each new motor. Include measurement of the motor terminal voltages and motor currents when the motor is being operated at normal operating loads. For motors that are part of variable frequency drive systems, use true-RMS-reading instruments in making the measurements.
 - 3. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, [and] including alarm conditions, [and demonstrate satisfactory interfacing with the data acquisition and alarm systems].

3.11 EQUIPMENT PROTECTION

- A. Exercise care at all times after installation of equipment, motor control centers, etc., to keep out foreign matter, dust, dirt, debris, or moisture. Use protective sheet-metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

3.12 CLEANING EQUIPMENT

- A. Before final acceptance, thoroughly clean the electrical Work of cement, plaster and other materials.

- B. Clean out and vacuum all construction debris from the bottom of all equipment.
- C. Provide and touch-up to original condition any factory painting that has been marred or scratched during shipment or installation, using paint furnished by the equipment manufacturer.
- D. Remove temporary tags, markers, stickers and the like.
- E. Remove all oil and grease spots with a non-flammable cleaning solvent by carefully wiping and scraping cracks and corners.
- F. Clean luminaires inside and out.
- G. Dispose of cleaning debris and refuse off-site.

END OF SECTION

SECTION 16110

ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install complete raceway systems as shown on the drawings and as specified herein.
- B. Raceways and conductors that are listed on the conduit and cable schedules are generally not shown on the Drawings, except where they are required to pass through a restricted or designated space and the Contractor would benefit from additional information. Conduit block diagrams indicate exposed conduits as solid lines and shall be run near the ceilings or along walls of the areas through which they pass and shall be routed to avoid interferences with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches, etc. Conduit block diagrams indicate concealed or buried conduits as dashed lines and shall be run in underground duct banks, center of concrete floor slabs, in partitions, or above hung ceilings as required.
- C. In the event that individual equipment loads provided are larger than indicated in the Contract Documents, revise raceways, conductors, starters, overload elements, and branch circuit protectors as necessary in order to control and protect the increased connected load in conformance to NEC requirements as part of the WORK.

1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI) Publications:
 - 1. C80.1 Specification for Zinc Coated Rigid Steel Conduit
 - 2. C80.5 Specifications for Rigid Aluminum Conduit
- B. Federal Specifications (FS):
 - 1. FS W C 1094 W C 1094A Conduit and Conduit Fittings, Plastic, Rigid
 - 2. FS WW C 540 WW C 540A Conduit, Metal, Rigid, (Electrical, Aluminum)
 - 3. WW C 540C Conduit, Metal, Rigid & Coupling, Elbow & Nipple, Electrical Conduit, Aluminum
 - 4. FS WW C 566 WW C 566C Flexible Metal Conduit
- C. National Electrical Manufacturers Association (NEMA) Publications:
 - 1. RN 1 Polyvinyl Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
 - 2. TC2 Electrical Polyvinyl Chloride (PVC) Conduit
 - 3. TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation
 - 4. TC14 Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- D. Underwriters Laboratories (UL) Standards:
 - 1. 6 Rigid Metal Electrical Conduit
 - 2. 6A Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel
 - 3. 360 Liquid-Tight Flexible Metal Conduit
 - 4. 651 Electrical Rigid Nonmetallic Conduit and Fittings
 - 5. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

6. 2515 Aboveground Reinforced Thermosetting Resin Conduit

1.03 SUBMITTALS

- A. Submit complete catalog cuts of raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
- B. Prepare as-built drawings of encased concealed and exposed raceways, ducts, raceways, junction boxes, pull boxes, and electrical and instrumentation equipment.

1.04 LOCATIONS

- A. Refer to Section 16010 for definitions of types of locations.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Pull and junction boxes, fittings and other indicated enclosures that are dedicated to the raceway system shall comply with the requirements of this Section.
- B. Provide exposed conduit of 3/4-inch minimum trade size and encased conduit of 1-inch minimum trade size.
- C. The use of short sections of 1/2-inch flexible conduit for final termination of field control devices and instrumentation is permitted. They may not be longer than 36 inches in length, and may only transition to the smaller size junction boxes or condulets at the field device.

2.02 CONDUIT, RACEWAYS

- A. Galvanized Rigid Steel Conduit (GRS) shall be manufactured from mild steel, hot-dip galvanized inside and out, conforming to ANSI C80.1 and UL 6. Couplings shall be threaded type. Manufacturers shall be Allied Tube and Conduit, Wheatland Tube or approved equal.
- B. PVC coated rigid steel conduit (PGRS) shall meet the requirements of GRS above. A PVC coating shall be bonded to the outer surface with a thickness not less than 40 mils. The inside surfaces and threads of the conduit shall be provided with a 2-mil urethane coating. PGRS shall be manufactured in accordance with UL-6, ANSO C80.1 and NEMA RN1. Manufacturers shall be Robroy Industries Perma-Cote or Plasti-Bond series, Thomas & Betts Ocal Blue or approved equal.
- C. Liquidtight Flexible Conduit shall be constructed of a flexible galvanized metal core with a sunlight-resistant thermoplastic outer jacket. Conduit shall be manufactured in accordance with UL 360. Manufacturers shall be Anaconda Sealtite, Electriflex Liquatite or approved equal.
- D. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be PVC Schedule 40 (PVC 40) or PVC Schedule 80 (PVC 80) and sunlight resistant. Conduit shall be approved for underground use and for use with 90°C wires, and shall conform to NEMA TC-2 and UL 651. Manufacturers shall be Carlon, Cantex or approved equal.

2.03 CONDUIT SUPPORTS

- A. For indoor, dry locations, supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer. All other locations shall be Type 316 stainless steel.
- B. For indoor, dry locations, supports for multiple conduits shall be hot-dip galvanized Unistrut or Superstrut channels, or equal. All associated hardware shall be hot-dip galvanized. All other locations shall be Type 316 stainless steel.
- C. All channels, strut, threaded rods, nuts and clamps in corrosive areas shall be of epoxy resin reinforced fiberglass material. Provide Robroy, Superstrut, or equal.

2.04 FITTINGS

- A. General
 - 1. For use with metallic conduit, provide cast and malleable iron fittings of the threaded type with 5 full threads.
 - 2. Fittings
 - a. Provide fittings with neoprene gaskets and non-magnetic stainless steel screws.
 - b. Attach covers by means of holes tapped into the body of the fittings.
 - c. Covers for fittings attached by means of clips or clamps will not be accepted.
 - 3. Terminations
 - a. In outdoor areas, terminate conduit in rain-tight hubs as manufactured by Myers, O.Z. Gedney, Appleton or approved equal.
 - b. In other than outdoor areas, provide sealed locknuts and bushings.
- B. Fittings for use with rigid steel shall be hot dipped galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse-Hinds Condulets, Appleton Unilets, or equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- C. Fittings for use with aluminum shall be cast aluminum with less than 0.40 percent copper content, and suitable for use with aluminum conduit. Manufactures shall be O.Z. Gedney, Appleton, Crouse-Hinds or approved equal.
- D. Fittings for use with PVC-coated GRS conduit shall be PVC-coated that are the products of the same manufacturer as the conduit. Both male and female threads and internal surfaces shall contain a 2-mil urethane coating.
- E. Fittings for use with rigid nonmetallic conduit shall be PVC and have solvent-weld-type conduit connections. Boxes shall be manufactured of PVC or fiberglass reinforced polyester (FRP). Manufactures shall be Carlon, Crouse-Hinds, Hoffman or approved equal. If such are not available, then the Specification for PVC coated galvanized rigid steel fittings shall apply.
- F. Fittings for flexible conduit shall be Appleton Type ST, O.Z. Gedney Series 4Q, or approved equal.
- G. Fittings for use with fiberglass conduit shall be fiberglass and as recommended by the conduit manufacturer.
- H. Combination expansion-deflection fittings with internal grounding shall be installed where conduit movement is expected in more than one dimension, and where conduits transition out of structures in locations where differential settlement may

occur. Combination expansion/deflection fittings shall be manufactured by Crouse-Hinds Type XJGD or approved equal.

- I. Expansion fittings with internal grounding shall be installed wherever exposed raceway cross building expansion joints. Expansion fittings shall be Crouse Hinds Type XLGSA or approved equal.
- J. Union couplings for conduits shall be the Erickson type and shall be Appleton Type EC, O.Z. Gedney 3-piece Series 4, or approved equal. Threadless couplings shall not be used.
- K. Bushings:
 - 1. Bushings shall be the insulated type.
 - 2. Bushings for rigid steel conduit shall be hot dip galvanized insulated grounding type, O.Z. Gedney Type HBLG, Appleton Type GIB, or approved equal.
- L. Conduit seals in areas where chlorine, ammonia, sulfur dioxide and/or hydrofluosilicic areas shall be Link Seal or approved equal.

2.05 BOXES

- A. Boxes specified herein are for use with raceway systems only. Boxes used for housing electrical and instrumentation equipment shall be as described elsewhere in these Specifications.
- B. NEMA 1 Areas: NEMA 1 terminal boxes, junction boxes, pull boxes, etc. shall be either sheet or cast malleable iron or aluminum depending on raceway material. Boxes shall be suitable for wall mounting or have feet where self-standing. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. All boxes shall have hinged gasketed doors with quarter turn latches or 3-point latch (single operator) system on enclosures larger than 36 inches wide or 32 inches tall. Terminal boxes shall be furnished with terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V. Boxes shall be Concept Series as manufactured by Hoffman Engineering Co. or approved equal.
- C. NEMA 4X Areas: NEMA 4X terminal boxes, junction boxes, pull boxes, etc. shall be Type 304 or 316 stainless steel. Boxes shall be suitable for wall mounting or have feet where self-standing. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. All boxes shall have hinged gasketed doors with quarter turn latches or 3-point latch (single operator) system on enclosures larger than 36 inches wide or 32 inches tall. Terminal boxes shall be furnished with terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20A, 600V. Boxes shall be Concept Series as manufactured by Hoffman Engineering Co. or approved equal.
- D. Boxes for use in chemically corrosive areas shall be of rigid PVC. Construction shall be the same as specified for NEMA 4X areas as specified above.

2.06 WIREWAYS AND AUXILIARY GUTTERS

- A. General: Wireways shall consist of a prefabricated channel-shaped trough with hinged or removable covers, associated fittings, and supports. Straight sections shall not be longer than 5 feet. Separate power, control, signal and communications cables by grounded metallic dividers in wireways or run in separate wireways. Cross-sectional dimensions shall be as indicated on the Drawings. Fittings shall consist of elbows, tees, crosses, and closing plates as required.
- B. Interior Locations: All components shall be constructed from sheet steel not less than 14 gauge and coated with a corrosion-resistant gray paint. Covers shall be held closed with hinges and clamps.
- C. Exterior Locations: Wireway and associated fittings shall be NEMA rated for the area in which it is to be installed. Wireways shall be supplied with gasketed closing end plates and gasketed hinged covers.
- D. Corrosive Locations: In corrosive locations provide enclosure type boxes for use as wireways. Enclosures and associated fittings shall meet NEMA 4X classifications and shall be manufactured from reinforced injection molded fiberglass or formed and welded stainless steel and shall have gasketed closing plates and hinged and gasketed covers with spring loaded latches.
- E. Ground the steel and aluminum wireway bodies. Provide steel dividers with steel wireways or aluminum dividers with aluminum wireways, and ground by means of an individual grounding conductor.
- F. Terminate conduits in all wet and damp locations with rain-tight hubs as manufactured by O.Z. Gedney, Myers or approved equal. In finished areas, provide sealed locknuts and bushings.

2.07 CONDUIT SEALANTS

- A. Moisture Barrier Types: Sealant shall be a non-toxic, 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, non-toxic, asbestos-free, expanding, putty type material with a 3 hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

PART 3 - EXECUTION

3.01 CONDUIT, RACEWAY AND FITTING INSTALLATION

- A. No wire shall be pulled until the raceway system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the raceway system has been completed in every detail.
- B. From pull point to pull point, the sum of the angles of all of the bends and offsets shall not exceed 270 degrees.
- C. Coat threads with a conductive lubricant before assembly.

- D. Provide joints that are tight, thoroughly grounded, secure and free of obstructions by use of a mandrel. Adequately ream the conduit in order to prevent damage to the wires and cables inside. Use strap wrenches and vises to install the conduit in order to prevent wrench marks on the conduit. Any conduit with wrench marks shall be replaced.
- E. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction. Duxseal, or 3M seal spray shall be used in all applications. Plugging with tape is prohibited, even for short periods of time.
- F. For power, control and signal circuits, provide conduit per Conduit Use Tables below, unless specifically indicated otherwise on the Drawings:
 - 1. Exception: For raceways leaving a building above grade and then going below grade, provide PVC-coated GRS from a point 3 feet above grade to a point 5 feet from the building wall.
- G. Unless boxes have cast, threaded hubs, provide insulated type metallic grounding bushings for metallic conduits at all boxes. Bond together all conduits to provide continuity of the equipment grounding system. Size bonding conductor per NEC.
- H. Provide flexible conduit in lengths of not more than 36 inches at connections to motors, valves and any equipment subject to vibration or relative movement. All flexible conduits, regardless of length or manufacturer rating, shall have a dedicated ground bonding conductor pulled through, whether it is included in the conduit fill schedules or not.
- I. Conduits embedded in concrete floors on grade shall be installed between grids of reinforcing steel, or shall be encased below the floors, provided the concrete is thickened in a manner satisfactory to the Engineer. Installation of conduit below the bottom of this slab is not acceptable; embedding or encasing is required.
- J. Damage to PVC coating of coated conduits or fittings shall be repaired with factory-approved PVC patching material to the original factory condition.
- K. Underground Raceways: Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the handhole located outside the building. For additional requirements see Section 16402.
- L. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits exposed except where the Drawings indicate that they are to be embedded in the floor slab, walls, or ceiling, or to be installed underground.
 - 1. Exposed Conduits:
 - a. Support exposed conduits within 1 foot of any outlet and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps. Coordinate conduit locations with piping, equipment, fixtures, and with structural and architectural elements. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel to building lines. No diagonal runs will be accepted. Bends in parallel runs shall be concentric and shall be run straight and true.
 - b. Group together exposed conduits in horizontal runs located away from walls and support on trapeze hangers. Arrange such conduits uniformly and neatly. Trapeze hangers shall consist of channels of adequate size,

suspended by means of minimum 3/8" diameter rods or other suitable means from the ceiling or from pipe hangers. Install such runs so as not to interfere with the operation of valves or any other equipment, and keep at least 6 inches clear of any pipe which may operate at more than 100°F. Treat cut surfaces or damaged ends with corrosion-resistant coatings such as "Devcon Z", prepared by Subox Coatings; "Galvanox Type I", prepared by Pedley-Knowles; or approved equal. Application shall follow manufacturer's recommendation.

- M. All penetrations through walls into or out of corrosive locations, as defined in Section 16010 shall be made gas-tight. In concrete walls, pour concrete after the conduit is in place, if possible. If not, core drill concrete or CMU walls, install conduit and caulk around it with non-shrink grout. Install conduit seal in each conduit near the penetration.
- N. All conduit penetrations through interior walls and floors shall be sealed with fire retardant type conduit sealant.
- O. Conduit Identification: In each handhole, pullbox, cabinet, motor control center or other equipment enclosure, identify each conduit using the conduit number shown on the Drawings by means of a stamped brass tag affixed with stainless steel wire; where affixing a tag is not feasible, identify conduits by affixing a brass tag with epoxy or other approved method of stenciling to the wall or structure adjacent to the conduit terminus.
- P. Conduit Seals:
 - 1. Moisture Seals: Provide in accordance with NEC Paragraph 300.5(g).
 - 2. Gas Seals: Provide in accordance with NEC Paragraph 501.5.
- Q. Rigid PVC conduit shall be stored on a flat surface and shielded from the sun.

CONDUIT USE TABLE 1

	Inside Buildings					
	Exposed		Concealed			
Circuit Type	Standard	Corrosive	Above Suspended Ceilings	In Stud Walls	Embedded In Concrete	Slab On Grade
Power & 120 Vac Control	GRS	PVC Coated GRS	PVC-80 or GRS	GRS	PVC-40 or PVC-80	PVC-40 or PVC-80
Signal	GRS	PVC Coated GRS	GRS	GRS	GRS	GRS

CONDUIT USE TABLE 2

Circuit Type	Outside Buildings			Transition
	Exposed	Buried In Soil	Duct Bank Encased In Concrete	Within 5 Feet of Building
Power & 120 Vac Control	PVC Coated GRS	PVC Coated GRS	PVC-40	PVC Coated GRS
Signal	PVC Coated GRS	PVC Coated GRS	GRS	PVC Coated GRS

Notes:

1. Generally, the Conduit Use Tables apply.
2. Signal circuits are those subject to RF interference or induced current. MSPs, TSPs, telephone cable, coaxial cable, and manufacturer's cables specially designed for low level signals are all presumed to be part of signal circuits.
3. Provide fiberglass conduit where indicated on the Drawings.

3.02 WIREWAY INSTALLATION

- A. Straight sections and fittings shall be solidly bolted together to be mechanically rigid and electrically continuous. Dead ends shall be closed. Unused conduit openings shall be plugged.
- B. Wireways shall be supported every 5 feet.
- C. Wireways and auxiliary gutters shall not contain wiring or control devices and shall not extend over 30 feet in length.

END OF SECTION

SECTION 16120

LOW VOLTAGE WIRE AND CABLE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish labor, materials, equipment and incidentals necessary to install wire and cable specified under this Section. Electrical work shall be in accordance with Specification 16010 – General Electrical Requirements.
- B. Work shall include building wire, cable, wiring connections and terminations and modular wiring systems.

1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. B3-74 Specification for Soft or Annealed Copper Wire
 - 2. B8-77 Specification for Concentric Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. B173-71 Specification for Rope Lay Stranded Copper Conductors Having Concentric Stranded Members
- B. Insulated Cable Engineers Association (ICEA):
 - 1. S-66-524 Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable
- C. International Electrical Testing Association (NETA);
 - 1. ATS Acceptance Testing Specifications
- D. National Electrical Manufacturers Association
 - 1. WC-3 Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
 - 2. WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- E. Underwriters Laboratories (UL) Standards:
 - 1. 62 Flexible Cords and Fixture Wire
 - 2. 510 Insulating Tape
 - 3. 1063 Stranded Conductors for Machine Tool Wire

1.03 SUBMITTALS

- A. Submit the following material or equipment data:
 - 1. Each type of cable and wire to be used.
 - 2. Cable and wire splices
 - 3. Wire markers

1.04 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall protect all cable and wire from being damaged at all times.
- B. Cable ends shall be protected from water entry in accordance with the manufacturer's recommended procedures. Cable ends shall not be left open in manholes or other locations subject to submergence. If the cable ends become

submerged prior to splicing or termination, the cables shall be replaced in their entirety.

- C. Cables shall be pulled into raceways in accordance with the manufacturer's requirements. Under no circumstances shall cable pulling tensions exceed the manufacturer's written instructions.
- D. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. General: Conductors, include grounding conductors, shall be stranded copper. Aluminum conductor and/or solid conductor wire and cable will not be permitted. Insulation shall bear the UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. Conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. Wiring shall have wire markers at each end.
- B. Power and Control Conductors, 600 Volts and Below:
 - 1. Solid copper wires shall be 600 volt Type XHHW, sizes #12 and #10 AWG for use with lighting and receptacle circuits only.
 - 2. Stranded copper wire for power circuits shall be 600 volt Type XHHW or RHW, Class B stranding, sizes #12 AWG and larger.
 - 3. Stranded copper wire for control circuits shall be 600 volt Type XHHW or RHW, Class B stranding, size #14 AWG.
 - 4. Control wires inside panels and cabinets shall be machine tool grade type MTW, UL approved, rated for 90 degrees C at dry locations.
 - 5. Fixture wire shall be 600 volt, silicone rubber insulated, 200°C, UL Type SF 2, with stranded copper conductors.
 - 6. Cords shall be 600 volt, 2 conductor plus ground, Type SO, hard service, of adequate length and with grounding type plug attached, rated in amperes as shown on the Drawings.
 - 7. Conductors for feeders as defined in Article 100 of the NEC shall be sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
 - 8. Conductors for branch circuits as defined in Article 100 of the NEC shall be sized to prevent voltage drop exceeding 3 percent at the farthest connected load or combinations of such loads and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.
- C. Tray Cable, 600 volt and Below:
 - 1. Multi-conductor tray cable shall be rated 600 volts, listed by UL as Type TC cable per Article 336 of the NEC. Each cable conductor shall be insulated with XHHW-2 type insulation rated at 600 volts. The individual conductors

shall be twisted together and jacketed with a PVC outer covering containing a UL label and necessary identification, including the manufacturer, the number of conductors, size, XHHW-2 insulation, sunlight-resistant and other pertinent information.

2. Conductor sizes shall be the same as for power and control as noted above.
3. Multi-conductor power cables include the following:

Phase Conductor Size (AWG)	Minimum Ground Wire Size (AWG)	No. of Conductors (not incl. Ground)
12	12	2 3
10	10	2 3
8	10	3
6	8	3
4	6	3
2	6	3
1/0	6	3
2/0	4	3
4/0	4	3

4. Multi-conductor control cables include the following:

Conductor Size (AWG)	No. of Conductors (Including 1#14 AWG Ground)
14	3
14	4
14	5
14	7
14	9
14	12
14	19
14	37

2.02 SPLICES AND TERMINATIONS OF CONDUCTORS

A. Splices:

1. Wire and Cable Splicing Materials and Applications:
 - a. For Lighting Systems and Power Outlets: Wire nuts shall be twist-on type insulated connectors utilizing an outer insulating cover and a means for connecting and holding the conductors firmly. They shall be UL listed and suitable for connecting two to four solid copper

- conductors of #14 or #12 AWG size or two or three #10 AWG solid copper conductors.
- b. All Equipment: Crimp type connectors shall be insulated type with nylon jacket, suitable for the size and material of the wires and the number of wires to be spliced and for use with either solid or stranded conductors. They shall be UL listed.
- c. Division 16 Equipment and Power Conductors: Bolted pressure connectors shall be suitable for the size and material of the conductors to be spliced. They shall be UL listed and of the split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor.
- d. All Equipment: Epoxy splice kits shall include epoxy resin, hardener, and mold, and shall be suitable for use in wet locations and hazardous locations.
- 2. Terminal Cabinets: Provide terminal cabinets per Section 17510. Termination system shall include insulated, crimp-type connectors. Coordinate the lug and boards for correct fit. All terminations shall include marker sleeves.
- B. Terminations:
 - 1. Low Voltage Terminations:
 - a. Crimp type terminals shall be UL listed, self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
 - b. Terminal lugs shall be UL listed and of the split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor. Tongues shall have NEMA standard drilling.
 - c. Crimp with manufacturer recommended ratchet-type tool with calibrated dies. Hand crimping tools are not acceptable.
 - C. Tape used for splices and terminations shall be compatible with the insulation and jacket of the cable and shall be of plastic material. Tape shall conform with UL 510. Varnished cambric, rubber and thermoplastic tape shall be used for all split-bolt terminations.
 - D. Wire markers shall be heat shrink type (Raychem; T&B; or equal). Wire identification numbers shall be permanently imprinted on the markers. In locations which are not practical for heat shrink type labels, such as conduit bodies and small pull boxes, machine-printed, adhesive backed wire markers shall be used. Markers shall be custom-printed with the full identification string. Individual character markers and clip-on wire markers are not acceptable.

PART 3 - EXECUTION

3.01 CONDUCTOR INSTALLATION

- A. The Contractor shall provide, terminate and test all power, control, and instrumentation conductors.
- B. The Contractor shall, as a minimum, provide the number of control wires listed in the conduit schedule or on the Contract Drawings. Excess wires shall be treated as spares for future use.

- C. Conductors shall not be pulled into any raceway until raceway has been cleared of moisture and debris.
- D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be neatly fanned out to terminals.
- E. Single conductor cable in cable trays shall be No. 1/0 or larger and shall be of a type listed and marked for use in cable trays. Tray cable smaller than 1/0 shall be multi-conductor, with outer jacket.
- F. Provide the following types and sizes of conductors for the uses indicated for 600 volts or less:
 - 1. Solid Copper, Sizes #12 and #10 AWG: As shown on the Drawings for circuits for receptacles, switches and light fixtures with screw-type terminals.
 - 2. Stranded Copper, Size #14 AWG and Larger, Individual Conductors or CC: As shown on the Drawings for the control of motors or other equipment. Size #14 shall not be used for power supplies to any equipment.
 - 3. Stranded Copper, Sizes #12 AWG and Larger: As shown on the drawings for motors and other power circuits.
 - 4. Fixture Wire: For connections to all fixtures in which the temperature may exceed the rating of branch circuit conductors.
- G. Color Coding: All wire shall be coded with specific colors infused in the conductor insulation at the time of manufacture. If a conductor is specified in a gauge not available with integrally colored insulation, it shall be marked by the Contractor at the time of installation using colored electrical coding tape or an approved marking paint. Where tape or paint is used as the conductor identification system, it shall clearly distinguish the conductor over its entire exposed length in all junction boxes, manholes, conduit bodies, or other accessible intermediate locations, and at every termination. All wiring shall conform to the following wiring color code:

SYSTEM	CONDUCTOR	COLOR
120/240 Volt AC, 1-Phase, 3 Wire	Neutral Line 1 Line 2	White Black Red
120/208 Volt AC, 3-Phase, 4 Wire;	Neutral Phase A Phase B Phase C	White Black Red Blue
277/480 Volt AC, 3-Phase 4 Wire	Neutral Phase A Phase B Phase C	Grey Brown Orange Yellow
All Systems	Earth, System, or Equipment Ground	Green Insulation, Green w/ Yellow Tracer, or Bare Conductor
120 Volt AC Control Power Circuits (In field or in Control Cabinets)	Neutral Line 1 Line 2	White Black Red

SYSTEM	CONDUCTOR	COLOR
120 Volt AC UPS-derived Control Power (secondary side)	Neutral Line	White w/ Red Tracer Red w/ White Tracer
24 VAC Control Power Circuits (In field or in Cabinets)	Neutral Line	White or Grey, with Yellow Tracer Brown
12 or 24 Volt DC Control Wiring (PLC Discrete I/O, etc.)	DC Negative DC Positive DC Switched (DI/DO)	Yellow Orange Blue
120 Volt AC Control Wiring inside or outside cabinets to/from PLC Discrete I/O	Common or Neutral 120 VAC discrete inputs 120 VAC relay or discrete outputs	White or Grey, w/ Blue Tracer Blue Red
Instrumentation Twisted-shielded Cabling (PLC Analog I/O @ 4-20mA, or 1-5 Volt DC, etc.) Process Signals to/from Transmitters, Analyzers, etc.	Negative Polarity Positive Polarity (1st Conductor) Positive Polarity (2nd Conductor) Shield Drain Wire	Black White (or clear) Red Bare Conductor, or covered w/ heat-shrink tubing of a unique color
Instrumentation wiring in cabinets (PLC Analog I/O from field terminations of shielded cables).	PLC Analog Input Connections PLC Analog Output Connections	Grey Brown

- H. Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- I. Wrap all cables in manholes with fireproofing tape. Extend tape 1-inch into ducts.
- J. Cable bending radius shall be per applicable code. Install feeder cables in one continuous length unless splices are favorably reviewed.
- K. Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in any flexible conduit or any raceway in which all or any portion of a run consists of non-metallic duct or conduit. For flexible conduit, an external bonding jumper is an acceptable alternative.
- L. In panels, bundle incoming wire and cables, No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

- M. For cables crossing hinges, utilize extra flexible stranded wire, make up into groups not exceeding 12, and arrange so that they will be protected from chafing and excess flexing when the hinged member is moved.

3.02 CONDUCTOR SPLICES AND TERMINATIONS

- A. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices, when permitted, and terminations shall be in accordance with the splice or termination kit manufacturer's instructions. Splice or terminate wire and cable as follows:
 - 1. Watertight Splices: Splices in concrete pullboxes, for any type of cable or wire, shall be watertight and rated for continuous submergence. Make splices in low voltage cables using epoxy resin splicing kits rated for application up to 600 volts.
- B. Terminations:
 - 2. Terminate stranded #14 wire using crimp type terminals where not terminated in a box lug type terminal. Terminals must be coordinated with type of terminal board where provided.
 - 3. Excess control wire shall be long enough to terminate at any terminal block in the enclosure, be properly taped, be identified with origin and be neatly coiled.

3.03 CONDUCTOR IDENTIFICATION

- A. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule or as favorably reviewed by the Engineer.
- B. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

3.04 FIELD TESTS

- A. Insulation Resistance Tests: For all circuits 150 volts to ground or more and for all motor circuits over 1/2 horsepower, test cables per NETA Paragraph 8.3.1. The insulation resistance shall be 20 megohms or more. Submit results for review. See also Section 16010.
- B. Phase Rotation: The phase rotation of all circuits shall be clockwise in sequence. The Contractor shall verify that each three-phase service, feeder and branch circuits meet this requirement. A record shall be kept at each circuit tested and, on completion, given to the Engineer for review.

END OF SECTION

SECTION 16124

SIGNAL CABLE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.
- B. Related Work Described Elsewhere:
 - 1. Division 17: Instrumentation and Controls

1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. B8 Concentric Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft, Specification for
- B. Institute of Electrical and Electronic Engineers (IEEE):
 - 1. 383 Shielded Instrumentation Cable, Specifications for
- C. Rural Electrification Administration (REA):
 - 1. PE-39 Specification for Filled Telephone Cables
- D. Underwriters Laboratories Incorporated (UL):
 - 1. 13 Power Limited Circuit Cable Class 2, Specifications for (Bulletin)
 - 2. 83 Thermoplastic Insulated Wires and Cables
 - 3. 444 Communication Cables
- E. ANSI/TIA/EIA-568-C.2: Telecommunications Cabling Standard.

1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the Product Information category of the General Conditions and the submittal requirements of Section 16010.

PART 2 - PRODUCTS

2.01 SHIELDED TWISTED PAIRS (STP, OR TSP)

- A. Cable shall conform to IEEE 383, UL 13, and UL 83 and shall be type TC cable suitable for direct burial. Each TSP shall consist of two #16 AWG, 7-strand copper conductors per ASTM B8 with 15 mils PVC insulation. Conductors shall be twisted with 2-inch or shorter lay, with 100% foil shielding and tinned copper drain wires. Each pair shall have a 35-mil-thick outer jacket. Cable shall be rated at 90°C and for

operation of 600 volts. Cable shall be manufactured by Belden, General Cable, or approved equal.

2.02 SPECIAL CABLES

- A. Special cables required for PLC system, video cameras, computer networks shall be supplied where shown on the Drawings or as required by the manufacturer or supplier. Deviations must be favorably reviewed by the Engineer.

2.03 COAXIAL CABLE

- A. Coaxial cable shall match existing and be compatible with the radio and communication frequency being used.

2.04 NETWORK CABLE

- A. Provide UL listed ETA Category 6 Ethernet cable consisting of 4 pair of 24 gage solid unshielded twisted pairs with overall PVC jacket. Cable shall have a maximum attenuation of 24.2 dB per 100 meters at 100 MHz. Cables shall terminate in RJ-45 Ethernet connectors at both sides of the termination points.
- B. Cable shall meet the requirements of ANSI/TIA/EIA-568-B.1 for Category 6 horizontal cable. Cable shall be label-verified. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Conductors shall be solid, un-tinned, 24 AWG copper. Cable shall be Type CMR per NFPA 70 or like rated.
- C. The use of Teflon insulated, plenum-rated Category 6 cable is acceptable for both plenum and non-plenum applications. Teflon insulated plenum-rated cable, if used, shall be Type 4x0, where all four pairs are Teflon insulated.
- D. Network cable installed in underground conduits shall be rated for suitable for the application.

PART 3 - EXECUTION

3.01 CABLE INSTALLATION

- A. Signal cable shall be installed by personnel who have had a minimum of 3 years experience in terminating and splicing twisted shielded conductors and co-axial cables.
- B. Adequate care shall be exercised by the installers to prevent cable damage or sheath distortion. Bending radius shall not be less than 10 times the cable O.D.
- C. Cables shall be continuous from initiation to termination without splices except where specifically indicated.

- D. Cable shielding shall be grounded at one end only of the cable, preferably the receiving end. Bonding shall be to a single ground point only. Bonding from cable to cable in multiple run installations shall not be permitted.
- E. Heat shrinkable sleeving shall be installed on all cables to insulate shielding at the ungrounded cable terminations.
- F. Where installed in control consoles containing power circuits, cables shall be routed a minimum of 2 inches distant. Color coding shall be strictly observed throughout the installation.
- G. For telephone cables, provide 4-pair cable to outlets. Use 25 pair or larger for connection between telephone patch panels. Allow at least 25% spare capacity between patch panels.
- H. Manufacturer's cable pulling tension shall not be exceeded.

3.02 CONDUCTOR SPLICES AND TERMINATIONS

- A. Splices: Install all conductors without splices unless necessary for installation, as determined by the Construction Manager. Splices, when permitted, and terminations shall be in accordance with the splice or termination kit manufacturer's instructions.
 - 1. Shields shall be handled as a separate conductor. Use manufacturer's compression sleeve and insulated pigtail. Keep pigtail as short as possible. Terminate pigtail with marker sleeve and tug.
 - 2. No splicing is acceptable for coaxial cables.
- B. Terminations:
 - 1. Crimp-type terminals shall be UL listed, self-insulating, sleeve type with ring or rectangular tongue, suitable for size and material of the wire to be terminated and for use with either stranded or solid wire. Spade type lugs are acceptable with telephone (TC) cable systems only.
 - 2. Crimp with manufacturer's recommended ratchet-type tool with calibrated dies. Hand crimping tools are not acceptable.
 - 3. Coaxial cable and connectors shall be terminated in accordance with the manufacturer's instructions. Use manufacturer's recommended solder. The Contractor shall prevent misapplication of solder and termination.

3.03 CONDUCTOR IDENTIFICATION

- A. Identify each wire or cable at each termination, in each pullbox, and in each handhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule or as favorably reviewed by the Construction Manager. Conductor numbering shall be coordinated with the Interconnection Diagrams specified in Division 17.

- B. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

3.04 FIELD TESTS

- A. Insulation Resistance Tests: Perform insulation resistance tests on all circuits. Make these tests before any equipment has been connected. Test the insulation with a 600 Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 100 megohms or more. Submit results for review.
- B. Heat shrinkable sleeving shall be installed on all cables to insulate shielding at the ungrounded cable terminations.
- C. Where installed in control consoles containing power circuits, cables shall be routed a minimum of 2 inches distant. Color coding shall be strictly observed throughout the installation.
- D. For telephone cables, provide 4-pair cable to outlets. Use 25 pair or larger for connection between telephone patch panels. Allow at least 25% spare capacity between patch panels.
- E. Manufacturer's cable pulling tension shall not be exceeded.

END OF SECTION

SECTION 16402

UNDERGROUND ELECTRICAL WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.

1.02 APPLICABLE STANDARDS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. Federal Specifications (Fed. Spec.):
 - a. RR-F-621C Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
 - b. RR-G-661D Grating, Metal, Bar Type (Floor, except for Naval Vessels)
 - 2. American Concrete Institute (ACI) Publication:
 - a. 318 Building Code Requirements for Reinforced Concrete
 - 3. American Society of Testing and Materials (ASTM) Publications:
 - a. A36 Structural Steel
 - b. A153 Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - c. A615 Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
 - d. C33 Concrete Aggregates
 - e. C150 Portland Cement
 - f. C858 Standard Specification for Underground Precast Concrete Utility Structures
 - 4. American Association of State Highway and Transportation Officials (AASHTO) Publication:
 - a. HB-13 Standard Specifications for Highway Bridges
 - 5. American National Standard Institute (ANSI) Publication:
 - a. C2 National Electrical Safety Code
 - 6. National Fire Protection Association (NFPA) Publication:
 - a. 70 National Electrical Code (NEC)
 - 7. Pacific Gas and Electric Company (PG&E) Standard:
 - a. Drawing Primary Electric Underground Equipment 062000 enclosures
 - 8. State of California Public Utilities Commission (Cal. PUC) Publication:
 - a. G.O.128 Construction of Underground Electric Supply and Communication System, Rule for

1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the Product Review category of the General Conditions and the submittal requirements of Section 16010.

- B. Manufacturer's Data and Shop Drawings:
 - 1. Handholes - Include a table of dimensions which shows proposed size of each handhole.
 - 2. Handhole Frame and Cover
 - 3. Sealing Material for Precast Handhole Joints
 - 4. Steps, ladder rungs and other hardware
 - 5. Location and type of joints
- C. Certificates
 - 1. Test Reports: Submit for approval 30 days before the materials are used, copies of laboratory test reports for the following:
 - a. Arc-proofing test for cable fireproofing materials

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials and equipment shall conform to the respective specifications and standards and to the specifications herein. Electrical ratings shall be as indicated.
- B. Conduit: Provide per Section 16110.
- C. Wire and Cable: Provide per Section 16120 and Section 16124.

2.02 HANDHOLES

- A. Provide handholes of reinforced precast concrete, or injection molded composite plastic material. Handholes shall include a base, a body, extensions, and a cover. Handholes with a perimeter of 10 feet or more (e.g., 3 feet by 2 feet) shall have both pulling irons and cable racks. All hardware shall be stainless steel, or hot-dip galvanized after fabrication; cable racking hardware, however, shall be non-metallic and corrosion resistant. If no handhole size is shown on the Drawings, size units per NEC or provide 12 inches by 24 inches by 18 inches deep, whichever is larger. Structure shall be fabricated in accordance with ACI 318.
- B. Aggregate used in pre-cast handholes shall conform to the specifications given in ASTM C33.
- C. Cement used shall be Type 11, low alkali Portland cement and shall meet ASTM C150, Type 11.
- D. Reinforcing bars shall be intermediate grade billet steel conforming to ASTM A615.
- E. Design wheel loads for handhole covers shall be HS 20-44 as given in AASHTO HB-13.

PART 3 - EXECUTION

3.01 TRENCHING, BACKFILL, AND COMPACTION

- A. See Division 2, Sitework.

3.02 WIRE AND CABLE INSTALLATION

- A. See Section 16120 and Section 16124.

3.03 UNDERGROUND RACEWAYS WITHOUT CONCRETE ENCASEMENT

- A. All underground raceways shall be without concrete encasement unless otherwise specifically shown otherwise on the Drawings.
 - 1. Underground raceways shall slope toward handholes, pullboxes, etc., at minimum rate of 3 inches per 100 feet unless indicated otherwise on Drawings. Raceway entrances in handholes, etc., shall be by means of bell ends and shall be sealed against entry of silt, debris, rodents, etc., into raceways.
 - 2. Minimum radius of all horizontal bends in underground duct banks shall be 10 times the conduit diameter. Bends shall be formed of factory made sweeps or continuous assembly of bend segments or curved segments, except that polyvinyl chloride conduits may be field formed. Minimum radius of all vertical bends in underground raceways shall be ten times nominal size of conduit.
 - 3. Underground raceways within roadways shall be run parallel or perpendicular to road centerline.
 - 4. Pull wires left in underground raceways shall be 1/8-inch nylon rope or 3/16-inch polypropylene.
 - 5. Terminate conduits in end-bells where duct lines enter handholes. Separators shall be of precast concrete, high impact polystyrene, steel, or any combination of these. Stagger the joints of the conduits by rows and layers so as to provide a duct line having the maximum strength. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs. As each section of a duct line is completed, draw a brush through having the diameter of the duct, and having stiff bristles until the conduit is clear of all particles of earth, sand, and gravel; then immediately install conduit plugs.
 - 6. Construct underground raceway systems (whether single raceways, or multiple raceway banks) utilizing snap together plastic "chairs" spaced and staked to the trench floor, no more than 6 feet apart along the entire length of the trench to maintain the specified minimum encasement between raceways, and between the duct bank and trench walls and floor. Provide Carlon Snap-N-Stac, or equal.
- B. Provide sand backfill three inches all around the raceway.
- C. See Section 16110 for additional requirements.

3.04 HANDHOLES

- A. Provide handholes complete with all accessories, as indicated. Identify each casting by having the manufacturer's name and address cast into an interior face or permanently attached thereto.
- B. Handhole or Concrete Pullbox Grounding: Ground rods installed in electrical distribution system handholes or concrete pullboxes shall be properly connected to the cable shielding, metallic sheath, and armor at each cable joint or splice by means of No. 4 AWG or equivalent braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Ground wires shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Ground wires shall be neatly and firmly attached to handhole walls and the amount of exposed bare wire shall be held to a minimum.
- C. Installation of Cable in Handholes: Do not install cables utilizing the shortest route, but route along those walls providing the longest route and the maximum spare cable lengths. Form all cables to closely parallel walls, not to interfere with duct entrances, and support on brackets and cable insulators at a maximum of 18 inches. Support cable splices in underground structures by racks, leaving top space open for future cables, except as otherwise indicated for existing installations. Provide one spare three-insulator rack arm for each cable rack in each underground structure.

END OF SECTION

SECTION 16450
ELECTRICAL GROUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.
- B. Work Included: Furnish all labor, material, equipment, tools and services necessary for the installation, connection and testing of all grounding as specified herein and as shown on the Drawings.

1.02 REFERENCE STANDARD

- A. American Society for Testing and Materials (ASTM) Publication:
 - 1. B228 Copper Clad Steel Conductors Specification
 - 2. D178 Specifications for Rubber Insulating Matting
- B. National Fire Protection Association (NEPA):
 - 1. 70 National Electric Code (NEC)
 - 2. 780 Standard for the Installation of Lightning Protection Systems
- C. Underwriters Laboratories (UL) Standards:
 - 1. 96 Lightning Protection Components
 - 2. 96A Installation Requirements for Lightning Protection System
- D. International Electrical Testing Association (NETA) Publication:
 - 1. ATS Acceptance Testing Specifications for Electrical Equipment for Power

1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the Product Information category of the General Conditions and the submittal requirements of Section 16010.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The grounding systems shall consist of the ground rods, grounding conductors, ground bus, ground fittings and clamps, and bonding conductors to water piping and structural steel, UFER grounding as shown on the Drawings. One system shown provides service and separately derived system grounds. A second system is an electronic ground system to provide for the discharge of static electricity.

2.02 SYSTEM COMPONENTS

- A. Ground Rods: Ground rods shall be cone pointed copper clad Grade 40 HS steel rods conforming to ASTM B228 and UL 467. The welded copper encased steel rod shall have a conductivity of not less than 27% of pure copper. Rods shall be not less than 3/4-inch in diameter and 10 feet long, unless otherwise indicated. Rods longer than 10 feet shall be made up of 10-foot units joined together with threaded couplings. The manufacturer's trademark shall be stamped near the top.
- B. Ground Conductors: Buried conductors shall be medium-hard drawn bare copper; other conductors shall be soft drawn copper. Sizes over No. 6 AWG shall be stranded. Coat all ground connections except the exothermic welds with electrical joint compound, non-petroleum type, UL listed for copper and aluminum applications.
- C. Ground Connections: Connection to ground rods and buried connections shall be by exothermic weld. Alternatively, non-reversible, compression connectors may be used for inaccessible grounding connections, constructed of high-copper alloy, and manufactured specifically for the particular grounding application. Exothermic welds shall be Cadweld, Thermoweld or approved equal. Non-reversible connectors shall be Burndy Hyground, similar by Thomas & Betts or approved equal.
- D. Ground Rod Boxes: Boxes shall be a 9-inch-diameter precast concrete unit with hot-dip galvanized traffic covers. Units shall be 12-inches deep. Covers shall be embossed with the wording "Ground Rod."
- E. Ground Bus: Ground bus shall be a high conductivity copper alloy strap measuring 3/16-inch by 3/4-inch and of lengths as shown on the Drawings. Bus shall be predrilled and tapped to accept 8-32 brass machine screws on 12-inch centers.
- F. Exposed grounding connectors shall be of the compression type (connector-to-cable), constructed of high-copper alloy and manufactured specifically for the particular grounding application. Connectors shall be manufactured by Burndy, O.Z. Gedney or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground all equipment for which a ground connection is required per NEC whether the ground connection is specifically shown on the Drawings.
- B. Provide a separate grounding conductor, securely grounded in each raceway independent of raceway material.
- C. Provide a separate grounding conductor for each motor and connect at motor box. Provide a supplemental ground connection for motor shaft grounding rings, where applicable.

- D. Sizes shall be as indicated on the Conduit Schedule and in accordance with NEC Article 250.
- E. Provide a grounding-type bushing for secondary feeder conduits that originate from the secondary section of each MCC section, switchboard, or panelboard.
- F. Individually bond the raceway to the ground bus in the secondary section.
- G. Provide a green insulated wire as grounding jumper from the ground screw to a box grounding screw, and, for grounding type devices, to the equipment grounding conductor.
- H. Provide a separate grounding conductor in each individual raceway for parallel feeders. Connect the parallel ground conductors together at each end of the parallel run, as required by the NEC.
- I. Interconnect the secondary switchgear MCC or panelboard neutral bus to the ground bus in the secondary switchgear compartment only at the service entrance point. For wye connected, 3 phase, separately derived systems with 3 wire distribution, connect the transformer neutral to the grounding electrode system at the transformer. Connections shall be in accordance with the NEC.
- J. Provide a ground rod box for each ground rod so as to permit ready access for the connection and/or removal of any pressure connectors to facilitate testing.
- K. Where ground rods must be driven to depths over 10 feet, increase rod diameter used, sufficiently to prevent the rod from bending or being damaged.
- L. Bond metallic water piping at its entrance into each building. Ground separately derived electrical system neutrals to the metallic water piping in addition to the system driven ground, per NEC requirements.
- M. Make embedded or buried ground connections, taps and splices with exothermic welds or non-reversible compression connections. Coat ground connections.
- N. Effectively bond structural steel for buildings to the grounding system using exothermic welds.
- O. Install rubber mats in front of indoor low voltage switchboards and switchgear, medium voltage switchgear, and motor control centers.

3.02 TESTING

- A. Perform testing per NETA Standard ATS. Test methods shall conform to NETA Standard ATS using the three-electrode method for small systems. Conduct tests only after a period of not less than 48 hours of dry weather.
- B. Furnish to the Engineer a test report with recorded data of each ground rod location.

- C. Furnish a separate report on the rubber mats. Make measurements in conformance with manufacturer's instructions.

END OF SECTION

SECTION 16955
CONTROL DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provisions: Applicable provisions of Section 16010 become a part of this Section as if repeated herein.
- B. Work Included: Furnish and install all control devices complete, including, as applicable, enclosures, engraved escutcheons or nameplates, gaskets, lenses, lamps and mounting provisions.
- C. Related Work Specified Elsewhere:
 - 1. Section 11372: Compressed Air System
 - 2. Section 17510: Panels

1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA) Publications:
 - 1. ICS1 Industrial Control and Systems: General Requirements
 - 2. ICS2 Controllers, Contactors and Overload Relays rated 600 V
 - 3. ICS6 Enclosures

1.03 SUBMITTALS

- A. Submit material or equipment data in accordance with the submittal requirements of Sections 01300 and 16010.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All control devices shall conform to applicable provisions of NEMA Standards ICS1 and ICS2.

2.02 CONTROL AND TIMER RELAYS

- A. General Requirements:
 - 1. Provide relays rated for 1 million operations at 10 amp, 120 Vac, at power factor of 0.2.
 - 2. Where timing relays are interfaced to motor starters or adjustable speed motor controllers, provide auxiliary machine-tool relays or Size 0 magnetic contactors.
 - 3. Where timing relays or control relays require additional contacts, provide auxiliary control relays, properly sized for the application.

- B. Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits. Relays shall be of the following types (abbreviations in parentheses correspond to labels on the Drawings):
1. Size 0 Magnetic Contactors (MS): Provide Size 0 magnetic contactors for driving Size 4 and Size 5 ac operated motor starters. Provide Size 0 contactors of the same type and manufacture as the motor starter contactors.
 2. Relays (CR):
 - a. Provide machine tool relays for the following applications:
 - 1) All relays driving 120-Vac motor starters up to and including Size 3.
 - 2) All relays driving non-motor loads up to 6 amps (or 720 VA).
 - b. Provide machine tool type relays with convertible contacts rated 10 amperes continuous with NEMA Rating Designation A600 for ac applications and N600 for dc applications. Coils shall be designed for continuous duty and shall have the voltage rating indicated on the Drawings.
 - c. Relays shall be the magnetically held type unless designated otherwise on the Drawings. For each relay, provide one spare Form C contact over and above the number indicated on the Drawings. In addition, for latching relays, provide coil clearing contacts as necessary.
 - d. Manufacturer: Square D, Class 8501 Type X; General Electric CR120B; or equal.
 3. General Purpose Control (CR) relays (plug-in):
 - a. Provide plug-in style 2-, 3-, or 4-pole enclosed relays with integral neon or LED indicators for the following applications:
 - 1) Relay logic (relays driving other relays, including machine tool relays) operating at voltages up to 120 Vac.
 - 2) Control power switching.
 - 3) All relays driving non-motor loads up to 2 amps (240 VA) at 120 Vac.
 - b. Provide relay sockets rated for 10-amp, 240 Vac with screw-type barriered terminals.
 - c. Manufacturer: IDEC RH Series; Square D, Class 8501 R; or equal.
 4. Analog or Digital Signal Switching (SR) Relays:
 - a. Provide plug-in style indicating type relays with gold plated silver contacts for switching low level currents (less than 100 mA).
 - b. Provide relay sockets with screw-type barriered terminals.
 - c. Manufacturer: IDEC RY/RM series;
 5. Latching Relays (LR):
 - a. Heavy duty latching relays shall be 600-volt machine tool industrial relays, magnetically held, two-coil type. Relay shall have convertible contacts rated 10 amperes with NEMA rating design A600. Latching relay shall be Square D Class 8501 Type X; General Electric CR170BL; or equal.
 - b. General purpose latching relays shall be general purpose plug-in relay, two-coil magnetically held with an integral neon or LED indicators. Relay contacts shall be rated for 10 amp, 240 volts with coil voltage as shown on the Drawings. Relay shall be complete with socket and shall be Square D, Class 8501 Type K; IDEC RR2KP Series; or equal.
 6. Timing Relays (TR) and (TD):
 - a. General: Relays designated TR shall be machine tool industrial relays, while those designated as TD shall be general purpose plug-in time delay relays.
 - b. Timing Relay (TR): Timing relay shall be machine tool industrial relay with solid-state timer and external adjustment dial. Range shall be 0 to

120 seconds unless indicated otherwise on the Drawings. Relay shall include an LED indicator and instantaneous and time-delay contacts rated at 10 amps, meeting NEMA A600 designation. Timing relay shall be "on delay" or "off delay" as indicated on the Drawings and shall be Allen Bradley 700-PS; Square D Class 8501 Type X; or equal.

- c. Time Delay Relays (TD): Relay shall be solid-state with multi-range programmable settings. The relays shall include a calibrated front dial and LED indicator and shall be complete with socket. Relays shall be "on delay" or "off delay" type as indicated on the Drawings. Provide an additional Form C contact over and above the number indicated on the Drawings. Relay contacts shall be rated 10-amp, 120 Vac. Relays shall be IDEC Type RTE, ATC Type 339B; or equal.

2.03 ELAPSED TIME METERS (ETM)

- A. Elapsed time meters shall be of the synchronous motor-driven type having a minimum of 6 decimal digits where the least significant digit shall represent tenths (1/10ths) of hours. Unless specified otherwise, they shall not be equipped with a reset button. They shall be for panel mounting with a square bezel approximately 2-1/2 inches on a side. Meter voltage shall be not more than 120 Vac for meters mounted in instrumentation panels. Elapsed time meters shall be ATC 5702; Yokogawa/General Electric Series 200; Type 240; or equal.

2.04 CONTROL PANEL ACCESSORIES

- A. Relays, timers and other internally mounted equipment shall be of the types specified in other sections of these Specifications.
- B. Panel face mounted equipment shall be of the types specified in other sections of these Specifications.
- C. Standards: All control devices shall conform to applicable provisions of NEMA Standards ICS 1 and ICS 2.
- D. Pushbuttons, Selector Switches and Pilot Lights:
 - 1. Shall be heavy-duty oil-tight units; each unit shall have an engraved escutcheon plate unless nameplates are indicated on the Drawings or are necessary because of length of identification. Pushbuttons and selector switches shall have contacts rated 10 amperes continuous, Rating Designation A600 in conformance with NEMA ICS 2.
 - 2. Pushbuttons used as emergency stop devices shall have a padlockable means for maintaining an open circuit. Indicating lights shall be push-to-test transformer type with lenses of the colors shown on the Drawings.
 - 3. Pilot lights shall be LED type and Push-to-Test.
- E. Multi-position control switches shall have rotary action, round knurled handle and the number of positions and stages shown on the Drawings. They shall be suitable for panel mounting. Each position shall have a positive detent. Contacts shall have a continuous current rating of 10 amperes at 300 Vac. Switches shall have integral indicator.
- F. For 4-20 mAdc and 1 to 5 Vdc signal selector switches, provide oil-tight selector switches with electronic duty gold contact blocks. Provide sliding contacts for reliable operation without benefit of thermal cleaning action.

- G. Manufacturer: Provide Microswitch heavy-duty oil-tight manual controls, Type PT, with electronic duty gold contact blocks; Allen-Bradley Bulletin 800T oil-tight selector switch with stackable "Logic-Reed" contact blocks; or equal.
- H. Colors and Descriptions:
1. Indicating Lamps: Unless otherwise noted on the Drawings, the following color code and inscriptions shall be followed for the lenses of all indicating lights.

Indicating Lamp Inscription	Color
ON/START	Green
OFF/STOP	Red
CLOSED	Red
LOW	Amber
FAIL	Red
HIGH	Amber
OPEN	Green
POWER ON	White
RESET	Red
AUTO	Blue

2. Lettering shall be black on white and amber lenses. Lettering shall be white on red and green lenses.
 3. Pushbuttons: Follow color coding for indicating lamp above.
 4. All unused or noninscribed buttons shall be black. Lettering shall be black on white and yellow buttons. Lettering shall be white on black, red and green buttons.
- I. Panel Lights and Receptacles: Panels shall be internally lighted by LED luminaires, provided with guards and a toggle switch located convenient to each access door. One duplex GFI type receptacle shall be provided in each panel section. The lights and receptacles shall be wired to outgoing terminal blocks for 120-volt, 60-Hertz, single-phase supply.
- J. Nameplates: Unless specified otherwise in the Drawings, nameplates shall be black lamacoid with minimum 3/16-inch-high white letters for major area titles, 5/32-inch for component titles, and 1/8-inch for subtitles, and shall be fastened with a permanent but dissolvable adhesive or by screws.

2.05 CONTROL STATIONS

- A. Provide control stations complying with NEMA ICS 6 for manual control functions as follows and as shown on the Drawings: start-stop pushbutton, hand-off-auto, forward-reverse-jog-stop, etc. Control stations shall include selector switches, pushbuttons, and indicators as specified in this Section.
- B. Enclosures shall be as follows:

1. Dry Locations: NEMA Type 12
 2. Corrosive Locations: NEMA Type 4X
 3. Hazardous Locations (Gases): NEMA Type 7
 4. Hazardous Locations (Dust): NEMA Type 9
 5. Wet Locations: NEMA Type 4
- C. Nameplates: Provide an engraved plastic nameplate for each control station and escutcheons or nameplates for devices mounted thereon.
- D. Provide pushbuttons, selector switches, indicators, etc., as shown on the Drawings and as required. Provide control devices with NEMA ratings matching that of the control station.
- E. Manufacturer: Provide Allen-Bradley; Westinghouse; Crouse-Hinds; or equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Identify all control devices with engraved plastic nameplates or escutcheons, as applicable. Install control devices as recommended by the manufacturer.

3.02 PROBES AND HOLDER

- A. Adjust potentiometer to suit conductivity of water.

END OF SECTION

SECTION 17010

INSTRUMENTATION AND CONTROLS, GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work Included:

1. Provide all tools, equipment, materials, and supplies and be responsible for all labor required to complete the installation, startup and operational testing of a complete and operable Instrumentation and Control (I&C) System as indicated on the Drawings and as specified herein.
2. Provide all the necessary equipment components and interconnections along with the services of manufacturers' engineering representatives necessary to ensure that the Owner receives a completely integrated and operational I&C system as herein specified.
3. Provide all terminations for wiring at field mounted instruments, equipment enclosures, alarm and status contacts.
4. Provide all Instrumentation and Control wire required for a fully functioning Instrumentation and Controls System as shown on the Drawings except for wire specifically specified in Division 16. See Section 16010.
5. The surge tank vendor shall furnish a control panel and all instruments and valves and other appurtenances for automatic control of the tank. This panel will have connections for signals to the SCADA system per the I drawings. There will also be a contractor furnished pressure transmitter. Owner's integrator shall modify their existing telemetry apparatus to accept these signals and transmit them to the location(s) where they will be monitored.

B. Work Specified in Other Divisions:

1. Process piping, air compressors, main air supply headers, and other mechanical work and equipment as specified in Divisions 11, 12, 13, 14, or 15.
2. Instruments and controls which are not directly used for process control, i.e., those provided as part of a package system, such as a boiler, air compressor, etc. as specified in Divisions 11, 12, 13, 14, 15, or 16.
3. Division 16 work, including all instrumentation and controls conduit, and only that wire specified in Division 16. Refer to Division 16 Specifications for specific requirements for wire, conduit, grounding, and other electrical equipment.
4. General mechanical requirements as specified in Section 11001.

1.02 I&C SUBCONTRACTOR QUALIFICATIONS

- A. An I&C Subcontractor shall be an electrical contractor who has demonstrated experience in purchasing, calibrating, fabricating, installing and testing the Instrumentation and Control (I&C) products listed in this Specification Section. Normally, the I&C Subcontractor is a systems house regularly engaged in the business of panel fabrication, control component procurement, programmable logic controller and personal computer (PC) application in the process control industry.
- B. The I&C Subcontractor has been regularly engaged in performing all aspects of the type of work specified in this Section and shown on the Drawings.

1.03 I&C SUBCONTRACTOR SYSTEM RESPONSIBILITIES

- A. General: The I&C equipment as specified in this Division shall be considered an integrated system. Entire system installation including calibration, verification, startup, operation testing, and training shall be performed by qualified personnel, possessing all the necessary skills and equipment, and who have had experience performing similar installations. Instrumentation and control systems drawings are diagrammatic only; it is the responsibility of the Contractor to obtain technical data, determine performance requirements, develop instrumentation detail installation designs, and coordinate the selection of specified equipment with Contractor supplied equipment to meet the design conditions stated.
- B. System Responsibilities:
1. Instrumentation and control system drawings are diagrammatic only. Obtain technical data, determine performance requirements, develop installation details and integrate I&C subcontractor supplied equipment with Contractor supplied equipment where depicted on the Drawings.
 2. Compatibility: See that all components of the instrumentation system, including equipment specified under other Divisions, are completely compatible and function properly as a system. Provide such additional equipment, accessories, etc., as are necessary to meet these objectives at no cost to the Owner.
 3. Coordination: For control components, devices, and systems specified in Divisions 11, 12, 13, 14, 15, 16, and 17, or shown on the Drawings.
 - a. Provide technical advice to mechanical and electrical subcontractors as necessary regarding their installation of instruments.
 - b. Verify the correctness of installation of all instruments.
 - c. Verify that the proper type, size, and number of control wires with their conduits are provided.
 - d. Verify that the proper type, size, and number of pneumatic tubes with their conduits are provided.
 - e. Verify that proper electric power circuits provided for all components and systems.
 - f. Resolve all manufacturers' installation discrepancies between requirements and the detail requirements of the Drawings and Specifications.
 - g. Supervise final signal connections, both electric and pneumatic, to all process instrumentation and control equipment.
 - h. Adjust, startup, and test all process instrumentation and control equipment.
 - i. Provide specified documentation and training.
 4. Performance: While the Drawings provide sufficient information to establish the form and function of the systems and their relationships, the responsibility for system integration and performance rests solely with the Contractor. The Engineer provides technical instruction and guidance where needed.
 5. Site and Instrument Inspection: Inspect site for conformance to Drawings, paying special attention to space allocation and dimensions shown or required on Drawings. Inspect completed work and verify that it is ready for installation of instruments and equipment. Inspect each instrument and piece of equipment for damage, defects, completeness, and correct operation before installing.

1.04 SUBMITTALS

- A. Refer to Division 1 for required method of preparation and transmittal and conform to requirements herein.
- B. Shop Drawings: Submit shop drawings (diagrams) for review in complete bound sets indexed by Specification number, with exterior tabs marked by subject. Submit manufacturer's catalog cuts for each item for which shop drawings are not required. Manufacturer's catalog cuts, specifications or data sheets shall be clearly marked to delineate the options or styles to be furnished. Show dimensions, physical configurations, methods of connecting instruments together, mounting details, and wiring schematics. Drawings shall be complete with device tag numbers, wire numbers and terminal board numbers. Submit fabrication details, nameplate legends, and control panel internal wiring and piping schematic drawings. Submit panel graphic drawings where applicable. Include material lists and/or bills of material.
- C. Specification Forms:
 - 1. Submit completed Specification Forms per ISA S20, including those instrumentation and control components directly related to process control, but specified in other Divisions of these Specifications.
 - 2. Include on each form the assigned tag numbers, manufacturer's part numbers, and device data. More than one tag numbered item may be included on a sheet.
- D. As-Built Drawings: Submit a revised set of shop drawings that incorporates all change orders and modifications made during performance of the work. In addition to updated loop diagrams, interconnect diagrams and elementary diagrams, submit equipment and device wiring diagrams (see Sketch 17010-4) and other drawings as necessary to depict the "as-built" condition of equipment. Include all installed field and panel conduit and piping/tubing runs and routing, tray systems, supports, mounting details, interconnection diagrams with cable, wire, tube and termination numbers. Coordinate all drawings with the conductor identification requirements in Section 16120 and Section 16124. Submit a copy of CAD produced drawings on magnetic media in AutoCAD DWG or DXF format.
- E. Operation and Maintenance Manuals: Furnish Operation and Maintenance Manuals, including Instruction Manuals and Part Lists, for equipment provided under Division 17 as required by Division 1. Obtain data from manufacturers, and format and bind as specified. Obtain distribution method instructions from the Owner or his representative.
 - 1. Schedule: Deliver at least two (2) copies of manuals in 3-ring binders (8-1/2 by 11-inch format) not later than the equipment shipment date.
 - 2. Contents: Include in manuals not less than the following information, as applicable, for each instrument, equipment, subsystem and/or control loop:
 - a. General, introduction and overall description, purpose, functions, simplified theory of operations, etc.
 - b. Specifications (including equipment specification data sheet as described above under Shop Drawings), sufficiently detailed for reordering exact duplicates of the original items.
 - c. Installation instructions, procedures, sequences, tolerances, and precautions.
 - d. Operational procedures.
 - e. Shutdown procedures.
 - f. Maintenance, calibration, and repair instructions.

- g. Parts list and spare parts recommendations.
 - h. Calibration curves, rating tables, and any other data showing the relationship of the variable inputs and the calibrated output of all measuring devices and controlled equipment.
3. Format:
- a. Use drawings and pictorials to illustrate the text to the extent necessary to insure a clear, concise presentation. If manuals have been written to cover a family of similar instruments or equipment, strike out inapplicable information in a neat fashion or emphasize applicable portion by heavily weighted arrows, circles or boxes; whichever provides the clearest and neatest presentation.
 - b. Group manuals by system control panels, including field instrumentation connected or associated with the panel. Where identical instruments are used in more than one control loop or subsystem, include only one instruction manual, per panel grouping; however, an index by tag number for all instruments shall identify its location in that manual.
 - c. Provide control loop and/or subsystem operational descriptions to identify the function of each instrument and its relation to the other instruments in the loop.
4. Binding: Bind each manual in a cover which indicates the panel or process area to which it applies, manufacturer's name, local address and telephone number, and year of purchase. Punch and bind manuals in standard three ring binders and include system name and subcontractor's name on binding.
- F. Accessory and Maintenance Materials: Submit data for the following items:
- 1. Special Tools and Accessories: Special tools, instruments, and accessories for maintaining instruments and equipment requiring periodic repair and adjustment as specified elsewhere herein. Also, furnish special lifting and handling devices for equipment requiring such devices.
 - 2. Maintenance Materials and Spare Parts: Submit a list of manufacturer recommended spare parts for each item specified. Refer to other sections of these Specifications.
- G. Test Reports: Submit the following test reports as described herein:
- 1. Instrument Calibration Data Sheets (para. 2.13)
 - 2. Factory Testing of Control Panels (para. 2.14)
 - 3. Instrument Verification Report (para. 3.08.B)
 - 4. Final Operational Testing (para. 3.08.C)
- H. Demonstration and Final Operation Test Plan and Results: Submit a document that outlines all procedures to be used in final operational testing of instrument and control systems. Include a description of each system, the scope of testing, test methods and materials, testing instruments and recorders, a list of functional parameters to be recorded on each item, and Shop Drawings showing temporary bypasses, jumpers, and devices.

1.05 QUALITY ASSURANCE

- A. Standard of Quality: The Contractor shall provide equipment of the types and sizes specified which has been demonstrated to operate successfully. Provide equipment which is new and of recent proven design.

1.06 INSPECTIONS

- A. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.
- B. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.
- C. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

1.07 DRAWINGS

- A. Drawings: The Instrumentation Drawings are diagrammatic; exact locations of instrumentation products shall be determined in the field by the Engineer. Except where special details are used to illustrate the method of installation of a particular piece or type of equipment or material, the requirements or descriptions in this Specification shall take precedence in the event of conflict.
 - 1. Locations of equipment, inserts, anchors, motors, panels, pull boxes, manholes, conduits, stub-ups, fittings, power and convenience outlets, and ground wells are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.
 - 2. Review the Drawings and Specification Divisions of other trades and perform the instrumentation work that will be required for the installations.
 - 3. Should there be a need to deviate from the Instrumentation Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.
 - 4. Resolution of varying interpretations of the Contract Documents shall conform to Division 0, General and Supplementary Conditions.
 - 5. The Drawings provide details of installation and supersede the manufacturer's recommendation where a conflict exists.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Box, crate, or otherwise enclose and protect instruments and equipment during shipment, handling, and storage. Keep all equipment dry and covered from exposure to weather, moisture, corrosive liquids and gases or any element that could degrade the equipment. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Notify the Engineer in writing in the event that any equipment or material is damaged. Obtain prior favorable review by the Engineer before making repairs to damaged products.

PART 2 - PRODUCTS

2.01 MATERIALS AND STANDARD SPECIFICATIONS

- A. 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 plant. All instruments in the plant of the same type shall be made by the same manufacturer.

2.02 NAMEPLATES

- A. For each piece of equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings and the model designation.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. 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 upon prior request by the Contractor.
- C. Each control device, including pushbuttons, 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.
- D. Provide CAUTION or SAFETY nameplates 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.

2.03 NAME TAGS

- A. All instrumentation and equipment items or systems shall be identified by name tags. Field equipment shall be tagged with the assigned instrumentation tag number listed in the Instrument Schedule.
- B. Name tags shall be stainless steel with engraved or stamped black characters of 3/16 inch minimum height. Tags shall be attached to equipment with a tag holder and stainless steel band with a worm screw clamping device. Use 20-gauge stainless steel wire where banding is impractical. For field panels or large equipment cases use stainless steel screws; however, such permanent attachment shall not be on an ordinarily replaceable part.

2.04 FIELD-MOUNTED EQUIPMENT

- A. All instrument and control equipment mounted outside of protective structures shall be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Protective devices used on 120 Vac inputs to field mounted equipment shall be secondary valve surge protectors conforming to the requirements of ANSI C62.1.

2.05 EQUIPMENT OPERATING CONDITIONS

- A. All equipment shall be rated for normal operating performance with varying operating conditions over the following minimum ranges:
 - 1. Electrical Power: 120 Vac $\pm$ 10%, 60 Hz, unregulated, except where specifically stated otherwise on the Drawings or in the Specifications, or when two-wire, loop-powered devices are specified.

2.06 EQUIPMENT LOCATIONS

- A. Provide equipment and materials suitable for the types of locations in which they are located as defined under Division 16. All equipment specified for field

mounting shall be weatherproof and splash proof as a minimum. If electrical or electronic components are contained within the equipment, they shall be housed in NEMA 3R gasketed cases, NEMA 4 cases, NEMA 4X in corrosive locations, and NEMA 7 in hazardous locations unless noted otherwise on the Drawings.

2.07 ANALOG SIGNAL INDICATED UNITS

- A. For all instruments with local or remote indicators, provide indicators scaled in actual engineering units, i.e., gallons per minute, feet, psi, etc., rather than 0 to 100%, unless noted otherwise on the Drawings or Instrument Schedule.

2.08 SIGNAL TRANSMISSION

- A. Analog:
 - 1. Signal transmission between electric or electronic instruments shall be 4-20 mA and shall operate at 24 Vdc. 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. Nonstandard transmission systems such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted in the Instrument Schedule or shown on the Drawings. When transmitters with nonstandard outputs do occur, their output shall be converted to 4-20 mA prior to transmission.
- B. Discrete: All alarm and status signals shall be 120 Vac unless specified otherwise on the Instrument Schedule. Proprietary data highway or serial bit transmissions such as RS232C shall be allowed to the extent shown on the Drawings.

2.09 PANEL/RACK/ENCLOSURE BAY POWER SUPPLIES

- A. Provide each main rack and/or enclosure bay with a separate isolation transformer to prevent ground loops between the instrument and electrical power grounds. These transformers may be nonshielded control power type.
- B. For each two-wire transmitter, provide a 24 Vdc regulated 50 mA power supply with 120 Vac input. Output voltage may be 24 Vdc $\pm 5\%$ manufacturing tolerance at no load but shall hold within 1% from no load to full load at 120 Vac $\pm 10\%$ input. Line to-load regulation shall be within 0.1% from no-load to full load. Ripple shall be less than 15 mV peak-to-peak.
- C. Manufacturer: Provide Model AP9046 instrument loop power supply as manufactured by Action Instruments with plug-in mounting base, equivalent capacity Lambda power supply with terminal blocks for external connections, or equal.

2.10 PAINTING

- A. Factory paint all instruments and equipment except where installed in pipelines. Where instrument panels are installed adjacent to electrical control panels provided under Division 16, provide instrument panels of identical color to that of electrical control panels. Paint as required in Division 9 for structural supports, brackets, etc. Repair damaged factory paint to satisfaction of the Engineer. Feathering, priming and painting shall produce a reasonable match to the surrounding paint work.

2.11 FASTENERS

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel. Provide stainless steel fasteners in corrosive locations. When fastening to existing walls, floors, and the like, provide capsule anchors, not expansion shields. Size capsule anchors to meet load requirements. Minimum size capsule anchor bolt is 3/8 inch.

2.12 TUBING, PIPE, FITTINGS AND SUPPORTS

- A. General: Instrument tubing listed below is required for all instruments and control valves. Select the appropriate tubing materials to satisfy service conditions except where specifically shown on Installation Detail Drawing.
 - 1. Copper Tubing: Soft-annealed copper tubing shall be 1/4 inch O.D. x 0.030 inch wall, 3/8 inch O.D. x 0.032 inch wall, or 1/2 inch O.D. x 0.032 inch wall as shown on the Drawings. Copper tubing shall be seamless copper, Type DHP, bright annealed after coiling, dehydrated and sealed in 50 foot aluminum coils, per ASTM B75. Use for instrument or valve connections only.
 - 2. Copper Tubing: Hard drawn copper tubing shall be in accordance with ASTM B88. Sizes shall be 3/8 inch standard: 3/8 inch O.D. x 0.030 inch wall; 1/2 inch standard: 1/2 inch O.D. x 0.035 inch wall; or 5/8 inch standard: 5/8 inch O.D. x 0.040 inch wall in 20 foot straight lengths with plastic capped ends. Use for header or branch service only.
 - 3. Stainless Steel: Stainless tubing shall be Type 304 seamless, cold drawn and annealed per ASTM A269. Sizes shall be 1/4 inch O.D. x 0.045 inch wall, 3/8 inch O.D. x 0.035 inch wall or 1/2 inch O.D. x 0.035 inch wall. Use for instrument or valve connections.
 - 4. Pneumatic Tubing: Pneumatic tubing for panel internals shall be 1/4 or 3/8 inch O.D. rigidwall, clear polyethylene, 125 psi rating. Tubing shall be supported in plastic duct or conduit where appropriate. Use for enclosed or indoor instrument or valve connections.
 - 5. Fittings:
 - a. Copper Tube: Solder joint fittings shall be seamless wrought copper per ASTM B75. Compression fittings shall be Brass equal to Imperial or Swagelok.
 - b. Stainless Steel Tube: Weld joint fittings shall be Type 304 stainless. Compression fittings shall be Type 316 stainless steel equal to Imperial or Swagelok.
 - c. Supports for Tubing: Supports located in areas exposed to the weather or corrosive atmosphere shall be Type 304 stainless steel Unistrut or equal or made of steel conforming to ASTM A276. Supports not exposed to the weather or corrosive atmosphere shall be carbon steel painted.
 - d. Weld joint fittings shall be permitted for header and branch service only. Instrument and valve connections shall be compression-type only. Use unions on as necessary to simplify instrument removal.
 - 6. Valves:
 - a. Pipe, Pipe Fittings and Valves: Main-line piping material and root valves for instrumentation shall be as specified in Section 15050.
 - b. Instrument valves shall be 1/4-inch, 3/8-inch or 1/2-inch from Whitey or Hoke to match tubing material and size.

2.13 INSTRUMENT CALIBRATION

- A. Each field instrument shall be calibrated at 0%, 25%, 50%, 75% and 100% of span using test instruments to simulate inputs and read outputs that are rated to an accuracy of at least 5 times greater than the specified accuracy of the instrument being calibrated. Such test instruments have accuracies traceable to the National Institute of Standards and Technology (NIST).
- B. Submit a written report to the Engineer on each instrument. This report shall include a laboratory calibration sheet or the manufacturer's standards calibration sheet on each instrument and calibration reading as finally adjusted within tolerances.
- C. The Contractor may, at his option, choose to perform calibration on an instrument by acquiring the services of an independent test lab, or by obtaining the required test instruments and performing the calibration.

PART 3 - EXECUTION

3.01 MOUNTINGS

- A. Mount and install equipment as indicated. Mount field instruments on pipe mounts or other similar means in accordance with suppliers' recommendation. Where mounted in control panels, mount according to requirements of that section.
- B. Equipment specified for field mounting shall be suitable for direct pipe mounting or surface mounting, surface-mounted indicators and equipment with calibration adjustments or requiring periodic inspection shall be mounted not lower than 3 feet 6 inches nor higher than 6 feet above walkways, platforms, catwalks, and the like.
- C. Note that applicable specifications require detail drawings showing seismic sway bracing design and anchorage requirements for their equipment. Seismic zone requirements are specified in Division 1.
- D. All devices shall be accessible to operators for servicing, operating, reading, etc. Provide permanent platforms to assure devices are continuously accessible.

3.02 PROCESS CONNECTIONS

- A. Provide instrument impulse tubing (see Part 2) to meet the intended process service and ambient environmental condition for corrosion resistance, etc. Install impulse tubing with a continuous slope according to service to promote self-draining or venting back to the process. Terminate connection to process lines or vessels in a service rated roof valve, provided under other Divisions, that will permit closing off the impulse line or removal of the element without requiring shut down of the process. Include blowdown of drip legs and valves for terminations of impulse lines at the instruments.
- B. Process vessels, line penetrations, and root valves shall be furnished and installed under other Divisions of these Specifications. Instrument tubing and valve manifolds are installed as part of this Specification.

3.03 FIELD WIRING

- A. Ring out signal wiring prior to termination and perform surge withstand tests where required (see Section 16010, Part 3 for methods). Verify wire number and terminations are satisfactory as designated on the Loop and Interconnect

Diagrams. Verify all terminations are tight and shields are uniformly grounded at one location.

3.04 ELECTROMAGNETIC INTERFERENCE (EMI)

- A. Construction shall proceed in a manner which minimizes the introduction of noise (RFI/EMI) into the I&C System.
- B. Cross signal wires and wires carrying ac power or control signals at right angles.
- C. Separate signal wires from wires carrying ac power or switched ac/dc control signals within control panels, terminal cabinets, telemetry equipment, multiplexer cabinets, and data loggers as much as possible. Provide the following minimum separations within such equipment unless indicated otherwise on the Drawings:

Power Wiring Capacity	Separation (Inches)
120 volts ac or 10 amps	12
240 volts ac or 50 amps	18
480 volts ac or 200 amps	24
4,160 volts ac or 800 amps	48

3.05 SIGNAL GROUNDING

- A. The Drawings and Division 16, Section 16450, specify safety grounding for all equipment in this Division.
- B. A single-point grounding system for instrument signals is required for all instrument panels. This instrument single point grounding system does not use building steel or conduit systems for its ground path.
 - 1. Ground all signal shields, signal grounds, and power supplies at an isolated signal bus within each instrument panel, rack, or enclosure. The shields at the far ends of these signal cables must be disconnected (floated) from any ground to prevent ground loops.
 - 2. Do not connect the rack or enclosure frames to the signal grounding buses.
 - 3. Connect each isolated signal ground bus within each panel using a stranded, insulated copper wire of size 6 AWG or larger directly to a system ground rod installed per the Drawings.

3.06 PREPARATION

- A. Ensure that installation areas are clean and that concrete or masonry operations are completed prior to installing instruments and equipment. Maintain the areas in a broom-clean condition during installation operations.
- B. Panels shall be protected during construction to prevent damage to front panel devices and prevent dust accumulation in the intervals. Other protective measures (lamp, strip heaters, etc.) shall be included as weather conditions dictate.

END OF SECTION

SECTION 17150

PRESSURE MEASUREMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements of Division 1 and Section 17010 form a part of this Section. This Section specifies pressure measurement devices for process instrumentation, auxiliary equipment and supplies directly related to the installation of and operation of these pressure measurement devices, to perform the required functions in conjunction with information and equipment specified in other sections of Division 17. Refer to the Instrument Index in Section 17010 for a listing of required devices.

1.02 SUBMITTALS

- A. Shop drawings to be submitted in this section shall be made in one package under the Product Review Category of Shop Drawings.
- B. Shop Drawings: In addition to the requirements of Section 17010, shop drawings shall include for each type of instrument: supply voltage and frequency, electrical load, accuracy, description of operation, operating instructions, and calibration procedure.
- C. Installation Method: The proposed method of mounting sensors and instruments shall accompany all shop drawings.
- D. Parts List: Submit a Parts List with current net prices and a list of recommended spares.

1.03 QUALITY ASSURANCE

- A. Manufacturer: In addition to the requirements of Section 17010, pressure measurement devices furnished shall be manufactured by firms regularly and currently engaged in the design and manufacture of similar equipment. All equipment furnished shall be new and of current design.
- B. Maintainability: All equipment shall be designed for ease of maintenance and repair, and access to critical parts shall not require a major disassembly. Internal field adjustments where permitted or required herein shall be easily accessible upon removal of a panel or cover.
- C. Materials and Installation: Materials and installation shall comply with the requirements of the current editions of referenced electrical codes and standards, and the codes and standards referred to shall be used for establishing the minimum quality of the materials and equipment supplied and installed. All equipment of the same type shall be products of the same manufacturer. Capacities of all equipment shall not be less than that indicated in the Instrument Index.

PART 2 - PRODUCTS

2.01 PRESSURE TRANSMITTERS - ELECTRONIC

A. General:

1. Electronic indicating-type pressure transmitters shall convert a gauge or absolute pressure measurement to a 4-20 mA_{dc} linear electrical output signal capable of transmission into at least a 600-ohm maximum load at 24 V_{dc} or less. Signal and power transmission shall be provided on a single pair of wires. Operating ambient temperature limits shall be at least -40° to +82°C.
2. Range shall be as indicated in the Instrument Index. Overrange protection shall be at least 1-1/2 times span without degradation of accuracy. Reference accuracy shall be ±1/2 percent or better.

B. Construction:

1. The transmitter enclosure shall be NEMA 4X rated. The process connection for clean liquid service shall be 1/4-inch NPT. Enclosure and wetted surface material shall be corrosion resistant and suitable for the process fluid.

C. Manufacturers: Endress + Hauser, Rosemount, or equal.

2.02 INSTRUMENT MANIFOLDS

- #### A.
- Provide test valve manifolds for pressure and differential pressure transmitters and pressure switches and pressure/vacuum gauges installed in clean liquid (no entrained solids) service or filtered water. Provide corrosion resistant test manifolds with integral 2-valve assemblies (or block and bleed assembly) for pressure transmitters and switches and gauges and 3-valve assemblies (block and bypass with manometer ports) for differential pressure transmitter installation.

B. Provide manifold(s) with the following hardware, performance features and ratings:

1. Traditional mount manifold type. Two-valve or three-valve.
2. Direct mount manifold type. Two-valve.
3. Coplaner manifold type. Three-valve integral.
4. Process connection. 1/2-14 MNPT.
5. Material: Body, Bonnet, Stem, Drain/Vent Plug, 316 SST.
6. Packing material: Grafoil.
7. Calibration tap or adapter.

2.03 PRESSURE GAUGES

- #### A.
- Pressure Gauges shall be 4-1/2 inch in diameter, bottom connected with white laminated dials and black graduations.
- #### B.
- Gauges shall have a blowout disc and safety glass, encased in phenolic, steel or cast iron. Measuring element shall be a stainless-steel bourbon tube with welded, stress-relieved joints. Socket shall have wrench flats.
- #### C.
- Movement shall be rotary geared, all stainless-steel material.

- D. Accuracy shall be ½ percent of range.
- E. All pressure gauges shall be provided with pulsation snubbers constructed of 316 stainless steel, pressure diaphragm seal, an isolation valve and a drain valve as shown on the Contract Drawings.
- F. Manufacturers: The pressure gauge shall be Ashcroft 1279 w/101 or 201 diaphragm seals.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation, testing, calibration, validation, startup and instruction shall be in accordance with Section 17010.

END OF SECTION