BIGHORN DESERT VIEW WATER AGENCY

Water System Improvements and Consolidation Projects

CONTRACT NO. PWC26-01

BID SET

September 4, 2026

PROJECT MANUAL

Prepared by:

Funded by:

BIGHORN DESERT VIEW WATER AGENCY

YUCCA VALLEY, CA

Water System Improvements and Consolidation Projects

Approved By:

BDVWA General Manager / Jennifer Cusack

_____

BDVWA Chief Engineer / Marina West, PG

_____

Prepared By:

California Rural Water Association

BID SET - NOT FOR CONSTRUCTION

BIGHORN DESERT VIEW WATER AGENCY

Water System Improvements and Consolidation Projects

Signature Page

BID SET - NOT FOR CONSTRUCTION



Civil
Date 9/4/26



Electrical
Date 9/3/26

Bighorn Desert View Water Agency

Water System Improvements and Consolidation Projects

PROJECT MANUAL

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NOTICE INVITING SEALED PROPOSALS (BIDS)

BIGHORN-DESERT VIEW WATER AGENCY
CONTRACT NO. PWC26-01
BDVWA Water System Improvements and Consolidation Projects

NOTICE IS GIVEN sealed proposals will be received by the Bighorn-Desert View Water Agency (Agency), at its office at 622 South Jemez Trail, Yucca Valley, California, until 11:00 a.m. on October 20, 2026 for furnishing the work described in the contract documents. Proposals will then and there be opened and publicly read aloud. Proposals received after the time announced for the opening will not be considered. Mailed bids must arrive before or on October 19th to be accepted. The Contract Documents may be examined at the office of the Agency or as specified below.

Location and Description of Work. The Project generally consists of the construction of approximately 26,100 LF of 6-inch PVC C900 water mains, 650 LF of 8-inch PVC C900 water mains, four (4) PRV stations in precast concrete vaults, trench cutoff walls, construction of a new CMU booster pump station, installation of a vertical turbine pump at an existing pump station, SCADA integration and PLC programming, and associated appurtenances (including combination air valve assemblies, fire hydrants, valves, fittings and more). Additional project information, bid requirements, and instructions are included in the Contract Documents.

Contract Documents. Interested contractors can review plans and specifications in any of the following ways: (1) Request a link to the Plans and Specifications from Rydell Asbenson at r.asbenson@mceng.us. (2) View them at the local office of BDVWA located at 622 Jemez Trail, Yucca Valley, California 92284. (3) Request a copy from SLO County Builders Exchange at their website slocbe.com or at planroom@slocbe.com (4) Request a copy from AGC Plan Room, AGC Members can access documents directly through the AGCSD Online Planroom (OPR). Non-members can request a 1-week free trial by emailing planroom@agcsd.org or visiting https://login.onlineplanservice.com/login.aspx?sender=AGCS.

The Agency may reject any or all proposals and waive irregularities or informalities in any of the proposals. Each proposal shall be submitted only on the prescribed proposal form included with the contract documents. Any alteration to the proposal form will result in the rejection of the bid.

MANDATORY Pre-Bid Walk-Through. A Mandatory Pre-Bid Walk-Through will be conducted on Wednesday, September 30th starting at 10:00 a.m. The meeting will be held at 622 S. Jemez Trail, Yucca Valley, CA 92284. Personal Protective Equipment (PPE) is required for that walk-through. For safety reasons, attendees must bring and wear hard hats, safety vests, and close-toed shoes, if construction is occurring during the Pre-Bid Wal-Through.

Contractor Classification. Bidders on this work will be required to be licensed by the State of California as Classification A - General Engineering Contractor at the time of the bid and at the time of award as such license is defined in Section 7056 and/or Section 7058 of the Business

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and Professions Code and Sections 7055-7059 of Title 16 of the California Code of Regulations.

Prevailing Wages. The successful bidder is required to pay prevailing wages as determined by the Division of Industrial Relations. A copy of the Division's wage determinations is available for inspection at the Agency's headquarters. Any excavation five feet or deeper requires the submission of a separate shoring plan and an itemized bid. In all respects, the successful bidder shall comply with requirements of law pertaining to public works contracts.

Public Works Project. Public Works Requirements apply to this project, including, but not limited to:

A. all applicable requirements of Labor Code Sections 1771, 1774 - 1776, 1813, and 1815.

B. the appropriate number of apprentices are on the job site, as set forth in Labor Code Section 1777.5.

C. workers' compensation coverage, set forth in Labor Code Sections 1860 and 1861.

D. to keep accurate records of the work performed on the public works project, as set forth in Labor Code Section 1812.

E. inspection of payroll records pursuant to Labor Code Section 1776, and applicable regulations.

F. and other requirements imposed by law.

Dated: September 16, 2026

Marina D. West, PG Chief Engineer

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INFORMATION FOR BIDDERS

1. GENERAL

The work hereunder must be done in strict conformity with the plans and specifications adopted and approved by the Agency.

2. CONTRACT DOCUMENTS

(a) The contract documents shall consist of the following:

Notice Inviting Sealed Proposals (Bids)
Information for Bidders
Proposal (Bid)
Bid Forms
Agreement
Payment Bond
Performance Bond
Maintenance and Guarantee Bond
Competent Person Designation
Qualifications of Successful Bidder
Addenda issued Prior to Bid Opening
General Conditions
Special Provisions
Technical Specifications

(b) Terms and conditions contained in the contract documents are part of the contract. The governing board of the Agency may reject bids and waive informalities in bids. No bidder may withdraw a bid after bid opening, subject to applicable law.

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3. MANDATORY PRE-BID MEETING AND SITE WALK

A mandatory pre-bid meeting and site walk will be held on **September 30, 2026, at 10 a.m.**, beginning at the Bighorn-Desert View Water Agency office located at 622 S. Jemez Trail, Yucca Valley, California. Attendance by a representative of each prospective Prime Contractor intending to submit a bid is mandatory. Bids submitted by Prime Contractors that do not attend the mandatory pre-bid meeting and site walk will be considered non-responsive and will not be considered for award. The purpose of the meeting and site walk is to familiarize prospective bidders with the Project, existing site conditions, access and staging constraints, environmental requirements, existing facilities, and other conditions that may affect prosecution of the Work. Subcontractors, suppliers, and other interested parties may attend but are not required to do so. Statements or interpretations made during the pre-bid meeting or site walk shall not modify the Contract Documents. Any clarification, interpretation, or modification of the Contract Documents considered necessary by the Agency will be issued by written Addendum.

Prospective bidders remain responsible for independently examining the Project sites and Contract Documents and for fully informing themselves of all conditions and requirements affecting the Work.

4. PROPOSALS

Bids shall be made upon the form of proposal furnished by the Agency and a part of the contract documents. Bids shall be properly executed and with all items filled in; the signatures of persons signing shall be in longhand. Erasures, inter-lineation or other corrections shall be authenticated by affixing in the margin immediately opposite the correction, the initials of a person signing the bid. If the unit price and the total amount named by a bidder for an item are not in agreement, the unit price alone shall be considered as representing the bidder's intention, and the totals shall be corrected to conform.

Persons bidding may submit bids on any of the schedules set forth in the bid form.

Bids shall not contain recapitulation of the work to be done. Alternative proposals will not be considered except as called for. No oral, telegraphic or telephonic proposals or modifications will be considered.

Bids shall be accompanied by a bidder bond in a form acceptable to the Agency or cash in the amount of ten percent (10%) of the bid price.

Before submitting a bid, bidders shall carefully examine all contract documents, shall visit the site of the work, shall fully inform themselves as to all the existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the contract. No allowance will be made because of lack of such examination or knowledge. Bids shall be sealed in an envelope marked "Bid for Water System Improvements and Consolidation Projects – Do Not Open Until Time of Bid" addressed to the Secretary of the Agency, and be delivered thereto on or before the day and hour set for the opening of bids in the notice inviting sealed proposals, and shall bear the name of the bidder. It is the SOLE responsibility of the bidder to see that his bid is delivered and received in proper time. Any bid received after that scheduled closing time for receipt of bids shall be returned to the bidder unopened.

The Agency shall have a period of 60 days after the opening of bids within which to accept or reject the bids. If no bid is accepted within the period, or if the successful bidder executes and delivers the necessary contract documents to the Agency, the Agency will return to each bidder all checks and bonds received by the Agency from unsuccessful bidders within 10 days after the execution of the contract and presentation of required certificates and bonds or within 10 days after being requested to do so by the bidder if no bid is accepted within the period.

5. AGREEMENT AND BONDS

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The form of contract which the successful bidder, as Contractor, will be required to execute is included in the contract documents, and should be carefully examined by the bidder. The agreement, bonds, and other documents to be executed by the Contractor shall be executed in original triplicates stamped according to law, one of which original triplicate shall be filed with the Agency, and the others with the Agency's Attorney and the Agency's Engineer.

The successful bidder, simultaneously with the execution of the agreement, shall furnish and maintain a payment bond in an amount equal to one hundred percent (100%) of the contract price and change order prices, and a faithful performance bond in an amount equal to one hundred percent (100%) of the contract price and change order prices. The bonds shall be secured from a surety company satisfactory to the Agency and whose name is on file with the County Clerk of San Bernardino County as an approved and financially sound surety company, authorized to transact business in this State.

The bonds shall meet all of the requirements and contain the conditions required by California Civil Code Section 9000 et seq., and other applicable provisions of the law and regulations of the State of California.

Failure to execute the contract and file acceptable bonds and proof of insurance coverage as provided therein within the time set forth herein shall be just cause for the annulment of the award and forfeiture of the proposed guarantee.

6. ADDENDA OR BULLETINS

Addenda or bulletins issued before the time to submit bids expires, or forming a part of the contract documents furnished to the bidder for preparation of his bid, shall be covered in the bid and shall be made a part of the contract.

7. WITHDRAWAL OF BID

A bidder may withdraw the bid personally or by a signed written request *prior* to the scheduled time for opening of the bids (but not after).

8. AWARD OR REJECTIONS OF BIDS

The contract will be awarded to the lowest responsible bidder complying with these instructions and with the notice inviting sealed proposals. The Agency may reject bids or waive informality in bids. If in the judgment of the Agency a bid is unbalanced, or if the bidder is not responsible, it shall be considered sufficient grounds for rejection of the entire bid.

9. BIDDERS INTERESTED IN MORE THAN ONE BID

No person, firm or corporation shall make or file, or be interested in more than one bid for the same work, unless alternative bids are solicited. A person, firm or corporation submitting a subproposal to a bidder, or who has quoted prices on material to a bidder, is not disqualified

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from submitting a subproposal or quoting prices to other bidders.

10. OTHER REQUIREMENTS

Before award of the contract, a bidder upon request shall furnish a recent statement of financial condition and previous construction experience or other evidence of qualifications.

Before entering into a contract, the bidder to whom the contract has been awarded shall furnish satisfactory evidence of workers' compensation insurance and public liability and property damage insurance as specified in the special provisions.

Funding for the subject project will be provided in whole or in part by the State of California Department of Water Resources ("State") pursuant to Grant Agreement No. 4600014979 between the State and the Agency under the Proposition 1 Integrated Regional Water Management (IRWM) Program dated on or about March 13th, 2023, and by the State Water Resources Control Board ("State Water Board") pursuant to Grant Agreement No. D2102065 between the State Water Board and the Agency under the Drinking Water State Revolving Fund (DWSRF) Program dated on or about April 20th, 2023. These agreements are located in Attachments A and B, respectively.

All applicable requirements of these funding agreements are hereby incorporated into the Contract Documents and shall apply to the Work. The successful bidder shall comply with all applicable requirements of the State, the State Water Board, and any other federal, state, or local agencies having jurisdiction over the Project.

Certain requirements applicable to the State Water Board funding may originate from federal funding sources and shall apply to the Contract to the extent required by the funding agreements.

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PROPOSAL TO

BIGHORN-DESERT VIEW WATER AGENCY

FOR THE CONSTRUCTION OF THE

WATER SYSTEM IMPROVEMENTS AND CONSOLIDATION PROJECTS

BID SET - NOT FOR CONSTRUCTION

Name of Bidder:_____
Business Address:_____
_____
Telephone No. _____
Place of Residence: _____

The site of the work to be constructed and referred to herein is in the County of San Bernardino, California.

The work is to be in accordance with the specifications and contract documents and as shown on plans therefore entitled "**WATER SYSTEM IMPROVEMENTS AND CONSOLIDATION PROJECTS"** TO THE GOVERNING BOARD OF BIGHORN-DESERT VIEW WATER AGENCY.

In compliance with your notice inviting sealed proposals (bids) and other documents, the undersigned bidder proposes to perform the work and in a workmanlike manner, in strict conformity with the plans and specifications and other contract documents, including **Addenda Nos. _____, _____ and _____,** on file in the office of the Secretary of the Agency for the contract unit prices herein.

The undersigned agrees that the Total Base Bid shall be the sum of Bid Items 1 through 27 as set forth in the Bid Form – Schedule of Prices. The undersigned further acknowledges the Deductive Alternatives identified in the Bid Form and agrees that such Deductive Alternatives, if applied by the Agency, shall adjust the Contract Price in accordance with the unit prices and lump sum prices stated therein.

It is understood the foregoing quantities are approximate only and are solely for the purpose of facilitating the comparison of bids. The Contractor's compensation will be computed upon the basis of the actual quantities in the complete work, whether they be more or less than those shown.

State manufacturer's name and address for each type of material upon which this proposal is based.

Signature of Bidder: _____

_____

Address

_____

Authorized Officer of Bidder

_____

_____

DATED:_____

NOTE: If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a co-partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnership. If the Bidder is an individual, the signature shall be placed above. If a joint venture of a special partnership, the names of the general partners and special partners shall be submitted.

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BID FORM – SCHEDULE OF PRICES

(For Bid Items Defined in Section 01150 – Measurement and Payment)

Bid Item No.	Description	Dwg Vol.	Quantity	Units	Unit Price, $	Total, $
1	Bonds and Insurance	1, 2, 3	1	Lump Sum		
2	Mobilization and Demobilization	1, 2, 3	1	Lump Sum		
3	Traffic Control Plan Preparation and Implementation	1, 2, 3	1	Lump Sum		
4	Storm Water Pollution Prevention Plan	1, 2, 3	1	Lump Sum		
5	Adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life or limb, conforming to applicable California Safety Orders.	1, 2, 3	1	Lump Sum		
6	Zone B 6-inch Transmission Pipeline	1	8,260	Linear Feet		
7	Warren Vista 6-inch Pipeline	1	3,470	Linear Feet		
8	Winters Road Common Trench (3) 6-inch Pipelines	1	2,600	Linear Feet		
9	Rainbow Drive 6-inch Pipeline	1	1,310	Linear Feet		
10	Lanes End 6-inch Pipeline	1	705	Linear Feet		
11	Zone B Flush Out Station	1	1	LS		
12	Reche Road and D-1 Pump Station 8-inch Pipeline	2	610	Linear Feet		
13	Stearman Road 6-inch Pipeline	2	1,025	Linear Feet		
14	Osgood Avenue 6-inch Pipeline	2	1,360	Linear Feet		
15	Reche Road 6-inch Pipeline	2	685	Linear Feet		
16	Alta Avenue 6-inch Pipeline	2	4,005	Linear Feet		
17	North Kuna Avenue 6-inch Pipeline	2	2,643	Linear Feet		
18	Yucca Mesa Road Interties	2	2	Lump Sum		

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19	PRV Station	1, 2	4	Each		
20	Combination Air Valve Assembly	1,2	15	Each		
21	Blow Off Assembly	1,2	4	Each		
22	Trench Cutoff Wall	1	14	Each		
23	Fire Hydrant	1,2	9	Each		

BID FORM – SCHEDULE OF PRICES CONTINUED

(For Bid Items Defined in Section 01150 – Measurement and Payment)

Bid Item No.	Description	Dwg Volume	Quantity	Units	Unit Price, $	Total, $
24	Zone B Booster Pump Station	3	1	Lump Sum		
25	Zone D1 Booster Pump Improvements	3	1	Lump Sum		
26	SCADA and PLC Programming	3	1	Lump Sum	$41,750	$41,750
27	All Remaining Work Included in the Contract Drawings and Specifications NOT included in other Bid Items.	1,2,3	1	Lump Sum		
TOTAL BASE BID PRICE (Bid Items 1 through 27)					$	
The Total Base Bid shall be the sum of Bid Items 1 through 27. Award, if made, will be based on the Total Base Bid unless otherwise determined by the Agency in accordance with the Contract Documents.						

Total Base Bid Price (Bid Items 1 through 27):_____

_____

(Written in Words)

BID SET - NOT FOR CONSTRUCTION

BID FORM – SCHEDULE OF DEDUCTIVE ALTERNATIVE PRICES

(For Bid Items Defined in Section 01150 – Measurement and Payment)

Bid Item No.	Description	Dwg Volume	Quantity	Units	Unit Price, $	Total, $
28 D-1	Deductive Alternative 1					
	Zone B Transmission Main 6-inch Pipeline Sta 157+50 to Sta 174+68	**1**	1,718	Linear Foot		
	PRV Station	**1**	1	Each		
	Combination Air Valve	**1**	3	Each		

	Blow Off Assembly	**1**	1	Each		
	Trench Cutoff Wall	**1**	2	Each		
					Deductive Alternative 1 Total	
29 D-2	Deductive Alternative 2 - Lanes End 6-inch Pipeline	1	705	Linear Foot		
30 D-3	Deductive Alternative 3 - Reche Road 6-inch Pipeline	2	685	Linear Foot		
Deductive Alternatives will be applied in the numerical order listed if required to meet budget constraints.						

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BID FORMS

BID BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____ as principal and _____ as surety, are held and firmly bound unto BIGHORN-DESERT VIEW WATER AGENCY, hereinafter referred to as "OWNER," for the sum of _____dollars, ($_____), the amount being ten percent (10%) at least of the total amount of the bid, to be paid to the said OWNER, its successors, and assigns; for which payment, will and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH,
that if the certain proposal of the above bounden for the completion of the Project as specifically set forth in documents entitled Contract Documents and Specifications for the **Water System Improvements and Consolidation Projects** in accordance with the Specifications and Construction Drawings on file at the office of the Owner, 622 S. Jemez Trail, Yucca Valley, California, is not withdrawn within the period specified Section 4 of the Information for Bidders, unless otherwise required by law, and notwithstanding the award of the contract to another bidder, and that if said proposal is accepted by the OWNER through action of its legally constituted contracting authorities and if the above bounden his/her heirs, executors, administrators, successors and assigns, shall duly enter into and execute a contract for such construction and shall execute and deliver the required Performance and Payment Bonds and proof of insurance coverage within fifteen (15) calendar days (not including holidays) after the date of notification by and from the said OWNER that the said Contract is ready for execution, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

IN WITNESS WHEREOF, we hereunto set our hands and seals this day of

_____ 20_____

_____
Signature

_____
Title

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Note: The standard printed bond form of any bonding company acceptable to the OWNER may be used in lieu of the foregoing approved sample bond form provided the security stipulations protecting the OWNER are not in anyway reduced by use of the surety company's printed standard form.

LIST OF MATERIAL/EQUIPMENT SUPPLIERS

Name the manufacturer or manufacturers of the items listed below and every major product or major piece of equipment whose cost exceeds fifteen percent (15%) of the total bid amount.

In addition, the bidder is required to fill out the following blanks, listing manufacturers from whom it intends to purchase the indicated items and which selections will be considered as binding upon the Bidder, provided that all such selections shall comply with the provisions of the Contract Documents

No change shall be allowed by the Engineer of any material manufacturer or supplier listed after receipt of bids unless the manufacturer so listed cannot furnish materials meeting the specifications. Should such change be allowed, there will be no change in the amount of the bid originally submitted.

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Item	Material	Manufacturer
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____
11.	_____	_____
12.	_____	_____

Add additional sheet as required.

REFERENCES

(***Offerer must complete the reference list as indicated*** for at least three (3) sites that are currently using a similar scope of work requested by the Agency. ***This reference list is mandatory***.)

REFERENCE No. 1

City/Agency: _____

Contact Name: _____ Phone Number: _____

Address: _____

Contract Amount: $ _____ Year: _____

Project Name & Description of work done: _____

_____

_____

_____

REFERENCE No. 2

City/Agency: _____

Contact Name: _____ Phone Number: _____

Address: _____

Contract Amount: $ _____ Year: _____

Project Name & Description of work done: _____

_____

_____

REFERENCE No. 3

City/Agency: _____

Contact Name: _____ Phone Number: _____

Address: _____

Contract Amount: $ _____ Year: _____

Project Name & Description of work done: _____

_____

_____

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COMPANY AND PARTNERSHIP IDENTIFICATION

Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of this work.

Legal name of Bidder _____

Street Address _____

Mailing Address _____

Business Telephone _____

Business Facsimile _____

Email Address _____

Type of Business:

☐ **Sole Proprietor** ☐ **Partnership** ☐ **Corporation** ☐ **Other:** _____

If corporation, indicate State where incorporated: _____

Contractor's License Numbers: _____ _____
(General Engineering Contractor Class "A") (Other)

Contractor's DIR* Registration: _____ _____
DIR Number Expiration Date

*DIR – California Department of Industrial Relations

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AFFIDAVIT

I, the undersigned, certify and declare that I have read all the answers contained in this identification form and known their contents. The matters stated in the form answers are true of my own knowledge and belief, except as to those matters stated on information and belief, and as to those matters I believe them to be true. I declare under penalty of perjury under the laws of the State of California, that the foregoing is correct.

Dated: _____ _____

(Signature)

_____

(Printed Name and Title)

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DESIGNATION OF SUBCONTRACTORS

In accordance with the provisions of Section 4100 and 4104 et. seq. of the Government Code of the State of California, the bidder shall, in its bid, list the name, License Number and Classification, and place of business of each subcontractor who will perform work or labor or render service to the prime contractor in an amount in excess of one-half of 1 percent of the prime contractor's total bid, including the percentage of Prime Contractor's total base bid.

Description of Work	Subcontractor/License No.	% of Contract

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ADDENDA ACKNOWLEDGEMENT

The undersigned acknowledges receipt of the following ADDENDA:

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Addendum No. _____ Date: _____

Name of Bidder: _____

Address: _____

Telephone Number: _____

By: _____
Signature Title

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WORKERS' COMPENSATION CERTIFICATE

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.

Dated: _____

_____
Contractor (Type Full Name)

_____
(Signature)

_____
(Title)

_____
(Street Address)

_____
(City) (State) (Zip)

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NOTE: If Contractor is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If the Contractor is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnerships. If the Contractor is an individual, the name of the firm shall be set forth together with the signature.

NON-COLLUSION DECLARATION

The undersigned declares under penalty of perjury as follows:

1. _____, being first duly sworn, deposes and says that he or she is (title) _____ of (company name) _____, the party making the foregoing bid.

2. The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation.

3. The bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding.

4. The bidder had not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract.

5. All statements contained in the bid are true.

6. The bidder has not, directly or indirectly, submitted the bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

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Dated:_____

_____
Contractor (Type Full Name)

_____
(Signature)

_____
(Title)

_____
(Street Address)

_____
(City) (State) (Zip)

(Attach Notarial Acknowledgement of Contractor)

ACKNOWLEDGMENT OF INSURANCE REQUIREMENTS

By signing below, Bidder acknowledges the insurance requirements as listed in Section 6.18 of the General Conditions (and as supplemented by the Special Provisions Section II Part 1. By this acknowledgment, the Bidder and its insurance provider(s) and surety(ies) certify that they have read and understand the insurance and bonding requirements in their entirety, including limits of coverage, additional insureds and endorsements, and bonding requirements, and that the Bidder can provide the insurance coverage and bonds as required in the Contract documents without exception.

Bidder understands that if the insurance coverage provided in these referenced Sections above cannot be provided, its bid is subject to rejection by the Owner as non-responsive.

BIDDER

Company Name: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Date: _____

INSURANCE PROVIDER/SURETY REPRESENTATIVE

Insurer/Surety Name: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Date: _____

Bidder Must Provide This Acknowledgment for Each Insurer or Surety Providing Insurance Coverage or a Bond under this Contract

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Debarment and Suspension Certification

1) The Contractor certifies, to the best of its knowledge and belief, that he/she and its subcontractors and subrecipients:
   a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any governmental entity (federal, state, or local;
   b) Have not, within the three (3) year period preceding this certification, been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) transaction or contract under a public transaction, violation of Federal or state antitrust statutes, or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
   c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, state, or local) with commission of any of the offenses listed in subparagraph (1)(b) of this certification; and
   d) Have not, within the three (3) year period preceding this certification, had one or more public transactions (Federal, state, and local) terminated for cause or default.
2) The Contractor also certifies that, if Contractor later becomes aware of any information contradicting the statements of paragraph (1) above, it will promptly provide that information to the State.
3) If the Contractor is unable to certify to all statements in paragraphs (1) and (2) of this certification, through those means available to Applicant, including the System for Award Management (SAM) Exclusion list. Contractor shall indicate so in its applications, or in the transmittal letter or message accompanying its annual certifications and assurances, and will provide a written explanation to the State.

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DEBARMENT AND SUSPENSION CERTIFICATION

SIGNATURE PAGE

In signing this document, I declare under penalties of perjury that the foregoing certifications and assurances, and any other statements made by me on behalf of the Applicant are true and correct.

Signature _____

Date _____

Printed Name _____

As the undersigned Attorney for the above named Contractor, I hereby affirm to the Agency that it has the authority under state and local law to make and comply with the certifications and assurances as indicated on the foregoing pages. I further affirm that, in my opinion, these certifications and assurances have been legally made and constitute legal and binding obligations of the Contractor.

I further affirm to the Contractor that, to the best of my knowledge, there is no legislation or litigation pending or imminent that might adversely affect the validity of these certifications and assurances or of the performance of the described project.

AFFIRMATION OF CONTRACTOR'S ATTORNEY

For_____(Name of Contractor)

Signature_____Date_____

Printed Name of Applicant's Attorney _____

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CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

The Contractor certifies that he/she, and his/her Subcontractors will provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing a drug-free awareness program to inform employees about—
   (1) The dangers of drug abuse in the workplace;
   (2) The Contractor's/Subcontractor's policies of maintaining a drug-free workplace;
   (3) Any available drug counseling, rehabilitation and employee assistance programs, and
   (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will—
   (1) Abide by the terms of the statement; and
   (2) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after each conviction;

(e) Notifying the Agency within ten days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction;

(f) Taking one of the following actions, within 30 days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted—
   (1) Taking appropriate personnel action against such an employee, up to and including termination; or
   (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

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_____
Typed Name and Title of Certification Official

_____ _____
Signature Date

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AGREEMENT FOR THE CONSTRUCTION OF

_____

As of _____, 202__, BIGHORN-DESERT VIEW WATER AGENCY, a public agency (herein "Agency"), and _____, a _____ (herein "Contractor"), agree as follows:

GENERAL

SECTION 1. SCOPE OF WORK

Contractor will furnish labor, equipment, and materials, and will perform work, for the construction of the facilities described in the Contract Documents set forth in Section 4 below.

SECTION 2. CONSIDERATION

Agency shall pay Contractor the sum set forth in Contractor's bid for the performance of the work.

SECTION 3. PAYMENTS

(a) Monthly progress payments shall be as follows:

(1) On or about the 25th day of each month, Contractor shall submit to Agency an invoice including an estimate of the cumulative amount and value of the work performed by Contractor prior to that date and subsequent to prior estimates. The estimate may include **50**% of the value of acceptable materials and equipment delivered to the work site. The estimate shall be based on certified copies of paid invoices by the Contractor.

(2) The Agency shall review the request as soon as practicable to determine whether the payment request is proper. A payment request found not to be a proper payment shall be returned within seven days after receipt accompanied by a written description of the reasons why the request is not proper.

(3) Agency shall pay Contractor, within **30** days of receipt of the invoice, **ninety-five** percent of the invoice amount reduced by: amounts due to Agency for equipment, services or materials furnished by Agency; amounts of claims or liens by the Agency or others, and amounts required to be deducted by federal, state or local governmental authorities.

(4) If the Agency fails to make progress payment within thirty days after receipt of an undisputed and properly submitted invoice, the Agency shall pay to the Contractor interest at the legal rate set forth in Code of Civil Procedure

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Section 685.101(a) from seven days after receipt of the invoice by the Agency until paid.

(5) Progress payments do not signify acceptance of the work, or any portion of the work. Payments do not preclude Agency from demanding and recovering damages for failure to fully perform.

(b) On satisfactory completion of the work, Agency shall pay Contractor ninety-five percent of the value of the actual work less prior monthly progress payments.

(c) Within sixty (60) days after the date of completion of the Work, as defined by Public Contract Code Section 7107, the undisputed amounts withheld by the Agency shall be released. "Completion" occurs on the acceptance by the governing body of the Agency; or the filing of a notice of cessation of labor.

(d) Notwithstanding the foregoing, Contractor may receive payment in full, other than retention for claims by the Agency or third parties, if the Contractor deposits approved securities or enters into an agreement with an escrow agent to hold earned retentions. The substitution of securities or the use of an escrow account shall be in the form and manner permitted by law.

SECTION 4. CONTRACT DOCUMENTS –

The complete contract includes the contract documents set forth herein, to wit: the Notice Inviting Sealed Proposals (Bids), the Information for Bidders, the Proposal, the Bid Forms, the General Conditions, the Special Provisions, the Technical Specifications, this Agreement, and exhibits, attachments, the Payment Bond, the Performance Bond, the Maintenance and Guarantee Bond, the Competent Person Designation, the Qualifications of Successful Bidder, the Certificate of Insurance, any Plans and Specifications, and any Addenda.

SECTION 5. COMPLIANCE WITH PROVISIONS OF LAW

(a) This Agency is subject to laws relating to public agencies which are part of this contract as though fully set forth herein.

(b) Contractor shall comply with laws relating to the work.

SECTION 6. ATTORNEYS' FEES

The Court shall award reasonable costs and expenses, including attorneys' fees, to the prevailing party in an action or proceeding to enforce this Agreement.

SECTION 7. NOTICES

Notices required or permitted shall be given by personal delivery, by first class mail, postage prepaid, or facsimile transmission:

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To Contractor: _____
_____
_____

To Agency: Bighorn-Desert View Water Agency
622 S. Jemez Trail
Yucca Valley, CA 92284-1440

SECTION 8. CONFLICT WITH PLANS AND SPECIFICATIONS

Conflict between the plans and specifications and this contract shall be brought to the attention of the Agency which shall resolve such conflict.

SECTION 9. ASSIGNMENT

(a) Contractor shall not assign this contract or payments under this contract.

(b) Contractor and each subcontractor hereby assign to the Agency rights, title, and interest in and to causes of action under Section 4 of the Clayton Act (15 U.S.C.A. 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 for this contract or the subcontract. This assignment shall be made and become effective without further acknowledgment by the parties at the time the Agency tenders final payment to the Contractor.

SECTION 10. SECTION HEADINGS

Section headings are for the convenience of the parties and shall not affect the interpretation of this contract.

SECTION 11. AUTHORITY OF AGENCY REPRESENTATIVE

Agency's representative shall decide questions about the quality or acceptability of materials furnished and work performed, manner of performance and rate of progress of the work, the interpretation of the plans and specifications and the fulfillment of the contract by Contractor.

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WAGES, HOURS, AND WORKING CONDITIONS

SECTION 12. PREVAILING WAGES

(a) A determination of the general prevailing rates of per diem wages and holiday and overtime work where the work is to be performed is on file at the Agency's offices. Contractor and subcontractors will not pay less than the prevailing rates of wages. Contractor will post one copy of the prevailing rates of wages at the job site.

(b) Contractor shall forfeit as penalty to the Agency the sum set forth in Labor Code

Section 1775 for each calendar day or portion thereof for each workman paid less than the prevailing rates under the contract or any subcontract.

SECTION 13. TRAVEL AND SUBSISTENCE PAYMENTS

Travel and subsistence payments shall be paid to each worker as defined in the applicable collective bargaining agreements filed with the Department of Industrial Relations for the particular craft, classification or type of work.

SECTION 14. HOURS OF WORK

(a) Eight hours labor constitutes a legal day's work. Workers shall be paid at a rate of one and one-half times the basic rate of pay for work in excess of eight hours during a calendar day or forty hours during a calendar week of the foregoing hours.

(b) Contractor shall keep and make available an accurate record showing the name each of each worker and hours worked each day and each week by each worker.

(c) As a penalty to the Agency, Contractor shall forfeit twenty-five dollars for each worker, including subcontractor's work, for each day the worker works more than eight hour or each week the worker works more than forty hours.

SECTION 15. APPRENTICES

Contractor shall comply with the Labor Code concerning the employment of apprentices.

SECTION 16. SUBCONTRACTORS

(a) Contractor shall comply with the *Subletting and Subcontracting Fair Practices Act* of the Public Contracts Code.

(b) Contractor shall submit to Agency the following information:

(i) The name and location of the place of business of each subcontractor performing work, labor or rendering construction services, and each subcontractor licensed by the State of California specially fabricating and installing improvements according to detailed drawings or the plans and specifications, in an amount in excess of one-half of one percent of the Contractor's total bid.

(ii) The portion of the work to be done by each subcontractor.

(c) The Contractor shall list only one subcontractor for each portion of the work identified in the bid.

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SECTION 17. NON-DISCRIMINATION

The Contractor shall not refuse to employ or promote any person, and shall not discriminate against any person with respect to compensation or terms and conditions of employment, and shall not discipline or discharge any person employed because of the person's race, religion, creed, color, national origin, ancestry or sex. The Contractor shall not refuse to accept otherwise qualified employees as indentured apprentices solely on the grounds of race, religion, creed, color, national origin, ancestry or sex.

SECTION 18. SAFETY

Contractor and subcontractors shall comply with the provisions of the Safety and Health Regulations for Construction, promulgated by the Secretary of Labor under the *Contract Work Hours and Safety Standards Act*, as set forth in Title 29, C.F.R. and by the California Division of Industrial Safety.

SECTION 19. CHARACTER OF WORKERS

Only competent workers shall be employed on the work. Workers who are incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fail to perform work properly and acceptably, shall be immediately removed from the work by the Contractor and not re-employed.

INSURANCE, INDEMNIFICATION AND BONDS

SECTION 20. INSURANCE

(a) Before beginning the performance of the work, Contractor shall purchase and maintain insurance to protect the Contractor and the Agency from claims: (i) arising from Contractor's operations under the contract by the Contractor, a subcontractor or anyone employed by them, or anyone for whose acts any of them may be liable; (ii) under workers' compensation, disability benefits and other similar benefits acts; (iii) for damages because of bodily injury, occupational sickness, or disease, or death of the Contractor's employees, or persons other than the Contractor's employees; (iv) for damages insured by usual personal injury liability coverage sustained by a person as a result of an offense related to employment of such person by the Contractor, or other persons; (v) for damages, other than the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; (vi) for damages because of bodily injury, death of a person or property damages arising from ownership, maintenance or use of a motor vehicle; (vii) involving contractual liability insurance applicable to the Contractor's obligations; and (viii) for damage to work in progress.

(b) The insurance required shall be written for not less than limits of liability specified in the contract documents or required by law, whichever is greater. The insurance shall be purchased from companies authorized to do business in the jurisdiction where the project is located. Coverages shall be written on an occurrence basis without interruption from the date of

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commencement of the work until date of final payment or until termination of coverage required to be maintained after final payment. Agency, its officers, agents and employees shall be named as additional insured.

(c) Certificates of insurance executed by the carrier(s) and acceptable to the Agency and copies of the policy shall be filed with the Agency prior to the commencement of the work. The Certificates and the insurance policies shall provide the policies will not be canceled or allowed to expire until at least thirty days prior written notice has been given to the Agency. If the insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

(d) Contractor shall require each subcontractor to maintain policies of insurance covering the hazards, and under the conditions mentioned above, and having the Agency, its officers, agents, volunteers and employees as additional insureds. Copies of the subcontractor's certificates of insurance and policies shall be filed with the Agency.

SECTION 21. INDEMNIFICATION

(a) Contractor shall indemnify and save the Agency, its officers, agents, volunteers and employees, free and harmless from costs, damages or liability, including attorneys' fees, arising out of any act or omission to act, including any negligent act or omission to act by Contractor, its officers, agents, subcontractors and employees with respect to the performance of the work or the Contractor's obligations under this contract.

(b) In addition to the foregoing, Contractor shall pay Agency costs, including attorneys' fees, incurred by the Agency in handling, responding to, or litigating stop notice claims or other demands against money due to the Contractor or against the Contractor's payment bond by Contractor's officers, agents, employees or subcontractors.

SECTION 22. PAYMENT BOND

(a) Before beginning the performance of the work, Contractor shall file a payment bond with the Agency for its approval and acceptance. The payment bond shall be in the sum of one hundred percent (100%) of the contract price.

(b) The payment bond shall be in substantially the form of the bond attached hereto. The bond shall be executed by a representative of the surety having no financial interest in the contractor. The payment bond shall be separate and distinct from any other bond required by this contract. In addition to all other requirements imposed by law or by the Contract Documents listed in Section 4 of this Agreement, all surety companies executing bonds for the work to be performed hereunder shall possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance as defined in Section 105 of the California Insurance

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Code, and said sureties must also appear on the Treasury Department's most current list (Circular 570 as amended).

SECTION 23. PERFORMANCE BOND

(a) Before beginning the performance of the work, Contractor shall file a performance bond with the Agency for its approval and acceptance. The performance bond shall be in the sum of one hundred percent (100%) of the contract p rice. The bond shall be payable by surety or sureties to Agency if Contractor fails to fully perform his obligations hereunder.

(b) The performance bond shall be in substantially the form of the bond attached hereto. The bond shall be executed by a representative of the surety having no financial interest in the Contractor. The performance bond shall be separate and distinct from any other bond required by this contract. In addition to all other requirements imposed by law or by the Contract Documents listed in Section 4 of this Agreement, all surety companies executing bonds for the work to be performed hereunder shall possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance as defined in Section 105 of the California Insurance Code, and said sureties must also appear on the Treasury Department's most current list (Circular 570 as amended).

SECTION 24. MAINTENANCE AND GUARANTEE BOND

(a) Upon acceptance of the work, Contractor shall file a maintenance and guarantee bond with the Agency for its approval and acceptance. The maintenance and guarantee bond shall be in the sum of no less than seventy percent (70%) of the contract price. The bond shall be payable by surety or sureties to Agency if Contractor fails to fully perform his obligations hereunder.

(b) The maintenance and guarantee bond shall be in substantially the form of the bond attached hereto. The bond shall be executed by a representative of the surety having no financial interest in the Contractor. The maintenance and guarantee bond shall be separate and distinct from any other bond required by this contract. In addition to all other requirements imposed by law or by the Contract Documents listed in Section 4 of this Agreement, all surety companies executing bonds for the work to be performed hereunder shall possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance as defined in Section 105 of the California Insurance Code, and said sureties must also appear on the Treasury Department's most current list (Circular 570 as amended).

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PERFORMANCE

SECTION 25. TIME FOR COMPLETION

(a) The work shall be completed by _____

(b) If the work is not completed before this date, the Agency will suffer damage. It is impractical and infeasible to determine the amount of damage. The Contractor shall pay to the

Agency, as fixed and liquidated damages and not as a penalty, the sum of $1,200 each calendar day of delay. The Contractor and Contractor's surety shall be liable for the amount. The Contractor shall not be charged liquidated damages because of any delays in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

(c) If the work is not completed before this date, the Agency will incur substantial damages which cannot be ascertained at this time. Contractor shall pay to Agency damages caused by Contractor's delay in completing the work.

(d) Within ten (10) days from the beginning of such delay, the Contractor shall notify the Agency in writing of the cause of the delay. Agency shall ascertain the facts and extent of the delay and extend the time for completing the work if in the Agency's judgment the findings justify an extension. The findings of fact shall be final and conclusive.

(e) The Agency may extend the time for completion if Agency determines such extension to be in the best interest of the Agency. If the Agency extends the time limit for the completion of the work at the request of the Contractor, for other than acts of God and situations beyond the control of both parties, such extension will increase the Agency's financial obligations incurred for engineering, inspection, supervision, incidental and overhead expenses directly chargeable to the contract and accruing during the period of extension. The Contractor shall reimburse Agency for such reasonable charges before the final payment.

(f) The Agency may deduct the liquidated damages from progress payments or from the final payment. The payment of progress payments shall not constitute a waiver of liquidated damages.

SECTION 26. ACTS OF GOD

Contractor is not responsible for the cost of repairing or restoring damage to the work exceeding five percent of the contract price and determined to have been proximately caused by earthquakes in excess of the magnitude of 3.5 on the Richter Scale and tidal waves, if damaged work is built in accordance with accepted and applicable building standards and the plans and specifications.

SECTION 27. UTILITY RELOCATION

(a) As between the parties, Agency is responsible for the timely removal, relocation or protection of existing main or truck line underground utility facilities located on the job site, if such utilities are not identified by the Agency in the plans and specifications. As to such unidentified utilities, Contractor shall be compensated for: the costs of relocation; repairing damage not due to the failure of Contractor to exercise reasonable care; removing or relocating such utilities not included in the plans and specifications with reasonable accuracy, and equipment on the project necessarily idled during such work. Contractor shall not be assessed liquidated damages for delay in completion of the project, when the delay is caused by the failure of the

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Agency or the owner of the utility to remove or relocate the facilities.

(b) The Agency is not required to indicate the presence of existing service laterals or appurtenances when the presence of such utilities on the work site can be inferred from other visible facilities, such as buildings, metering junction boxes, on or adjacent to the work site.

(c) Contractor shall immediately notify the Agency and utility in writing, if the Contractor discovers utility facilities not identified by the Agency in the contract plans and specifications.

SECTION 28. PUBLIC CONVENIENCE

(a) Contractor's operation shall cause no unnecessary public 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, adequate, continuous and unobstructed pedestrian and vehicular access shall be maintained to fire hydrants, residences, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals, unless other arrangements are made satisfactory to the owners.

(b) Vehicular access to residential driveways shall be maintained to the property line, except when necessary construction precludes such access for reasonable periods of time.

(c) Grading operations, roadway excavation and embankment construction shall 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.

(d) The Contractor shall comply with applicable state and local requirements for closure of streets. Contractor shall provide barriers, guards, lights, signs, temporary bridges, flagmen and watchmen advising the public of detours and construction hazards. Contractor shall comply with additional public safety requirements arising during construction. Contractor shall furnish and install, an upon completion of the work promptly remove, signs and warning devices.

(e) At least forty-eight hours in advance of closing or partial closing or of reopening any street, alley or other public thoroughfare, Contractor shall notify the police, fire, traffic and engineering departments of jurisdictional agencies involved and comply with their requirements.

SECTION 29. EXCAVATIONS

(a) Contractor shall submit for Agency approval, a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of trenches five feet or more in depth. The plan shall be at least as effective as that required by the Construction Safety Orders of the California Division of Industrial Safety. If the plan varies from the shoring systems standards established by the Safety Orders, the plan shall be prepared by a registered civil or structural engineer.

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(b) At the close of each working day, Contractor shall completely backfill open excavation and cover the same with temporary asphalt mix in accordance with normal practice in the industry and the rules, regulations, laws and ordinance of the State of California and the San Bernardino County Public Works Department.

(c) If the work involves digging trenches of excavations extending deeper than four feet below the surface, the Contractor shall promptly, and before the conditions are disturbed, notify the Agency, in writing, of any: (1) material the Contractor believes to be hazardous waste, as defined in Section 25117 of the Health and Safety Code, and required to be removed to a Class I, Class II, or Class III disposal site; (2) subsurface or latent physical conditions at the work site differing from those indicated; (3) unknown physical conditions at the work site of unusual nature, or different material from those ordinarily encountered and generally recognized as inherent in the work of the character provided in the contract. The Agency shall promptly investigate the conditions. If the Agency finds the conditions are as alleged by the Contractor and conditions cause a change in the Contractor's cost, or the time required for performance, the Agency shall issue a change order. If a dispute arising whether the Agency's findings are correct, the Contractor shall proceed with the work. The Contractor shall retain rights by contract or law pertaining to resolution of disputes and protests between the parties.

SECTION 30. EXTRA WORK

(a) The Agency may require changes in, additions to, or deductions from the work to be performed or to the materials to be furnished under this contract. No extra work shall be performed or change made except in pursuance of a written order from the Agency stating the extra work or change is authorized, and setting forth the basis upon which payment is to be made. No claim for additional compensation shall be valid unless pursuant to such change order. Nothing in this section shall excuse the Contractor from proceeding with the prosecution of the changed work. When required by the Agency, the Contractor shall furnish an itemized breakdown of the quantities and prices used in computing the value of any ordered change.

(b) Adjustments in the amounts to be paid to the Contractor by reason of any such change, addition or deduction shall be determined by one or more of the following methods:

(i) By an acceptable lump sum proposed from the Contractor.

(ii) By unit prices contained in the Contractor's original bid and incorporated in the contract documents or fixed by subsequent agreement between the Agency and the Contractor.

(iii) By ordering the Contractor to proceed with the work and to furnish daily reports of extra work. The reports shall itemize all costs for labor, material, and equipment rental. The reports for workmen shall include hours worked, rates of pay, names and classifications; and for equipment shall include size, type, identification number and hours of operation. Records and reports

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shall be made immediately available to the engineer upon his request.

(c) When the Agency orders extra work and there is an agreement between the Agency and the Contractor to perform the work, the Agency may approve the method used by the Contractor to accomplish the work. At the request of the Agency, the method to be used shall be memorialized in a writing prior to work being performed.

(d) If the Contractor contends a proposed change is a substantial revision in the character of the work, the question shall be immediately submitted to an arbitrator for decision. The arbitrator's decision will be final and conclusive unless it is fraudulent, capricious, arbitrary or so grossly erroneous as to imply bad faith. Each party shall advise the other in advance of the arbitration of the material on which the party intends to rely and give the other a reasonable opportunity to refute or supplement such factual material.

SECTION 31. CLEAN-UP

On completion of the work, Contractor shall remove debris and surplus materials from the work site.

SECTION 32. MATERIALS

(a) Unless otherwise specified, show, or permitted by the Agency, materials and equipment incorporated in the work shall be new and current manufacture. The Agency may request the Contractor to furnish manufacturer's certificates to this effect.

(b) Materials furnished and work performed shall be subject to inspection and testing by Agency's authorized agents at Agency's expenses. If such inspection and testing reveals non-compliance with the requirements of this contract, the Contractor shall bear the cost of necessary corrective measures and the cost of subsequent inspecting and testing.

(c) The inspection of the work shall not relieve the Contractor of the obligations under the contract. Even though equipment, materials, or work required under the contract have been inspected, accepted, and estimated for payment, the Contractor shall replace or repair such equipment, materials, or work found to be defective or otherwise not to comply with the requirements of the contract up to the end of the maintenance and guarantee period.

SECTION 33. PERMITS AND LICENSES

(a) Contractor shall apply for and procure permits and licenses necessary for the work.

(b) Contractor shall give notices necessary and incidental to the due and lawful prosecution of the work and shall comply duly with the terms and conditions of permits and licenses.

(c) Contractor shall pay charges and fees in connection with permits and licenses.

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SECTION 34. LAND AND RIGHTS OF WAY

(a) Agency shall provide land and rights-of-way where the work is constructed.

(b) Contractor shall procure additional rights-of-way desired by the Contractor to facilitate construction. Contractor shall enter into written agreements with property owners for such purposes and provide Agency with copies of the agreements.

(c) Except as provided above relating to utility relocation, when the work is to be performed in the vicinity of existing improvements, such improvements shall not be disturbed or damaged except for such removal or relocation in the land and rights-of-way provided by the Agency or unavoidable to accommodate the work.

SECTION 35. PLANS AND WORKING DRAWINGS SUBMITTED BY AGENCY

(a) The approved plans shall be supplemented by working drawings necessary to control the work adequately. Such drawings shall be consistent with the contract documents. Such drawings delivered to the Contractor shall be deemed written instructions to the Contractor.

(b) The Agency will furnish to the Contractor copies of drawings and specifications reasonably necessary for the execution of the work. The Contractor shall keep one set of drawings and specifications in good order available to the Agency's representative at the site of the work.

(c) The plans for the work show conditions supposed or believed by the engineer to exist. It is not intended or inferred the plans constitute a representation such conditions actually exist. The Agency, its officers, agents and employees shall not be liable for loss sustained by the Contractor as a result of variance of the conditions as shown on the plans and the actual conditions revealed during the progress of the work.

SECTION 36. SHOP DRAWINGS SUBMITTED BY CONTRACTOR

(a) Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, and illustrating some portion of the work.

(b) The Contractor shall review, stamp with approval, and submit for review by the Agency's representative, shop drawings for material and equipment to be incorporated into the work. Drawings shall be submitted in quadruplicate to the Agency's representative and be accompanied by a letter of transmittal listing the drawings submitted. Drawings shall show the name of the project, the name of the Contractor, the names of suppliers, manufacturers and subcontractors. Shop drawings shall be submitted with promptness and in orderly sequence to cause no delay in the work.

(c) Shop drawings shall be complete. If the shop drawings show deviations from the

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requirements of the plans and specifications because of standard shop practices or other reasons, the deviations and the reasons therefor shall be set forth in the letter of transmittal.

(d) By approving and submitting shop drawings, the Contractor represents material, equipment and other work shown thereon conforms to the plans and specifications except for the deviations set forth in the letter of transmittal.

(e) Within ten calendar days after receipt of the drawings, the Agency will return two prints of the drawings to the Contractor with comments. If noted by the Agency, the Contractor shall correct the drawings and resubmit in the same manner as the original submittal. The Contractor shall direct attention in the letter of transmittal accompanying resubmitted shop drawings to revisions other than the corrections requested by the Agency's representatives on previous submittals.

(f) The review by the Agency's representative is for general conformance with the design concept of the project and general compliance with the plans and specifications and shall not be construed as relieving the Contractor of the full responsibility for: providing materials, equipment and work required by the contract; the proper fitting and reconstruction of the work; the accuracy and completeness of the shop drawings; selection fabrication processes and techniques of construction; and performing the work in a safe manner.

(g) No portion of the work requiring a shop drawing submittal shall be commenced until the submittal has been reviewed by the Agency's representative and returned to the Contractor with a notation indicating re-submittal is not required.

SECTION 37. SUPERVISION BY THE CONTRACTOR

Before starting the work, the Contractor shall designate, in writing, a representative having authority to act for the Contractor. An alternate representative may be designated. (A joint venture shall designate only one representative and alternate). The representative or alternate shall be present at the work site when work is in progress. Orders or communications given to this representative shall be deemed delivered to the Contractor. In the absence of the Contractor or designated representative, directions or instructions may be given by the Agency's representative to the superintendent or foreman having charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or the representative.

SECTION 38. INSPECTION

(a) The Agency's representative shall have access to the work during construction and shall be furnished with reasonable facility for gaining knowledge of the progress, workmanship and character of materials used and employed in the work.

(b) When the Contractor varies the period during which work is carried on each day, Contractor shall give notice to the Agency's representative so proper inspection may be provided. Work done in the absence of the Agency's representative is subject to rejection.

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(c) No materials shall be installed until approved by the Agency's representative. Installations to be backfilled shall be inspected and approved by the Agency's representative prior to backfilling. The Contractor shall give notice in advance of backfilling to the Agency's representative so proper inspection may be provided.

(d) The inspection of the work shall not relieve the Contractor of obligations to fulfill the contract. Defective work shall be made good, and unsuitable materials may be rejected notwithstanding the fact such defective work and unsuitable materials have been previously overlooked by the Agency's representative and accepted.

SECTION 39. REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

(a) Rejected work shall be removed and replaced by the Contractor in an acceptable manner and no compensation will be allowed for such removal or replacement. Work done beyond the lines and grades shown on the plans or established by the Agency's representative, or work done without written authority will be considered as unauthorized and not be paid for. Such work may be ordered removed at the Contractor's expense.

(b) Upon failure on the part of the Contractor to comply promptly with an order of the Agency's representative under this section, the Agency's representative shall have authority to cause defective work to be removed and replaced, and unauthorized work to be removed, and to deduct the costs from monies due the Contractor.

SECTION 40. ERRORS OR DISCREPANCIES NOTED BY CONTRACTOR

(a) If the Contractor finds discrepancies between the specifications and the drawings, and the physical conditions at the site of the work, or finds errors or omissions in the drawings or in any survey, Contractor shall promptly notify the Agency in writing of any such discrepancy, error or omission. If the Contractor observes drawings or specifications at variance with applicable law, ordinance, regulation, order or decree, Contractor shall promptly notify the Agency in writing of such conflict.

(b) On receipt of any such notice, the Agency shall promptly investigate the circumstances and give appropriate instructions to the Contractor. Until such instructions are given, work done by the Contractor, after Contractor's discovery of such error, discrepancy or conflict, will be at Contractor's own risk and Contractor shall bear costs arising therefrom.

SECTION 41. EQUIPMENT

The Contractor must furnish adequate equipment and facilities to perform properly the work in a workmanlike manner in accordance with these specifications. Such equipment and facilities must be in a good state of repair and maintained in such state during the progress of the work and shall meet requirements of applicable ordinances and laws. No worn or obsolete equipment shall be used, and in no case shall the maker's rating of capacity for equipment be

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exceeded.

SECTION 42. STORAGE OF MATERIALS

Materials for use in the work shall be stored by the Contractor to prevent damage from exposure to the elements, admixture of foreign materials or from any other cause. Contractor is responsible for damage to or loss of materials by weather or other causes.

MISCELLANEOUS

SECTION 43. GUARANTEES

Contractor guarantees work from defect in workmanship for the period of two years from the date of acceptance by the Agency and shall repair and replace such work, together with other displaced work, without expense to the Agency, ordinary wear and tear, usual abuse or neglect excepted. Agency may have the defects repaired and made good at the expense of the Contractor, if Contractor fails to comply with the above-mentioned conditions within a week after being notified in writing.

SECTION 44. RISK OF LOSS PRIOR TO FINAL ACCEPTANCE

Except as set forth above relating to acts of God, risk of loss from total or partial destruction of the work, prior to final acceptance, shall be borne by Contractor regardless of the cause. Contractor shall repair or replace such damages or destroyed work, to its prior undamaged condition before being entitled to additional progress payments or final payment. Total or partial destruction or damage shall not excuse Contractor from completion of the work.

SECTION 45. TERMINATION: CONTRACTOR AT FAULT

(a) The Agency may declare the Contractor in default, should the Contractor fail to meet the requirements of the contract, or be placed in bankruptcy, or should a receiver be appointed for Contractor's properties, or should Contractor make an assignment for the benefit of creditors. In such event, the Agency will notify the Contractor in writing. On receipt of such written notice, the Contractor shall preserve site construction materials, equipment and plant, and undertake immediate steps to remedy such default.

If the Contractor fails to remedy such default within five calendar days after receipt of such written notice, the Agency may terminate the Contractor's right to proceed with the work as to which default has occurred. Upon receipt of such written notice, the Contractor shall for that work affected by any such termination:

(1) Assist the Agency in making an inventory of materials and equipment in storage at the site, en route to the site, in storage or manufacture away from the site, and on order from suppliers;

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(2) Assign to the Agency, subcontractors, supply contracts and equipment rental agreements all as designated by the Agency; and

(3) Remove from the site, all construction materials, equipment and plant listed in said inventory other than such construction materials, equipment and plant which are designated in writing by the Agency to be used by the Agency in completing such work.

(b) The Agency may complete the work to which notice applies by contract or otherwise, and may take possession of the materials, plant, tools, equipment, supplies and property furnished by the Contractor which is designated by the Agency in writing for such purpose.

(c) The expense of completing such work, together with a reasonable charge for administering a contract for such completion, shall be charged to the Contractor. Such expense shall be deducted by the Agency out of such monies as may become due to the Contractor. If this expense exceeds the sum otherwise payable under the contract, the Contractor and Contractor's sureties shall be liable. Upon written notice from the Agency, the Contractor shall promptly pay to the Agency, the amount of such excess. The Agency shall not be required to obtain the lowest bids for completing such work, but may make such expenditures as in the Agency's sole judgment will best accomplish such completion.

SECTION 46. TERMINATION: CONTRACTOR NOT AT FAULT

Agency may terminate the contract upon ten days written notice to the Contractor, if Agency finds reasons beyond the control of the parties which make it impossible or against the Agency's interests to complete the work. In such a case, the Contractor shall have no claims against the Agency, except for the value of work performed to the date of termination, and the cost of materials and equipment on hand, in transit, or on definite commitment, as of the date of termination if such materials and equipment would be needed in the work. The value of work performed and the cost of materials and shipment delivered to the site shall be determined by the Agency in accordance with the procedure prescribed for the making of a final estimate and payment.

SECTION 47. RESOLUTION OF CERTAIN CLAIMS

(a) Notwithstanding the foregoing, a demand of $375,000 or less, by the Contractor for a time extension; payment of money or damages arising from the work done by or on behalf of the Contractor pursuant to this contract; or payment of an amount which is disputed by the Agency shall be processed in accordance with Public Contracts Code Sections 20104 *et seq.* relating to informal conferences, non-binding judicially supervised mediation and judicial arbitration.

(b) A single written claim shall be filed under this section prior to the date of final payment for all demands, including demands not subject to Public Contracts Code Sections 20104 *et seq.*, arising out of the contract.

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(c) Within thirty (30) days of the receipt of the claim, the Agency may request additional documentation supporting the claim or relating to defenses or claims the Agency may have against the Contractor. If the amount of the claim is less than $50,000, the Contractor shall respond to the request for additional information within fifteen (15) days after receipt of the request. The Contractor shall respond to the request within thirty (30) days of receipt if the amount of the claim exceeds $50,000 but is less than $375,000.

(d) Unless further documentation is requested, the Agency shall respond to the claim within forty-five (45) days if the amount of the claim is less than $50,000, or within sixty (60) days if the amount of the claim is more than $50,000 but less than $375,000. If further documentation is requested, the Agency shall respond within the same amount of time taken by the Contractor to respond or fifteen (15) days, whichever is greater, after receipt of further information if the claim is less than $50,000. If the claim is more than $50,000 but less than $375,000 and further documentation is required by the Agency, the Agency shall respond within the same amount of time taken by the Contractor to respond or thirty (30) days, whichever is greater.

(e) If the Contractor disputes the Agency's response, or the Agency fails to respond, the Contractor may demand an informal conference to meet and confer for settlement of the issues in dispute. The demand shall be served on the Agency within fifteen (15) days after the deadline of the Agency to respond or within fifteen (15) days of the Agency's response, whichever occurs first. The Agency shall schedule the meet and confer conference within thirty (30) days of the request.

(f) If the meet and confer conference does not produce a satisfactory result, the Contractor may pursue remedies authorized by law.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, or caused it to be executed as of the day, month and year first above written.

AGENCY

By:_____

CONTRACTOR

By:_____

BID SET - NOT FOR CONSTRUCTION

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the Governing Board of the Bighorn-Desert View Water Agency (herein "Agency"), on _____, 202__, awarded to _____ (herein "Principal"), a contract for the **Water System Improvements and Consolidation Projects**.

WHEREAS, Principal is required to furnish a bond in connection with contract so if Principal or its subcontractors fail to pay for materials or supplies for the performance of the work, or for labor done thereon, or for amounts due under the Unemployment Insurance Act, the Surety on the bond will pay the same.

NOW THEREFORE, the Principal and _____ (herein "Surety") are held and firmly bound unto the Agency in the penal sum of _____ dollars ($_____), lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these promises.

THE CONDITION OF THIS OBLIGATION IS SUCH if Principal, its subcontractors, heirs, executors, administrators, successors, or assigns, shall fail to pay for materials, provisions, provender or other supplies or teams used in, upon, for or about the performance of the work contracted to be done, or for work or labor thereon of any kind, or fail to pay the persons named in California Civil Code Section 9000 et seq., or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for 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 such work and labor, and other laws of the State of California and rules and regulations of its agencies, then Surety will pay the same in or to an amount not exceeding the amount hereinabove set forth, and also will pay, in case suit is brought upon this bond, such reasonable attorneys= fees as shall be fixed by the court.

This bond shall inure to the benefit of the persons named in California Civil Code Section 9000 et seq., so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall remain in full force and effect.

No change, extension of time, alteration, or addition to the terms of the contract, or the work to be performed thereunder, or the specifications accompanying the same, shall affect Surety=s obligation on this bond. Surety waives notices of such change, extension of time, alteration, or addition to the terms of the contract, or to the work or to the specifications.

BID SET - NOT FOR CONSTRUCTION

IN WITNESS WHEREOF, three identical counterparts of this instrument, each of which shall be deemed an original, have been duly executed by the Principal and Surety above named on the _____ day of _____, 202__.

_____
(Principal)

By:

_____
(Surety)

By:
(Attorney-in-fact)

BID SET - NOT FOR CONSTRUCTION

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the governing board of the Bighorn-Desert View Water Agency (herein "Agency"), on _____, 202__, awarded to _____ (herein "Principal"), a contract for the **Water System Improvements and Consolidation Projects.**

WHEREAS, Principal is required under the terms of the contract to furnish a bond for the faithful performance of the contract;

NOW THEREFORE, the Principal and _____ (herein "Surety"), are held firmly bound unto the Agency in the penal sum of _____ dollars ($_____) lawful money of the United States of America, for the payment of which sum well and truly to be made, we bond ourselves, our heirs, executors, administrators and successors, jointly and severally and firmly by these promises.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above-bounden Principal, or its 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, including but not limited to the payment of liquidated damages, and any alteration thereof made as therein provided, on its 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 Agency, its officers and agents, as therein stipulated, this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

Surety stipulates and agrees no change, extension of time, alteration, or addition to the terms of the contract, or to the work to be performed thereunder, or the specifications accompanying the same, shall affect its obligation on this bond. Surety waives notice of such change, extension of time, alteration or addition to the terms of the contract, or to the work or to the or to the specifications.

Surety agrees in case suit is brought on this bond, Surety will pay Agency's reasonable attorneys' fees to be fixed by the court.

IN WITNESS WHEREOF, three identical counterparts of this instrument, each of which shall be deemed an original, have been duly executed by the Principal and Surety above named, on the _____ day of _____ 202__.

(Principal)

By:

(Surety)

By:_____
(Attorney-in-fact)

BID SET - NOT FOR CONSTRUCTION

(Attach acknowledgment)

BID SET - NOT FOR CONSTRUCTION

MAINTENANCE AND GUARANTEE BOND

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, the governing board of the Bighorn-Desert View Water Agency (sometimes referred to hereinafter as "Obligee") has permitted_____ _____ (sometimes referred to hereinafter as "Principal") to construct the **Water System Improvements and Consolidation Projects** Project, San Bernardino County, California, commonly known as and located at/on Landers, California;

WHEREAS, the said project is more particularly set forth in that certain design plan and specification dated _____, _____, and identified as, _____ PROJECT which are incorporated herein by this reference; and

WHEREAS, the Principal is required by the Obligee to warrant the completed project against defective labor or workmanship and materials for a period of two (2) years after the formal acceptance of the Work by the Agency and to provide a bond or letter of credit for guarantee of cost of repairs due to defective labor, workmanship, or materials.

NOW, THEREFORE, we _____, the undersigned as Principal, and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Obligee in the sum of $_____, said sum being not less than seventy percent (70%) of the total cost for construction (including labor and materials) of the above project, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the above bounded Principal, his or its 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 to make all repairs to said project necessitated by defective labor, workmanship or materials and shall faithfully fulfill this two (2) year Guarantee of all materials, labor and workmanship and indemnify and save harmless the Obligee, its officers and agents, as stipulated herein, then this obligation shall become null and void two (2) years from the date of Obligee's formal acceptance of the project; otherwise the bond shall remain in full force and effect and shall bind solely to perform the obligations of Principal.

In case suit is brought upon this bond, the said Surety will pay to the Obligee a reasonable attorney's fee to be fixed by the Court.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the agreement between the Obligee and the Principal, or the work to be performed by the Principal or the specifications of the project, shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement or to the work or to specifications.

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IN WITNESS WHEREOF, the Principle and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year set forth above.

_____	_____
Principle (Type Full Name)	Surety (Type Full Name)
_____	_____
(Signature)	(Signature)
_____	_____
(Title)	(Title)
_____	_____
(Street Address)	(Street Address)
_____	_____
(City) (State) (Zip)	(City) (State) (Zip)

(Attach Notarial Acknowledgement of Contractor and Surety)

BID SET - NOT FOR CONSTRUCTION

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (circular 570 as amended) and be authorized to transact business, and admitted, in the State of California.

END OF SECTION

Contractor/SubContractor OSHA Competent Person Designation

Based on the review of OSHA 29 CFR 1926.32(f), the following individual(s) representing _____ (Company Name) are designated as the OSHA *Competent Person* for the project listed below. He/she shall be responsible and accountable for jobsite safety.

_____ _____
(Signature/Title) (Date)

Project Name: _____

1. Competent Person _____
(Name)

(Optional):
Designated Competent Person in Line 1's absence:

2. _____
(Name)

OSHA defines competent person in 29 CFR 1926.32(f) as "*one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."*

Attach valid identification and certification documents for the above listed person(s).

BID SET NOT FOR CONSTRUCTION

QUALIFICATIONS OF SUCCESSFUL BIDDER FOR
BIGHORN-DESERT VIEW WATER AGENCY
FOR THE CONSTRUCTION OF WATER SYSTEM IMPROVEMENTS
AND CONSOLIDATION PROJECTS

Notice is hereby given that the Bighorn-Desert View Water Agency (BDVWA) has determined that the successful bidder on the WATER SYSTEM IMPROVEMENTS AND CONSOLIDATION PROJECTS, to be undertaken by BDVWA must be qualified for this project. It is mandatory that all Contractors and Subcontractors who perform work for BDVWA fully complete the qualification questionnaire provide all materials requested herein, and be approved by BDVWA prior to the award of any contract. If two or more business entities submit a bid as part of a Joint Venture, or expect to submit a bid as part of a Joint Venture, each entity within the Joint Venture must be separately qualified to bid. The fully completed questionnaire is to be submitted prior to issuance of the Notice of Intent to Award letter.
Answers to questions contained in the attached questionnaire, information about current bonding capacity, notarized statement from surety, and the most recent reviewed or audited financial statements, with accompanying notes and supplemental information, are required. BDVWA will use these documents as the basis of rating Contractors in respect to this bid. BDVWA reserves the right to check other sources available.

While it is the intent of the qualification questionnaire and documents required therewith to assist BDVWA in determining bidder responsibility and to aid BDVWA in selecting the lowest responsible bidder, neither the fact of qualification, nor any qualification rating, will preclude BDVWA from a post-bid consideration and determination of whether a bidder has the quality, fitness, capacity and experience to satisfactorily perform the proposed work, and has demonstrated the requisite trustworthiness.

The completed qualification package shall be submitted under seal and marked "CONFIDENTIAL", addressed to Marina West, Chief Engineer.

The qualification packages (questionnaire answers and financial statements) submitted by Contractors are not public records and are not open to public inspection. All information provided will be kept confidential to the extent permitted by law. However, the contents may be disclosed to third parties for purpose of verification, or investigation of substantial allegations. State law requires that the names of contractors applying for qualification status shall be public records subject to disclosure, and the first page of the questionnaire will be used for that purpose.

Each questionnaire must be signed under penalty of perjury in the manner designated at the end of the form, by an individual who has the legal authority to bind the Contractor on whose behalf that person is signing. If any information provided by a Contractor becomes inaccurate, the Contractor must immediately notify BDVWA and provide updated accurate information in writing, under penalty of perjury.

BDVWA will refuse to grant qualification where the requested information and materials are not provided. BDVWA reserves the right to waive minor irregularities and omissions in the information contained in the qualification application submitted, to make all final determinations, and to determine that the Contractor is qualified for this project.

Contractors may submit qualification packages during regular working hours on any day that the BDVWA office is open.

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CONTACT INFORMATION

Firm Name: _____ Check One: ☐ Corporation
(as it appears on license) ☐ Partnership
☐ Sole Prop.

Contact Person: _____

Address: _____

Phone: _____ Fax: _____

If firm is a sole proprietor or partnership:

Owner(s) of Company _____

Contractor's License Number(s):

_____

_____

_____

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PART I. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

Contractor will be immediately disqualified if the answer to any of questions 1 through 5 is "no."[1]

Contractor will be immediately disqualified if the answer to any of questions 6, 7, 8 or 9 is "yes."[2] If the answer to question 8 is "yes," and if debarment would be the sole reason for denial of qualification, any qualification issued will exclude the debarment period.

1. Contractor possesses a valid and current California Contractor's license for the project or projects for which it intends to submit a bid.
☐ Yes ☐ No

2. Contractor has a liability insurance policy with a policy limit of at least $1,000,000 per occurrence and $2,000,000 aggregate.
☐ Yes ☐ No

3. Contractor has current workers' compensation insurance policy as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.
☐ Yes ☐ No ☐ Contractor is exempt from this requirement, because it has no employees

4. Have you attached your latest copy of a reviewed or audited financial statement with accompanying notes and supplemental information.[3]
☐ Yes ☐ No

NOTE: A financial statement that is not either reviewed or audited is not acceptable. A letter verifying availability of a line of credit may also be attached; however, it will be considered as supplemental information only, and is not a substitute for the required financial statement.

5. Have you attached a notarized statement from an admitted surety insurer (approved by the California Department of Insurance) and authorized to issue bonds in the State of California, which states: (a) that your current bonding capacity is sufficient for the project for which you seek qualification if you are seeking qualification for a single project; or (if you are seeking qualification valid for a year) (b) your current available bonding capacity?
☐ Yes ☐ No
NOTE: Notarized statement must be from the surety company, not an agent or broker.

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[1] A "no" answer to Question 4 will not be disqualifying if the contractor is exempt from complying with Question 4, for reasons explained in footnote 3.

[2] A contractor disqualified solely because of a "Yes" answer given to question 6, 7, or 9 may appeal the disqualification and provide an explanation of the relevant circumstances during the appeal procedure.

[3] Public Contract Code section 20101(e) exempts from this requirement a contractor who has qualified as a small business pursuant to Government Code section 14837(d)(1), if the bid is "no more than 25 per cent of the qualifying amount provided in section 14837(d)(1)." As of January 1, 2001, the qualifying amount is $10 million, and 25 per cent of that amount, therefore, is $2.5 million.

6. Has your contractor's license been revoked at any time in the last five years?
☐ Yes ☐ No

7. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?
☐ Yes ☐ No

8. At the time of submitting this qualification form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
☐ Yes ☐ No
If the answer is "Yes," state the beginning and ending dates of the period of debarment:

_____

9. At any time during the last five years, has your firm, or any of its owners or officers been convicted of a crime involving the awarding of a contract of a government construction project, or the bidding or performance of a government contract?
☐ Yes ☐ No

BID SET - NOT FOR CONSTRUCTION

PART II. ORGANIZATION, HISTORY, ORGANIZATIONAL PERFORMANCE, COMPLIANCE WITH CIVIL AND CRIMINAL LAWS

A. Current Organization and Structure of the Business

For Firms That Are Corporations:

1a. Date incorporated : _____
1b. Under the laws of what state: _____
1c. Provide all the following information for each person who is either (a) an officer of the corporation (president, vice president, secretary, treasurer), or (b) the owner of at least ten per cent of the corporation's stock.

Name	Position	Years with Co.	% Ownership	Social Security #

1d. Identify every construction firm that any person listed above has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.
NOTE: For this question, "owner" and "partner" refer to ownership of ten per cent or more of the business, or 10 per cent or more of its stock, if the business is a corporation.

Person's Name	Construction Firm	Dates of Person's Participation with Firm

For Firms That Are Partnerships:

1a. Date of formation: _____
1b. Under the laws of what state: _____
1c. Provide all the following information for each partner who owns 10 per cent or more of the firm.

Name	Position	Years with Co.	% Ownership	Social Security #

BID SET - NOT FOR CONSTRUCTION

1d. Identify every construction company that any partner has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.
NOTE: For this question, "owner" and "partner" refer to ownership of ten per cent or more of the business, or ten per cent or more of its stock, if the business is a corporation.

Person's Name	Construction Company	Dates of Person's Participation with Company

For Firms That Are Sole Proprietorships:

1a. Date of commencement of business. _____
1b. Social security number of company owner. _____
1c. Identify every construction firm that the business owner has been associated with (as owner, general partner, limited partner or officer) at any time during the last five years.
NOTE: For this question, "owner" and "partner" refer to ownership of ten per cent or more of the business, or ten per cent or more of its stock, if the business is a corporation.

Person's Name	Construction Company	Dates of Person's Participation with Company

For Firms That Intend to Make a Bid as Part of a Joint Venture:

1a. Date of commencement of joint venture. _____
1b. Provide all of the following information for each firm that is a member of the joint venture that expects to bid on one or more projects:

Name of firm	% Ownership of Joint Venture

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B. History of the Business and Organizational Performance

2. Has there been any change in ownership of the firm at any time during the last three years?
NOTE: A corporation whose shares are publicly traded is not required to answer this question.
☐ Yes ☐ No
If "yes," explain on a separate signed page.

3. Is the firm a subsidiary, parent, holding company or affiliate of another construction firm?
NOTE: Include information about other firms if one firm owns 50 per cent or more of another, or if an owner, partner, or officer of your firm holds a similar position in another firm.
☐ Yes ☐ No
If "yes," explain on a separate signed page.

4. Are any corporate officers, partners or owners connected to any other construction firms.
NOTE: Include information about other firms if an owner, partner, or officer of your firm holds a similar position in another firm.
☐ Yes ☐ No
If "yes," explain on a separate signed page.

5. State your firm's gross revenues for each of the last three years:

_____ _____ _____

6. How many years has your organization been in business in California as a contractor under your present business name and license number? _____ years

7. Is your firm currently the debtor in a bankruptcy case?
☐ Yes ☐ No
If "yes," please attach a copy of the bankruptcy petition, showing the case number, and the date on which the petition was filed.

8. Was your firm in bankruptcy at any time during the last five years? (This question refers only to a bankruptcy action that was not described in answer to question 7, above)
☐ Yes ☐ No

If "yes," please attach a copy of the bankruptcy petition, showing the case number and the date on which the petition was filed, and a copy of the Bankruptcy Court's discharge order, or of any other document that ended the case, if no discharge order was issued.

Licenses

9. List all California construction license numbers, classifications and expiration dates of the California contractor licenses held by your firm:

_____

_____

10. If any of your firm's license(s) are held in the name of a corporation or partnership, list below the names of the qualifying individual(s) listed on the CSLB records who meet(s) the experience and examination requirements for each license.

_____

_____

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11. Has your firm changed names or license number in the past five years?
☐ Yes ☐ No
If "yes," explain on a separate signed page, including the reason for the change.

12. Has any owner, partner or (for corporations:) officer of your firm operated a construction firm under any other name in the last five years?
☐ Yes ☐ No
If "yes," explain on a separate signed page, including the reason for the change.

13. Has any CSLB license held by your firm or its Responsible Managing Employee (RME) or Responsible Managing Officer (RMO) been suspended within the last five years?
☐ Yes ☐ No
If "yes," please explain on a separate signed sheet.

Disputes

14. At any time in the last five years has your firm been assessed and paid liquidated damages after completion of a project under a construction contract with either a public or private owner?
☐ Yes ☐ No
If yes, explain on a separate signed page, identifying all such projects by owner, owner's address, the date of completion of the project, amount of liquidated damages assessed and all other information necessary to fully explain the assessment of liquidated damages.

15. In the last five years has your firm, or any firm with which any of your company's owners, officers or partners was associated, been debarred, disqualified, removed or otherwise prevented from bidding on, or completing, any government agency or public works project for any reason?
NOTE: "Associated with" refers to another construction firm in which an owner, partner or officer of your firm held a similar position, and which is listed in response to question 1c or 1d on this form.
☐ Yes ☐ No
If "yes," explain on a separate signed page. State whether the firm involved was the firm applying for qualification here or another firm. Identify by name of the company, the name of the person within your firm who was associated with that company, the year of the event, the owner of the project, the project and the basis for the action.

16. In the last five years has your firm been denied an award of a public works contract based on a finding by a public agency that your company was not a responsible bidder?
☐ Yes ☐ No
If "yes," explain on a separate signed page. Identify the year of the event, the owner, the project and the basis for the finding by the public agency.

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* * * * *

NOTE: The following two questions refer only to disputes between your firm and the owner of a project. You need not include information about disputes between your firm and a supplier, another contractor, or subcontractor. You need not include information about "pass-through" disputes in which the actual dispute is between a sub-contractor and a project owner. Also, you may omit reference to all disputes about amounts of less than $50,000.

17. In the past five years has any claim **against** your firm concerning your firm's work on a construction project been **filed in court or arbitration?**

☐ Yes ☐ No

If "yes," on separate signed sheets of paper identify the claim(s) by providing the project name, date of the claim, name of the claimant, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending or, if resolved, a brief description of the resolution).

18. In the past five years has your firm made any claim against a project owner concerning work on a project or payment for a contract and **filed that claim in court or arbitration**?

☐ Yes ☐ No

If "yes," on separate signed sheets of paper identify the claim by providing the project name, date of the claim, name of the entity (or entities) against whom the claim was filed, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending, or if resolved, a brief description of the resolution).

* * * * *

19. At any time during the past five years, has any surety company made any payments on your firm's behalf as a result of a default, to satisfy any claims made against a performance or payment bond issued on your firm's behalf, in connection with a construction project, either public or private?

☐ Yes ☐ No

If "yes," explain on a separate signed page the amount of each such claim, the name and telephone number of the claimant, the date of the claim, the grounds for the claim, the present status of the claim, the date of resolution of such claim if resolved, the method by which such was resolved if resolved, the nature of the resolution and the amount, if any, at which the claim was resolved.

20. In the last five years has any insurance carrier, for any form of insurance, refused to renew the insurance policy for your firm?

☐ Yes ☐ No

If "yes," explain on a separate signed page. Name the insurance carrier, the form of insurance and the year of the refusal.

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Criminal Matters and Related Civil Suits

21. Has your firm or any of its owners, officers or partners ever been found liable in a civil suit or found guilty in a criminal action for making any false claim or material misrepresentation to any public agency or entity?

☐ Yes ☐ No

If "yes," explain on a separate signed page, including identifying who was involved, the name of the public agency, the date of the investigation and the grounds for the finding.

22. Has your firm or any of its owners, officers or partners ever been convicted of a crime involving any federal, state, or local law related to construction?

☐ Yes ☐ No

If "yes," explain on a separate signed page, including identifying who was involved, the name of the public agency, the date of the conviction and the grounds for the conviction.

23. Has your firm or any of its owners, officers or partners ever been convicted of a federal or state crime of fraud, theft, or any other act of dishonesty?

☐ Yes ☐ No

If "yes," identify on a separate signed page the person or persons convicted, the court (the county if a state court, the district or location of the federal court), the year and the criminal conduct.

Bonding

24. Bonding capacity: Provide documentation from your surety identifying the following:

Name of bonding company/surety: _____

Name of surety agent, address and telephone number:

_____

25. If your firm was required to pay a premium of more than one per cent for a performance and payment bond on any project(s) on which your firm worked at any time during the last three years, state the percentage that your firm was required to pay. You may provide an explanation for a percentage rate higher than one per cent, if you wish to do so.

_____

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26. List all other sureties (name and full address) that have written bonds for your firm during the last five years, including the dates during which each wrote the bonds:

_____

_____

_____

_____

27. During the last five years, has your firm ever been denied bond coverage by a surety company, or has there ever been a period of time when your firm had no surety bond in place during a public construction project when one was required?

☐ Yes ☐ No

If yes, provide details on a separate signed sheet indicating the date when your firm was denied coverage and the name of the company or companies which denied coverage; and the period during which you had no surety bond in place.

C. Compliance with Occupational Safety and Health Laws and with Other Labor Legislation Safety

28. Has CAL OSHA cited and assessed penalties against your firm for any "serious," "willful" or "repeat" violations of its safety or health regulations in the past five years?

NOTE: If you have filed an appeal of a citation, and the Occupational Safety and Health Appeals Board has not yet ruled on your appeal, you need not include information about it.

☐ Yes ☐ No

If "yes," attached a separate signed page describing the citations, including information about the dates of the citations, the nature of the violation, the project on which the citation(s) was or were issued, the amount of penalty paid, if any. If the citation was appealed to the Occupational Safety and Health Appeals Board and a decision has been issued, state the case number and the date of the decision.

29. Has the federal Occupational Safety and Health Administration cited and assessed penalties against your firm in the past five years?

NOTE: If you have filed an appeal of a citation and the Appeals Board has not yet ruled on your appeal, or if there is a court appeal pending, you need not include information about the citation.

☐ Yes ☐ No

If "yes," attach a separate signed page describing each citation.

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30. Has the EPA or any Air Quality Management District or any Regional Water Quality Control Board cited and assessed penalties against either your firm or the owner of a project on which your firm was the contractor, in the past five years?
NOTE: If you have filed an appeal of a citation and the Appeals Board has not yet ruled on your appeal, or if there is a court appeal pending, you need not include information about the citation.
☐ Yes ☐ No
If "yes," attach a separate signed page describing each citation.

31. How often do you require documented safety meetings to be held for construction employees and field supervisors during the course of a project?

_____

32. List your firm's Experience Modification Rate (EMR) (California workers' compensation insurance) for each of the past three premium years:
NOTE: An Experience Modification Rate is issued to your firm annually by your workers' compensation insurance carrier.

Current year: _____

Previous year: _____

Year prior to previous year: _____
If your EMR for any of these three years is or was 1.00 or higher you may, if you wish, attach a letter of explanation.

33. Within the last five years has there ever been a period when your firm had employees but was without workers' compensation insurance or state-approved self-insurance?
☐ Yes ☐ No
If "yes," please explain the reason for the absence of workers' compensation insurance on a separate signed page. If "No," please provide a statement by your current workers' compensation insurance carrier that verifies periods of workers' compensation insurance coverage for the last five years. (If your firm has been in the construction business for less than five years, provide a statement by your workers' compensation insurance carrier verifying continuous workers' compensation insurance coverage for the period that your firm has been in the construction business.)

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Prevailing Wage and Apprenticeship Compliance Record

34. Has there been more than one occasion during the last five years in which your firm was required to pay either back wages or penalties for your own firm's failure to comply with the **state's** prevailing wage laws?

NOTE: This question refers only to your own firm's violation of prevailing wage laws, not to violations of the prevailing wage laws by a subcontractor.

☐ Yes ☐ No

If "yes," attach a separate signed page or pages, describing the nature of each violation, identifying the name of the project, the date of its completion, the public agency for which it was constructed; the number of employees who were initially underpaid and the amount of back wages and penalties that you were required to pay.

35. During the last five years, has there been more than one occasion in which your own firm has been penalized or required to pay back wages for failure to comply with the **federal** Davis-Bacon prevailing wage requirements?

☐ Yes ☐ No

If "yes," attach a separate signed page or pages describing the nature of the violation, identifying the name of the project, the date of its completion, the public agency for which it was constructed; the number of employees who were initially underpaid, the amount of back wages you were required to pay along with the amount of any penalty paid.

36. Provide the **name, address and telephone number** of the apprenticeship program (approved by the California Apprenticeship Council) from whom you intend to request the dispatch of apprentices to your company for use on any public work project for which you are awarded a contract by *BDVWA*.

_____

_____

37. If your firm operates its own State-approved apprenticeship program:

(a) Identify the craft or crafts in which your firm provided apprenticeship training in the past year.

(b) State the year in which each such apprenticeship program was approved, and attach evidence of the most recent California Apprenticeship Council approval(s) of your apprenticeship program(s).

(c) State the number of individuals who were employed by your firm as apprentices at any time during the past three years in each apprenticeship and the number of persons who, during the past three years, completed apprenticeships in each craft while employed by your firm.

_____

_____

_____

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38. At any time during the last five years, has your firm been found to have violated any provision of California apprenticeship laws or regulations, or the laws pertaining to use of apprentices on public works?

NOTE: You may omit reference to any incident that occurred prior to January 1, 1998, if the violation was by a subcontractor and your firm, as general contractor on a project, had no knowledge of the subcontractor's violation at the time they occurred.

☐ Yes ☐ No

If "yes," provide the date(s) of such findings, and attach copies of the Department's final decision(s).

PART III. RECENT CONSTRUCTION PROJECTS COMPLETED

39. Contractor shall provide information about its six most recently completed public works projects and its three largest completed private projects within the last three years.[4] Names and references must be current and verifiable. Use separate sheets of paper that contain all of the following information:

Project Name: _____

Location: _____

Owner: _____

Owner Contact (name and current phone number):

_____

_____

Architect or Engineer: _____

Architect or Engineer Contact (name and current phone number):

_____

_____

Construction Manager (name and current phone number):

_____

_____

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[4] If you wish, you may, using the same format, also provide information about other projects that you have completed that are similar to the project(s) for which you expect to bid.

Description of Project, Scope of Work Performed:

_____

_____

Total Value of Construction (including change orders): _____

Original Scheduled Completion Date: _____

Time Extensions Granted (number of days): _____

Actual Date of Completion: _____

* * * * * * *

I, the undersigned, certify and declare that I have read all the foregoing answers to this prequalification questionnaire and know their contents. The matters stated in the questionnaire answers are true of my own knowledge and belief, except as to those matters stated on information and belief, and as to those matters I believe them to be true. I declare under penalty of perjury under the laws of the State of California, that the foregoing is correct.

Dated: _____

(Name)

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GENERAL CONDITIONS

1.01 DEFINITIONS

Wherever the words defined in this article, or pronouns used in their stead, occur in these Specifications or in any of the other Contract Documents, the intent and meaning shall be as follows:

AGENCY. The Bighorn-Desert View Water Agency, County of San Bernardino, State of California.

AGENCY BOARD. The duly elected Board of Directors of the Bighorn-Desert View Water Agency.

AGENCY ENGINEER OR ENGINEER. The Engineer of the Bighorn-Desert View Water Agency, or an authorized deputy, agent, representative or inspector.

CONTRACTOR. Contractor shall mean the party entering into contract with the Agency for performance of the Work called for in these Specifications and shown on the Drawings, including the Contractor's authorized agents.

SUBCONTRACTOR. Subcontractor shall mean any person, firm, or corporation entering into agreement with the Contractor for performance of any part of the Contractor's obligation under the Contract.

CONTRACT. Contract shall mean the Contract Documents and shall include the written agreement entered into by the Agency and the Contractor for the performance of work described in the Specifications and shown on the Drawings, together with the Notice Inviting Bids, the Instructions to Bidders, the Proposal, the Information Required of Bidders, the Specifications, the Drawings, all Addenda issued by the Agency with respect to the foregoing prior to the opening of bids, and all Change Orders issued by the Agency and signed by the Contractor pertaining to the Contract after the Contract is awarded.

SPECIFICATIONS. Specifications shall mean the General Conditions, the Special Provisions and the Technical Specifications of the Contract, together with all-Addenda and Change Orders issued with respect thereto. All worked performed shall be in accordance with the Standard Specifications for Public Works Construction (SSPWC), the "Greenbook", current edition, except as modified herein.

DRAWINGS. Drawings or Contract Drawings shall mean those drawings accompanying the Specifications which show the location, nature, extent and form of the Work, together with applicable details.

SHOP DRAWINGS. Drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor or any Subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the Work shall be fabricated and/or installed. Shop Drawings are not considered to be part of the Contract Documents.

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

1.02 ABBREVIATIONS

Wherever the following abbreviations are used they shall have the meanings listed.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association, Inc.
CRSI	Concrete Reinforcement Steel Institute
NEMA	National Electrical Manufacturer's Association
NIC	Not in concrete
NTS	Not to Scale
OAE	Or Approved Equal
OSHA	Occupational Safety and Health Act
PCA	Portland Cement Association
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
UBC	Uniform Building Code
UPC	Uniform Plumbing Code
U/L	Underwriters Laboratories, Inc.

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2.0 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

The Specifications and the Drawings are intended to be explanatory of each other. Any work indicated in the Drawings and not in the Specifications, or vice versa, shall be executed as if indicated in both. As the figured dimensions shown on the Drawings and in the Specifications of the Contract may not in every case agree with scale dimensions, the figured dimensions shall be followed in preference to the scaled dimensions, and drawings to a large scale shall be followed in preference to the Drawings to a small scale. Should it appear that the Work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Engineer for such further explanations as may be necessary, and shall conform thereto as part of the Contract. In the event of any doubt or question arising respecting the meaning of the Specifications or Drawings, reference shall be made to the Engineer and the Engineer's decision therein shall be final.

2.02 CONFLICTS BETWEEN SPECIFICATIONS AND DRAWINGS

In case of conflict between the Specifications and the Drawings, the Specifications shall govern over the Drawings. In cases of conflict between the General Conditions and Special Provisions of the Specifications, the Special Provisions shall govern over the General Conditions.

2.03 STANDARD SPECIFICATIONS

A reference to the Standard Specifications shall mean "Standard Specifications for Public Works Construction" (SSPWC), the current edition and amendments. All work performed shall conform to the SSPWC.

2.04 SHOP DRAWINGS

Wherever called for in these Specifications or on the Drawings, or where required by the Engineer, the Contractor shall furnish to the Engineer for review six (6) prints of each Shop Drawing. The Shop Drawings shall be approved by the Contractor prior to submittal to the Engineer. Unless otherwise required, said drawings shall be submitted at a time sufficiently early to allow review of same by the Engineer, and to accommodate the rate of construction progress required under the Contract.

The Contractor shall stamp all six copies of the Shop Drawings stating his approval of the submittal and that the Contractor has determined and verified all field measurements and quantities, field construction criteria, materials, catalog numbers and similar data, and that the Contractor has reviewed and coordinated the information in the Shop Drawings with the requirements of the Work and the Contract Documents. Any Shop Drawings submitted without complying with this Section will not be reviewed by the Engineer.

Except as may be otherwise provided in the Special Provisions, the Engineer will return two prints of each Shop Drawing to the Contractor, with comments noted thereon, within fifteen (15) calendar days following their receipt at the Engineer's office. The Contract shall make a complete and acceptable submittal to the Engineer by the second submission of drawings. The Agency reserves the right to withhold moneys due the Contractor to cover additional costs of the Engineer's review

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beyond the second submittal.

If the Shop Drawings are returned to the Contractor marked APPROVED AS SUBMITTED, formal revision and resubmittal of said drawing will not be required.

If the Shop Drawings are returned to the Contractor marked APPROVED AS NOTED, formal revision and resubmittal of said drawing will not be required, but the noted correction will be adhered to by the Contractor.

If one print of the Shop Drawing is returned to the Contractor marked REVISE AND RESUBMIT the Contractor shall revise said drawing and shall resubmit six (6) copies of said revised drawing to the Engineer.

If one print of the Shop Drawing is returned to the Contractor marked NOT APPROVED Contractor shall resubmit six (6) copies of a material or installation process specified in the Contract Documents and/or acceptable to the Engineer.

Fabrication of an item shall not be commenced before the Engineer has reviewed the pertinent Shop Drawings and returned copies to the Contractor marked either APPROVED AS SUBMITTED or APPROVED AS NOTED. Revisions indicated on shop Drawings shall be considered as changes necessary to meet the requirements of the Contract Drawings and Specifications and shall not be taken as the basis of claims for extra work. The Contractor shall have no claim for damages or extension of time due to any delay resulting from the Contractor's having to make the required revisions to Shop Drawings (unless review by the Engineer of said drawings is delayed beyond a reasonable period of time and unless the contractor can establish that the Engineer's delay in review actually resulted in a delay in the contractor's construction schedule). The review of said drawings by the Engineer will be limited to checking for general agreement with the Specifications and Drawings and shall in no way relieve the Contractor of responsibility for errors or omissions contained therein, nor shall such review operate to waive or modify any provision contained in the Specifications or Contract Drawings. Fabricating dimensions, quantities of material, applicable code requirements and other Contract requirements shall be the Contractor's responsibility.

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2.05 REFERENCE TO STANDARDS, PUBLICATIONS OR STANDARD SPECIFICATIONS

Any reference made in the Specifications or Drawings to any specification, standard, or publication of any organization shall, in the absence of a specific designation to the contrary, be understood to refer to the latest edition of the specification, standard or publication in effect as of the date of advertising the Work.

2.06 REFERENCE TO PROPRIETARY PRODUCTS

Where references to proprietary products appear in the Specifications or Drawings, whether or not followed by the words "or approved equal", it is for the purpose of establishing an acceptable standard of quality or design. Unless a substitute is expressly prohibited, the Contractor may request approval of a substitute for any such proprietary product. Such approval normally will

not be given by the Engineer prior to award of a Contract. A request for substitution must be in writing and must include descriptive literature, specifications, test reports or samples, as appropriate, to enable the Engineer to determine the acceptability of the product proposed for substitution. If substitution is requested as part of a Shop Drawing submittal, the item(s) proposed for substitution shall be clearly indicated. No substitute product shall be used on the Work until written approval has been received from the Engineer. Any revisions to structures, piping, mechanical, electrical, instrumentation, or any other work made necessary by such substitution must be approved by the Engineer and the entire cost of these revisions shall be borne by the Contractor.

2.07 SPECIFICATIONS AND DRAWINGS FURNISHED TO CONTRACTOR

The Agency will furnish to the Contractor five (5) sets of Specifications together with Drawings. Additional quantities of Specifications and Drawings will be furnished at reproduction cost.

2.08 AS-BUILT DRAWINGS

The Contractor shall maintain, on the job site, a set of full-size blueline or blackline prints of the Contract Drawings. On these the Contractor shall mark all as-built conditions, locations, configurations, and other details which may vary from the details represented on the original drawings. This master record of as-built conditions, including all revisions made necessary by addenda, change orders and field conditions shall be maintained up-to-date during the progress of the Work.

In the case of those drawings which depict the detailed requirement for equipment to be assembled and wired in the factory, such as motor control centers and instrumentation, the as-built drawings shall be updated by indicating those portions which are superseded by final Shop Drawings, and by including a reference note describing the Shop Drawings by manufacturer, drawing and revision number and date.

Upon completion of the Work but prior to final acceptance, the as-built drawings maintained by the Contractor shall be delivered to the Agency.

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3.01 AUTHORITY OF AGENCY

The Work and the manner of performing the same shall be done to the satisfaction and approval of the Agency.

The Contract Documents do not purport to control the method of performing the Work but only the requirements as to the nature of the completed work. The Contractor shall assume the entire responsibility for methods of performing the Work.

3.02 AUTHORITY OF THE ENGINEER

The Engineer is the agent of the Agency and is employed to act as advisor and consultant to the Agency in engineering matters relating to the Contract. The Agency has delegated its authority under this Contract to the Engineer to determine the amount, quality, acceptability and fitness of the several kinds of work, material and equipment which are to be paid for under the Contract; to decide for the Agency all questions relative to the construction, meaning and intent of the Contract documents; to decide all questions relative to the classifications, measurements of quantities, materials and the fulfillment of this Contract, and to reject or condemn all work or material which does not conform to the terms of this Contract to recommend, for consideration and action of the Agency, progress payments and change orders. The Engineer's decision in all matters is the decision of the Agency and can only be changed by the Agency.

If the Contractor files any suit arising under the Contract and names the Engineer as a party and if no recovery is had against the Engineer, then the Engineer shall recover damages from the Contractor for reasonable attorney's fees for time spent by the attorney for the Engineer in the defense of the suit and the Engineer shall recover from the Contractor and be paid by the Contractor at the rate of $1,000.00 per day for the time of the Engineer required in connection with the preparation and defense of the suit.

3.03 INSPECTION AND TESTING

All materials furnished and all work performed under the Contract shall be subject to inspection by the Engineer. Such inspection may include mill, plant, shop or field inspection as required. The Engineer shall be permitted access to all parts of the Work, including plants where material or equipment are manufactured or fabricated, and the Engineer shall be furnished with such materials, information and assistance by the Contractor and Subcontractors and suppliers as is required to make a complete and detailed inspection.

Work done in the absence of prescribed inspection may be required to be removed and replaced under proper inspection, and the entire cost of removal and replacement, including the cost of all materials which may be furnished by the Agency and used in the Work thus removed, shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work shall not be covered up without the authority of the Engineer. If so covered. without authority, the work, upon order of the engineer, shall be uncovered to the extent required, and the Contractor similarly shall bear the entire cost of performing all the Work and furnishing all the material necessary for the removal of the covering and its subsequent replacement, as directed and approved by the Engineer.

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All inspection fees and costs imposed by agencies other than the Agency shall be paid by the Contractor.

The Engineer will make, or have made, such tests as he deems necessary to insure that the Work is being accomplished in accordance with the requirements of the Contract. Unless otherwise specified in the special Provisions, the cost of such testing will be borne by the Agency. In the event such tests reveal non-compliance with the requirements of the contract, the contractor shall bear the cost of such corrective measures deemed necessary by the engineer, as well as the cost of subsequent re-testing.

The Agency will provide inspection for an 8-hour day and 40-hour week. The Contractor shall reimburse the Agency at rates established by the Agency for inspection in excess of the foregoing including legal holidays.

3.04 CHANGE ORDERS

The Agency, or its duly authorized representative, may order changes in the Work through additions, deletions or modifications. Such changes will be effected through written change orders delivered to the Contractor describing the change required in the Work, together with any adjustment in Contract price or time in completion as hereinafter provided. No such change shall constitute the basis of claims for damage or anticipated profits; however, the Engineer will make reasonable allowance for the value of any work, materials or equipment furnished and subsequently rendered useless because of such changes. Any adjustment in Contract price resulting from a change order will be considered in computing subsequent monthly payments due the Contractor. Any work performed in accordance with a change order shall be subject to all provisions of the original Contract, and the Contractor's sureties shall be bound thereby to the same degree as under the original Contract.

Any adjustment in Contract price shall be based on unit price bid items or, additive and deductive bid items submitted by the Contractor in the original bid on the Work where such bid items are applicable.

If the original bid prices are not applicable, the adjustment in Contract price shall be based on a lump sum or unit price agreed upon by the Agency and the Contractor prior to executing the change order.

If the original bid prices are not applicable and the Agency and Contractor are unable to agree upon a lump sum or unit price prior to executing the change order, the adjustment in Contract price shall be made on a test-plus basis. In such an event, the following items will be included as the direct costs:

Materials and Supplies
Labor (including foremen's wages)
Workmen's compensation insurance
Unemployment insurance contributions paid to the State
Social Security taxes paid to the Federal Government

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Labor union health and welfare, pension, vacation-holiday and apprenticeship fund contribution
Value for use of equipment for actual time of use according to Caltrans "Labor Surcharge and Equipment Rental Rates" for the current year

In addition to the direct costs enumerated above, the Agency will pay to the Contractor for said extra work a percentage of said direct costs to compensate for the following profit and overhead items:

Profit
General expenses
All insurance except workmen's compensation insurance
Excise taxes
Property taxes
License and inspection fees
Bond premiums
All other items of expense not specifically enumerated above

Said percentage will be fifteen (15) percent of said direct costs provided the Contractor actually performs, said extra work. In the event said extra work is performed by a subcontractor, percentage paid to the Contractor will be 20 percent of said Subcontractor's direct costs. Said 20 percent will include allowance for profit and overhead costs for both the Contractor through more than one Subcontractor in succession, said percentage will not exceed 25 percent.

When work is being performed on a cost-plus basis, the Contractor shall submit written reports as directed by the engineer, showing all items of direct cost which enter into the Work. If required by the Engineer, the Contractor shall furnish direct cost items listed in said reports.

3.05 CONTRACTOR'S PLANT AND EQUIPMENT

The Contractor shall at all times be responsible for the adequacy, efficiency and sufficiency of the Contractor's plant and equipment and any Subcontractor's plant and equipment.

3.06 ASSIGNMENT OF CONTRACT

The Contractor shall not assign, sublet, sell, transfer or otherwise dispose of the Contract or any portion thereof, or his right, title or interest therein, or his obligations thereunder, without the prior written consent of the Agency. The Agency shall have no obligation whatsoever to provide such written consent.

If the Contractor violates the provisions of this section, the Contract may be terminated at the option of the Agency and the Agency shall be relieved of all liability and obligations to the Contractor, and to his assignee or transferee, growing out of such termination.

3.07 SUBCONTRACTS

All proposed Subcontractors shall be listed by the Contractor at the time of bid opening and shall

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be contained in the Information Required of Bidders. The Contractor may request a replacement of a previously approved Subcontractor only through the specific procedures contained in Public Contract Code Section 4107. Any such request is subject to approval by the Agency.

The Contractor shall perform not less than 50 percent of the Work with his own forces (i.e., without subcontracting). This requirement shall be understood to refer to work, the value of which totals not less than 50 percent of the Contract price. Refer to Section 2-3 of the SSPWC for clarification.

In the Agency's discretion, subject to the requirements of Sections 3.07(a) and (b), subcontracts may be permitted to such extent as shall be shown to be necessary or advantageous to the Contractor in the prosecution of the Work and without injury to the Agency's interests. The re-subletting of work by a Subcontractor shall be subject to the same limitations as an original subletting. Each Subcontractor shall be properly licensed for the type of work which he is to perform.

A copy of each subcontract, if in writing (or if not in writing, then a written statement signed by the Contractor giving the name of the Subcontractor and the terms and conditions of each subcontract), shall be filed promptly with the Engineer upon the Engineer's request. Each subcontract shall contain a reference to the Contract between the Agency and the Contractor, and the terms of that Contract shall be made a part of each subcontract insofar as applicable to the Work covered thereby. Each subcontract shall provide for annulment of same by the Contractor upon written order of the Engineer if, in the Engineer's opinion, the Subcontractor fails to comply with the requirements of the prime Contract insofar as the same may be applicable to this work.

The Contractor shall be responsible to the Agency for the acts and omissions of his Subcontractors and their employees to the same extent as the Contractor is responsible for the acts and omissions of employees. Nothing contained in this section shall create any contractual relationship between and Subcontractor and the Agency or Engineer or relieve the Contractor of any liability or obligations under the prime Contract.

The Contractor shall be permitted to rent equipment maintained and operated as long as the work performed is directed and constantly supervised by the Contractor. Any other arrangement will be construed as unauthorized subcontracting and such action will be subject to Contract termination.

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3.08 CONTRACTOR'S EMPLOYEES AND SUBCONTRACTORS

The Contractor shall at all times be responsible for the adequacy, efficiency and sufficiency of persons employed by the Contractor and any Subcontractor or persons employed by the Subcontractor. All workmen must have sufficient knowledge, skill and experience to perform properly the work assigned to them.

3.09 ATTENTION TO WORK

The Contractor shall supervise the Work and at all times shall be represented by a competent English speaking superintendent who shall receive and obey all instructions or orders given under the Contract, and who shall have full authority to execute the same, and to supply materials, tools

and labor without delay, and who shall be the legal representative of the Contractor.

3.10 SERVICE OF NOTICES

Any notice, order, direction, request or other communication given by the Agency to the Contractor under the Contract shall be deemed to be well and sufficiently given to the Contractor if left at any office used by the Contractor, or delivered to any of the Contractor's officers, or mailed in any post office addresses to the Contractor at the address mentioned in the Contract, or at the Contractor's last known place of business. If mailed it shall be deemed to have been given to and received by the Contractor two days after the day of mailing in any post office in the vicinity of the Work.

3.11 DEVIATION FROM CONTRACT

The Contractor shall not make any alteration or variation in or addition to or deviation or omission from the Contract without the advance written consent of the Agency.

3.12 SUSPENSION OF WORK

The Engineer acting on behalf of the Agency may, by written notice to the Contractor, suspend the Work, in whole or in part, for such period or periods as he may deem necessary due to unsuitable weather, delay in delivery of Agency furnished equipment or materials, or such other conditions as are considered unfavorable for prosecution of the Work, or failure on the part of the Contractor to carry out the provisions of the Contract or to provide material or workmanship meeting the requirements of the Specifications. Suspended work shall be resumed by the Contractor within a reasonable time, as designated by the Engineer, after receipt from the Engineer of written notice to proceed. Contractor shall not be entitled to receive extra or additional compensation, except as may otherwise be provided for explicitly in the Contract Documents, on account of suspension of work pursuant hereto.

3.13 TERMINATION OF. CONTRACT BY AGENCY (CONTRACTOR NOT AT FAULT)

The Agency may terminate the Contract upon ten calendar days written notice to the Contractor, if it is found that reasons beyond the control of either the Agency or Contractor make it impossible or against the Agency's interests to complete the Work. In such a case, the Contractor shall have no claims against the Agency except (1) for the value of work performed up to the date the Contract is terminated, and (2) for the cost of materials and equipment on hand, in transit, or on definite commitment as of the date the Contract is terminated, which would be needed in the Work and which meet the requirements of the Specifications. The value of work performed and the cost of materials and equipment delivered to the site, as mentioned above, shall be determined by the Engineer in accordance with the procedure prescribed for the making of the final estimate and payment and shall be paid in accordance with the same procedure.

3.14 TERMINATION OF CONTRACT BY AGENCY (CONTRACTOR AT FAULT)

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The Agency may terminate the Contract upon ten calendar days written notice to the Contractor in the event of any default by the Contractor. Without limitation, it shall be considered a Contract default whenever the Contractor shall: (1) declare bankruptcy, become insolvent or assign assets for the benefit of creditors, (2) disregard or violate important provisions of the Contract Documents or Engineer's instruction or fail to prosecute the Work according to the approved progress schedule, or (3) fail to provide a qualified superintendent, competent workmen or Subcontractors, or materials or equipment meeting the requirements of the Specifications and Drawings.

In the event the Contract is terminated, the Agency may take possession of the Work and of all materials, which have been provided in connection with the Work and may complete the Work by whatever method or means is selected. The cost of completing the Work shall be deducted from the balance which would have been due the Contractor had the Contract not been terminated and the Work completed in accordance with the Specifications and Drawings. If such cost exceeds the balance which would have been due, the Contractor shall pay the excess amount to the Agency. If such cost is less than the balance which would have been due, the Contractor shall have no claim to the difference except to such extent as may be necessary, in the opinion of the Engineer, to reimburse the Contractor or the Contractor's sureties for any expense properly incurred for materials, tools, equipment, property and labor devoted to the execution of the Work, of which the Agency shall have received the benefit. In computing such expense, as it relates to equipment and property, the salvage value at completion of the Work shall be deducted from the depreciated value at the time the Contract was terminated and the difference shall be considered as an expense.

3.15 TERMINATION OF CONTRACT BY CONTRACTOR

The Contractor may terminate the Contract upon ten calendar days written notice to the Agency whenever: (1) the entire work has been suspended in accordance with Section 3.12, for sixty (60) consecutive calendar days through no fault or negligence of the Contractor and notice to resume work or to terminate the Contract has not been received from the Agency within this time period, or (2) the Agency shall fail to pay the Contractor any substantial sums due in accordance with the terms of the Contract and within the time limits prescribed. In the event of such termination, the Contractor shall have no claims against the Agency except for those claims specifically enumerated in Section 3.13 and determined in accordance with that Section.

3.16 FAILURE TO COMPLY

If the Contractor should refuse or neglect to comply with the provisions of the Contract or the orders of the Engineer, the Agency may have such provisions or orders carried out by others at the expense of the Contractor.

3.17 PROTESTS

If the Contractor considers any work demanded of him to be outside the requirements of the Contract, or if he considers any order or ruling of the Engineer, or of any inspector to be unfair, he shall, immediately upon such work being demanded or such order or ruling being made, ask for written instructions or decision, whereupon he shall proceed without delay to perform the Work or to conform to the order or ruling; but unless the Contractor finds such instructions or decisions satisfactory, he shall, within five (5) days after receipt of same, file a written protest with the

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Engineer, stating clearly and in detail any objections and the reasons therefor. The Engineer shall, as soon as practicable after receipt of such written protest from the Contractor, forward said protest through appropriate channels to the Agency including any written comments on the issue or issues involved. The decision of the Agency on all such matters shall be considered final and binding upon all parties concerned. Except for such grounds for protests or objections as are made of record in the manner specified and within the time stated herein, the Contractor hereby waives all grounds for protests or objections to the orders, rulings, instructions or decisions of the Engineer and hereby agrees that, as to all matters not included in such protest, the orders, instructions and decisions of the engineer shall be final and conclusive.

3.18 RIGHTS-OF-WAY

Lands or rights-of-way for the Work to be constructed under the Contract will be provided by the Agency as shown on the Drawings. Nothing contained in the Specifications or Drawings shall be interpreted as giving the Contractor exclusive occupancy of the lands or rights-of-way provided. Any additional lands or fights-of-way required for construction operations shall be provided by the Contractor at the Contractor's own expense.

Except as may otherwise be provided, the Contractor shall secure from the agencies having jurisdiction the necessary permits to create obstructions, to make excavations if required under the Contract and to otherwise encroach upon rights-of-way and shall present evidence to the Engineer that such permission has been granted before work is commenced. Regulations and requirements of all agencies concerned shall be strictly adhered to in the performance of this Contract, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements under this Contract shall not be made the basis for claims for additional compensation.

The Contractor shall not do any work that would affect any oil, gas, sewer, storm drain, or water pipeline, any telephone, telegraph, or electric transmission line, fence, or any other structure, nor enter upon the rights-of-way involved until notified by the Engineer that the Agency has secured authority therefor from the proper party. After authority has been obtained, the Contractor shall give said party due notice of any intention to begin work and shall give said party due notice of any intention to begin work and shall give said party convenient access and every facility for removing, shoring, supporting, or otherwise protecting such pipeline, transmission line, ditch, fence or structure and for replacing same. The Contractor shall not be entitled to any extension of time or extra compensation on account of any postponement, interference, or delay caused by any such pipeline, transmission line, fence or structure being on the line of the Work except as provided herein.

3.19 CONSTRUCTION INTERFERENCE

As used in this section, the word "Utility" shall be understood to include tracks, overhead or underground wires, cables, pipelines, conduits, ducts, sewers or storm drains. The term "service connection" shall be understood to mean all or any portion of a pipeline (including sewer house laterals), conduit, wire, cable or duct, including meter, between a utility distribution line and an individual customer or customers when served by a single service connection. The term "construction interference" shall be understood to include any utility or service connection within

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the limits of excavation or over excavation required for the Work under the Contract as shown, or ordered by the Engineer, or any utility, or service connection located in the space which will be required by any of the Work under the Contract.

In the event any utility or service connection is required to be disturbed or removed to permit construction of a pipeline or other structure under the Contract, such disturbance or removal shall be done only with the approval of the Engineer and following notification to the owner of the interfering utility or service connection. Any such utility or service connection removed or otherwise disturbed shall be reconstructed as promptly as possible in its original or other authorized location in a condition at least as good as prior to such removal or disturbance, subject to the inspection of the owner of same. The Contractor's responsibility under this section to remove or replace shall apply even in the event such damage or destruction occurs after backfilling or is not discovered until after completion of backfilling. The owner of the utility or service connection shall be notified immediately after damage or destruction occurs or is discovered.

During the performance of the Work under this Contract, the owner of any utility affected by the Work shall have the right to enter when necessary upon any portion of the Work for the purpose of maintaining service and to make repairs to said utility.

The drawings show the approximate positions of known utilities in the immediate vicinity of the Work done but the Agency does not guarantee that all existing utilities are shown. Service connections normally are not shown on the Drawings. The Contractor, before commencing any excavation, shall ascertain from records or otherwise, the existence, horizontal and vertical position and ownership of all existing utilities and service connections. If the Contractor discovers any utility in the line of the Work which is not shown on the Drawings, he or she shall immediately notify the Engineer of the existence of same. The Agency will not be liable for any consequences arising as a result of a service connection being incorrectly located in the field by the agency having jurisdiction over said service connection.

All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a main or trunkline utility which actually constitutes a construction interference when said utility is not shown with reasonable accuracy as an interference or is omitted from the Drawings, will be paid for by the Agency as extra work. In such case, the Agency also will compensate the Contractor for equipment on the project necessarily idled during and by reason of such work. The Agency's obligation to repair damage to such a facility and to compensate the Contractor for idled equipment shall not extend to damage resulting from the failure of the Contractor to use reasonable care.

All costs involved in removing, relocating, protecting, supporting, repairing, maintaining, or replacing any utility or service connection other than those described in subsection (e) herein shall be borne by the Contractor.

The Contractor shall not be assessed liquidated damages for failure to complete the Work on time to the extent that such delay was caused by failure of the Agency or of the agency having jurisdiction over the utility or service connection to authorize or otherwise provide for its removal, relocation, protection, support, repair, maintenance or replacement.

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The Agency reserves the right, upon determination of the actual position of existing utilities and service connections, to order changes in alignment or grade of the Agency's pipelines when by so doing, the necessity for relocation of existing utilities or service connections will be avoided. Such changes will be ordered in writing by the Engineer. Where applicable, adjustment in the contract price will be on the basis of the unit prices stated in the proposal. Where unit prices in the proposal are not applicable, adjustment in Contract price will be in accordance with Section 3.04.

3.20 LINES AND GRADES

All surveying necessary and adequate for construction purposes will be done by the Agency Engineer or as modified in the Special Provisions.

The Contractor shall give two (2) working days notice, in writing, when the surveying services of the Agency Engineer will be required for laying out any portion of the Work, and he shall dig all holes necessary for line and grade stakes. The Contractor shall preserve all stakes set for the lines, grades or measurements of the Work in their proper places until authorized to remove them by the Agency Engineer. Any expenses incurred in replacing said stakes that the Contractor may have failed to preserve shall be borne by the Contractor.

Grades for all work will be set on the surface of the ground and the Contractor shall transfer them to the construction as necessary. At no time shall less than three (3) consecutive grade points be used in common so that any variation from a straight grade can be detected. Any such variation shall be reported to the Agency Engineer and in the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

The Contractor shall preserve all bench marks, stakes and other survey marks, and in case of their removal or destruction by the Contractor's employees or by a Subcontractor's employees, he shall be liable for the cost of their replacement.

3.21 SUPERVISION AND INSPECTION

The Agency Engineer shall decide within the provisions of the Specifications all questions which may arise concerning the quality or acceptance of materials furnished and work performed and all questions concerning the acceptable fulfillment of the Contract by the Contractor.

All work shall be done in a thorough and workmanlike manner under the direction and to the satisfaction of the Agency Engineer, and the materials used shall comply with these Specifications. Work shall be started and continued at such time and at such points as may be designated by the Agency Engineer and shall be carried on diligently and without unnecessary delay.

Each day the Contractor shall furnish the Agency Engineer a duplicate copy of all delivery and shipment tags or slips for all materials delivered on the Work. Tags or slips shall show the actual quantity of material received on the Work. No materials shall be used on the Work until such tags or slips have been furnished to the Agency Engineer.

All tests of materials shall be made under the direction of the Agency Engineer. The costs of tests

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for materials shall be borne by the Agency. At the Contractor's own expense, the materials for testing shall be delivered at the time and to the place designated by the Agency Engineer. Should the materials fail, the retesting cost shall be borne by the Contractor.

The Contractor shall prosecute work only in the presence of the Agency Engineer or his designated representative, and any work done in the absence of said Agency Engineer or his designated representative shall be subject to rejection for that reason. The Contractor shall give written notice to the Agency Engineer at least twenty-four (24) hours before beginning any work and shall furnish said Agency Engineer all reasonable facilities for obtaining full information respecting the progress and manner of work.

Any day shall be considered as a normal work day except Saturdays, Sundays or legal holidays or days on which the Contractor is expressly required by the Specifications or by law to suspend construction operations, or is prevented from working at the beginning of the workday for cause defined in Section 6 of the Standard Specifications or conditions resulting therefrom.

3.22 OBSERVING LAWS AND ORDINANCES

The Contractor shall keep himself fully informed of all Federal, State and local laws, ordinances and regulations which may affect the conduct of the Work, those engaged or employed by the Contractor, the materials used, and all orders and decrees of bodies or tribunals having any jurisdiction or authority over the Work. The Contractor shall observe and comply therewith, and shall protect and indemnify the Agency against any claim or liability arising from or based on the violation thereof.

The Contractor shall secure and pay for all necessary permits, licenses and make all necessary deposits before starting work.

3.23 COORDINATION WITH COMMUNITY AGENCIES

The Contractor shall notify the local Police Department, Fire Department and refuse contractor of any construction causing street closure forty-eight (48) hours prior to start of construction or closure.

The contractor shall also be responsible for notifying, in writing, affected businesses forty-eight (48) hours prior to the start of construction or closures.

3.24 FIRE HYDRANTS

Free access shall be provided to all fire hydrants at all times. The Contractor shall not draw any water from a fire hydrant for use on the Work, other than for extinguishing fire, without first obtaining permission from the Public Works Director the owner of such water.

Whenever required by the local water purveyor, the Contractor shall obtain a fire hydrant meter to record water usage. A deposit as established by the local water purveyor shall be paid by Contractor and refunded upon return of said hydrant meter. The water usage fees shall be paid for by the Contractor.

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3.25 LOSS AND DAMAGE

All loss or damage to the Agency or to third persons, occurring during the progress of the Work being performed under this Contract, which loss or damage occurs before acceptance of the Work by the Agency and which results from: (1) the negligence of the Contractor, or Contractor's agents or employees, or (2) any act or omission on the part of the Contractor or Contractor's agent or employees which is not authorized by these Specifications shall be sustained and borne by the Contractor.

Excavation shall be braced in accordance with CAL OSHA Standards so that they will be safe and the ground alongside the excavations will not slide or settle, and all existing improvements of any kind, either on public or private property, shall be fully protected from damage. If any damage does result, the necessary repairs as directed by the Agency Engineer, shall be made by and at the expense of the Contractor.

Performance under this Contract by the Contractor shall not be excused by any unforeseen obstruction or difficulties which may be encountered, including damage to or destruction of the project under construction by action of the elements or otherwise.

3.26 USE OF IMPROVEMENT DURING PROGRESS OF CONSTRUCTION

At any time during the progress of work, the Agency Engineer may, upon written notice to the Contractor, takeover and utilize the whole or any part of the improvement or appurtenance thereto which has been completed, giving if desired, permits to utilize same. Such uses by the Agency Engineer shall constitute a limited acceptance of that part of the improvement so taken over and utilized, but shall not relieve the Contractor and Contractor's sureties from responsibility for any damage to or defect in that or any part of the improvement.

3.27 ALTERNATIVE METHODS OF CONSTRUCTION

Whenever the Drawings and specifications provide that more than one specified method of construction or more than one specified type of construction equipment may be used to perform portions of the Work and leave the selection of the method of construction or the type of equipment to be used up to the Contractor, it is understood that the Agency does not guarantee that every such method of construction or type of equipment can be successfully used throughout all or any part of any project. It shall be the Contractor's responsibility to select and use the alternative(s) which will satisfactorily perform the Work under the conditions encountered. In the event some of the alternatives are not encountered. In the event some of the alternatives are not feasible or it is necessary to use more than one of the alternatives on the project, full compensation for any additional cost involved shall be considered as included in the Contract price paid for the item of work involved and no additional compensation will be allowed therefore.

3.28 EXAMINATION OF WORK

Contractor must examine the location, physical conditions and surroundings of the proposed work and judge for themselves the nature of the excavation to be made and the Work to be done.

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The Drawings for the Work show conditions as they are supposed or believed to exist by the Agency Engineer, but it is not intended or to be inferred that the conditions as shown thereon constitute a representative or warranty, express or implied, by the Agency or its officers, that such conditions are actually existent, nor shall the Contractor be relieved of the liability under this Contract, nor the Agency or any of its officers be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the Drawings and the actual conditions revealed during the progress of the Work or otherwise.

Execution of the Contract shall be conclusive evidence that the Contractor has satisfied himself through his own investigation as to the conditions to be encountered; the character, quality and quantity of work to be performed; materials and equipment to be furnished; and all requirements of the Drawings and Specifications.

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4.01 QUALITY

Material and equipment shall be new and of the quality specified. All work shall be executed in conformity with the best accepted standard practice of the trade so as to contribute to maximum efficiency of operation, accessibility and appearance, and minimum cost of maintenance and construction of future alterations and additions.

Whenever the Contractor shall furnish materials or manufactured articles or shall do work for which no detailed Specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required with due consideration of the use to which they are to be put. In general, the Work performed shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment of the Work as a whole or in part.

4.02 SAMPLES AND TESTS OF MATERIAL

Samples of materials to be supplied by the Contractor shall be prepared and submitted for checking, if required by the Specifications or the Engineer. The samples or test specimens shall be prepared and furnished with information as to their source in such quantities and sizes as may be required, with all freight and charges prepaid.

All samples shall be submitted before shipment of the material to the site of the Work and in ample time to permit the making of proper tests, analyses, examinations, rejections and resubmissions before the time at which it is desired to incorporate the material into the Work. All tests of materials furnished by the Contractor will be made by the Engineer in accordance with recognized standard practice. No such materials shall be used in the Work unless or until they have been accepted in writing by the Engineer and samples of materials will be retained by the Engineer for reference and comparison purposes.

The cost of material, inspection and testing in the vicinity of the Work unless specified otherwise herein, will be borne by the Agency. If the inspection and testing of material in the vicinity of the Work is not practicable, the Contractor may request such inspection and testing take place at the point of manufacture. In such an event, the additional cost to the Agency of remote inspection and testing shall be paid for by the Contractor. Such additional cost will consist of reimbursement for travel time and expense to and from the remote point.

4.03 PROOF OF COMPLIANCE WITH CONTRACT

In order that the Engineer may determine whether the Contractor has complied with the requirements of the Contract Documents not readily determinable through inspection and tests of plant, equipment, work or materials, the Contractor shall, at any time when requested, submit to the Engineer properly authenticated documents or other satisfactory proof as to compliance with such requirements.

4.04 SAFEGUARDING OF EQUIPMENT, MATERIAL AND WORK

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The Contractor shall properly safeguard all equipment, material and work against loss, damage, malicious mischief or tampering by unauthorized persons until acceptance of the Work by the Agency. Locked and covered storage or continuous surveillance by a watchman shall be provided if required to accomplish this purpose.

4.05 DEFECTIVE MATERIAL, EQUIPMENT AND WORKMANSHIP

Inspection of the Work shall not relieve the Contractor of any of his obligations under the Contract. Even though equipment, material or work required to be provided under the Contract have been inspected, accepted and estimated for payment, the Contractor shall, at the Contractor's own expense, replace or repair any such equipment, material or work found to be defective or otherwise not to comply with the requirements of the Contract up to the end of the maintenance and guarantee period.

Any equipment or material brought upon the job site by the Contractor and subsequently rejected by the Engineer as not complying with the requirements of the Contract shall be removed immediately by the Contractor.

If the Contractor shall fail to repair or replace unsatisfactory equipment or material from the job site within ten (10) calendar days after being ordered to do so by the Engineer, the engineer, acting on behalf of the Agency, may make the ordered repairs or remove the condemned equipment or material and the Agency will deduct the cost thereof from any moneys due or to become due the Contractor.

4.06 CHARACTER OF WORKMEN

Skilled workmen shall be employed on work requiring special qualifications. When requiring special qualifications. When required in writing by the Engineer, the Contractor or any Subcontractor shall discharge any person who is, in the opinion of the Engineer, incompetent, unfaithful, disorderly or otherwise unsatisfactory and shall not again employ such discharged person on the Work except with the consent of the Engineer. Such discharge shall not be the basis of any claim for compensation or damages against the Agency or any of its officers.

The Contractor shall provide, at all times, a superintendent on the job site who shall be able to speak, read and write the English language per Section 7-6 of the SSPWC.

4.07 RUBBISH AND DUST CONTROL

During the progress of the Work, the Contractor shall keep the site of the Work and other areas utilized by the contractor in a neat and clean condition and free from any accumulation of rubbish.

The Contractor shall at all times conduct work so as to avoid unnecessary dust. The Contractor shall provide adequate equipment, water and implement procedures to comply with the south Coast Air Quality Management Agency rules to prevent dust emissions.

4.08 CLEANING UP

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The Contractor shall promptly remove from the vicinity of the completed work, all rubbish, unused material, concrete forms, equipment and temporary structures used during construction. Additional clean-up work, if provided in the Special Provisions, shall be performed by the Contractor.

4.09 GUARANTEE

In addition to the guarantees required elsewhere in this Contract Document, the Contractor shall and hereby does guarantee all work for a period of two (2) years from formal acceptance of the Work by the Agency and shall repair and replace any and all such work, together with any other work which may be displaced, that may prove defective in workmanship and/or materials within the two (2) year period from the date of acceptance, without expense whatsoever to the Agency, ordinary wear and tear and usual abuse or neglect excepted. In the event of failure to comply with the above-mentioned conditions within seven (7) days after being notified in writing, or in the event of an emergency, the Agency is hereby authorized to proceed to have the defects repaired and make good at the expense of the Contractor, who hereby agrees to pay the cost and charges therefore immediately on demand.

The Contractor hereby guarantees that the entire work constructed under this Contract will meet fully all requirements thereof as to quality of workmanship and of materials furnished by the Contractor. The Contractor hereby agrees to make any repairs or replacements made necessary by defects in materials or workmanship supplied by the Contractor that becomes evident within the guarantee period, and to restore to full compliance with the requirements of these Specifications, including the test requirements set forth herein for any part of the Work constructed hereunder, which during said period is found to be deficient with respect to any provision of the Specifications. The Contractor also agrees to hold the Agency harmless from claims of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the Engineer. If the Contractor fails to make the repairs and replacements promptly, the Agency may do the Work and the Contractor and the Contractor's surety shall be liable to the Agency for the cost of such work.

Upon acceptance of the Work by the Agency, any and all manufacturer's guarantees held by the Contractor shall be delivered to the Agency.

The guarantees and agreements set forth hereinbefore shall be secured by a surety bond which shall be delivered by the Contractor to the Agency before the notice of completion shall be filed by the Engineer. Said bond shall be in an approved form and executed by a surety company or companies satisfactory to the Agency. Said bond shall remain in force for the period specified herein.

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5.01 CONTRACT TIME

Time is of the essence of the Contract. The Contractor shall commence work promptly under the Contract and all portions of the Work shall be prosecuted so that the entire work shall be completed and ready for use within the time stipulated.

5.02 CONTRACT PRICE

Prior to commencement of the Work, the Contractor shall submit a detailed price breakdown of any of the bid items for the Work contained in lump sum items. Such price breakdown shall include quantities, unit prices, and any other information required in sufficient detail to enable it to be used in preparing monthly progress estimates.

5.03 CONSTRUCTION SCHEDULE

The Contractor shall submit a construction schedule showing the order in which the Contractor proposes to carry on the Work and the dates when the various parts are to be begun and completed. The timing associated with submitting the schedule will be determined by the Engineer. The schedule shall be subject to the approval of the Engineer and if in the Engineer's opinion a schedule submitted is inadequate to secure the completion of the Work in the time agreed upon, or is otherwise not in accordance with the Specifications, the Engineer may require the Contractor to submit a new schedule which will insure timely completion of the Work. It is mandatory that an up-to-date construction schedule be submitted with each request for progress payment.

5.04 OVERTIME WORK

Except as otherwise provided in this Section, the Contractor shall receive no additional compensation for overtime work even though such overtime work may be required under emergency conditions and may be ordered by the Engineer in writing. Additional compensation will be paid the Contractor for overtime work only in the event extra work is ordered by the Engineer and the change order specifically authorizes the use of overtime work, and then only to such extent as overtime wages are regularly being paid by the Contractor for overtime work of a similar nature in the same locality.

5.05 EXTENSION OF TIME

The Contractor may be entitled to an extension of Contract time: (1) if the Work has been suspended by the Agency, in whole or in part; or (2) where weather or other circumstances occur which delay progress and which are clearly beyond the control of the Contractor; provided that, in either case, the Contractor is not at fault and is not negligent under the terms of the Contract. The extension of time allowed shall be as determined by the Engineer.

To receive consideration, a request for extension of time must be made in writing to the Engineer stating the reason for said request, and such request must be received by the Engineer within ten days following the end of the delay-causing condition.

5.06 FAILURE TO COMPLETE ON TIME

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The Contractor shall pay liquidated damages to the Agency in the amount specified in the Special Provisions if the Contractor fails to complete the Work within the time agreed upon. The period for which said damages shall be paid shall be the number of calendar days from the agreed date of completion as contained in the Contract, or from the date of termination of any extension of time approved by the Engineer, to the date the Engineer certifies completion of work to the Agency. The Agency may deduct the amount of said damages from any moneys due or to become due the Contractor.

The said amount is fixed and agreed upon by and between the Contractor and the Agency because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Agency would sustain. Said amount is agreed to be the amount of damages which the Agency would sustain.

5.07 MONTHLY ESTIMATES AND PAYMENTS

On or about the 25th of each month, the Engineer will prepare and certify to the Agency an estimate of the cumulative amount and value of Work performed by the Contractor up to that date. All payments will be paid on or before the 15th day of the following month. Except as may otherwise be provided in the Special Provisions, said amount may include fifty percent (50%) of the value of acceptable materials and equipment delivered to and properly stored at the site of the Work. Said value shall be based on certified copies of paid invoices delivered by the Contractor to the Engineer. To this amount shall be added all amounts due the Contractor for performance of extra work in accordance with approved Change Orders.

From the total computed above, a deduction of five percent (5%) shall be made as retention. Further deductions shall be made for: (1) amounts due the Agency for equipment or materials furnished or services rendered; (2) amounts due the Agency under the terms of the Contract; (3) amounts of any claims of lien filed with the Agency in accordance with Section 6.02(b); and (4) amounts required to be deducted by federal, state, or local governmental authority. From the balance thus determined, the amount of all previous payments shall be deducted, and the remainder shall constitute the monthly payment due the Contractor.

Pursuant to the provisions of Public Contract Code Sections 10263 and 22300, the Contractor is permitted to substitute securities for any moneys withheld to ensure performance of this Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the State Treasurer or a state or federally chartered bank in California as the escrow agent, who shall then pay the moneys to the Contractor. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor.

Alternatively, the Contractor may request and the Agency shall make payment of retentions earned directly to the escrow agent. The Contractor may direct the investment of the payments into securities and the Contractor shall receive the interest earned on the investments upon the same terms provided for in this Section for securities deposited by the Contractor. Upon satisfactory completion of the Contract, the Contractor shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the Agency pursuant to the terms of this Section.

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Securities eligible for investment under this Section shall include those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Agency. Securities selected must also comply with the Agency's current investment policy and 1995 California State Senate Bills 564 and 866.

The Contractor shall be beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon. The escrow agreement used pursuant to this Section shall be null, void and unenforceable unless it is substantially similar to the form enclosed.

The Engineer's estimate of the monthly payment due the Contractor will not be required to be made by strict measurement and an approximation will suffice. The monthly payments may be withheld or reduced if, in the Engineer's opinion, the Contractor is not diligently or efficiently endeavoring to comply with the intent of the Contract or if the Contractor fails to pay labor and material bills as they become due.

The Contractor shall furnish the Engineer promptly, upon request, all information and records necessary to determine the cost of the Work for purposes of estimating monthly payments, including an itemized statement, in a form satisfactory to the Engineer, of the actual cost of all acceptable materials delivered by the Contractor to the site.

No monthly payment shall be construed as an acceptance of the Work or of any portion of the Work, nor shall the making of such payment preclude the Agency from demanding and recovering from the Contractor such damages as it may sustain by reason of the Contractor's failure to comply with the requirements of the Contract.

In the event the Contract is terminated, any funds due the Contractor and retained by the Agency shall become the property of the Agency to the extent necessary to repay to the Agency any excess in the Contract price above the cost of the work completed at the time of the termination. After issuance of notice to discontinue work, no further payment will be made to the Contractor for the work covered by the notice until completion of the Work and final settlement has been made.

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5.08 UNPAID CLAIMS

If, upon or before completion of the Work, or at any time prior to expiration of the period within which claims of lien of stop notices may be filed for record, any person claiming to have performed any labor or to have furnished any materials, supplies or services toward the performance of this Contract, or to have agreed to do so, shall file with the Agency a verified statement of such claim stating in general terms the kind of labor and materials, the value of same and the name of the person to or from whom the same was furnished, together with a statement that the same has not been paid; or if any person shall bring against the Agency or any of its agents any action to enforce such claim or stop notice, the Agency will, until the action is settled, withhold from moneys due to the Contractor an amount sufficient to satisfy the decision of the court together with costs.

5.09 FULFILLMENT OF CONTRACT

The Contractor shall protect and care for all work until the Contract has been fulfilled to the satisfaction of the Agency Engineer, and subsequent acceptance of the Work by the Agency Board of Directors.

The Contractor shall remove all rubbish, excess earth and rock, leaving the site in a neat, orderly and presentable condition before the Agency Engineer makes final inspection of the Work to determine the fulfillment of the Contract.

5.10 FINAL ESTIMATE OF PAYMENT

When the Engineer is of the opinion that the Contractor has completely performed all work required under the Contract, the Engineer shall certify to the Agency that the Work is complete and shall submit to the Contractor a draft of Athe final estimate. The Contractor shall submit a written approval of said final estimate within five (5) calendar days after receipt, or, in the event the Contractor disagrees with said final estimate, the Contractor shall, within said five-day period, file a written statement of all claims to be presented. If the Contractor delays more than five calendar days in approving said final estimate or in presenting claims, the Agency may, at its sole option, treat the delay as a waiver of the Contractor's right to file a written statement of all claims to be presented or extend the time for final payment by the period of such delay.

Pursuant to Section 7107(c) of the Public Contracts Code, within 60 days after the date of completion of the Work, the retention withheld by the Agency shall be released. In the event of a dispute between the Agency and the Contractor, the Agency may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For purposes of this section, "completion" means any of the following:

The occupation, beneficial use, and enjoyment of the Work, excluding any operation only for testing, startup, or commissioning, by the Agency, or its agent, accompanied by cessation of labor on the Work.

The acceptance of the Work by the Agency.

After the commencement of the Work, a cessation of labor on the Work for a continuous period of 100 days or more, due to factors beyond the control of the contractor.

After the commencement of the Work, a cessation of labor on the Work for a continuous period of 30 days or more, if the Agency files for record a notice of cessation or a notice of completion.

If the Contractor disagrees with the Engineer's final estimate and files a timely written statement of his claims, the Engineer will issue, as a semi-final estimate, the proposed estimate submitted to the Contractor, and the Agency will make payment to the Contractor based thereon in accordance with the provision of Subsection 5.10(b). The Engineer then will investigate the Contractor's claims, make any revisions to said semi-final estimate as the Engineer deems appropriate and certify in writing to the Agency the amount and value of the work performed by the Contractor. The Agency then will make final payment to the Contractor based thereon in accordance with the provisions of Subsection 5.10(b).

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5.11 FINAL PAYMENT TERMINATES LIABILITY OF AGENCY

The acceptance by the Contractor of the final payment shall be a release of the Agency and its agents from all claims of and liability to the Contractor for anything done or furnished for, or relating to, the Work or for any act or neglect of the Agency or of any person relating to or affecting the Work.

5.12 NOTICE OF COMPLETION

As required by the California Code of Civil Procedure, and within ten calendar days after date of acceptance of the Work by the Agency Board of Directors, the Agency will file, in the county recorder's office, a notice of completion of the Work.

5.13 CHANGES IN WORK

GENERAL. The Agency reserves and shall have the right to revise the details of the contemplated work or to delete work or add work of a different character or function and have the Contractor perform such revised, decreased or added work as a Contract Achange order@.

> "Extra work" is defined as added work of a different character or function and for which no basis for payment is prescribed, or that involving revisions of the details of the Work in such a manner as to render inequitable payment under items upon which the Contractor bid; or that work to be done under the stipulated prices given in the bidding schedule.
>
> The signing of the Contract by the Contractor will be deemed to be an agreement on the part of the Contractor to perform extra work, as and when ordered by the Agency.
>
> If, required extra work results in delay to the Work, the Contractor will be given an equivalent extension of time.

PROCEDURE. Upon decision of the Agency to have extra work performed, or to delete or modify work, the Agency's representative will so inform the Contractor, acquainting the Contractor with the essential details. The Contractor shall thereupon prepare an estimate of cost and submit said price and estimate to the Agency's representative who will secure the Agency's approval in writing before work is started. The Agency reserves the right to reject any claims as a result of extending the Work under the bid prices, which has not been approved by the Agency in the same manner herein provided.

Adjustment in the compensation due the Contractor shall be determined by one or more of the following methods in the order of precedence listed below:

> Mutually agreeable lump-sum or unit prices, based upon current prevailing fair prices for materials, labor, overhead, and profit. If requested by the Agency's representative, the Contractor shall furnish an itemized breakdown of the quantities and prices used in computing proposed lump-sum and unit prices.

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Force account whereby the Contractor is compensated for furnishing labor, materials, tools, and equipment as follows:

Cost of labor plus 15 percent for workers directly engaged at the jobsite in the performance of the Work. Cost of labor shall include actual wages paid including employer payments to or on behalf of the workers for health and welfare, pension, vacation, and similar purposes plus payments imposed on payroll amounts by State and Federal laws plus subsistence and travel allowance payments to workers.

Cost of material plus 15 percent. Cost of material shall include sales tax, freight, and delivery charges. The Agency reserves the right to furnish such materials as it deems advisable and the Contractor shall not be paid the 15 percent markup on such materials.

For tools and equipment actually engaged in the performance of the Work, rental rates plus 15 percent. The rental rates shall be those prevailing in the area where the Work is performed. No rental charge shall be made for use of tools or equipment having a replacement value of $500 or less.

Subcontractor invoices to the Contractor plus five percent. Subcontractor invoices shall be based upon the above-described cost of labor plus fifteen percent, cost of material plus fifteen percent, and tool and equipment rates plus fifteen percent.

The Contractor shall submit to the Agency's representative for his verification, on a daily basis, work sheets showing an itemized breakdown of labor, materials, tools and equipment used in performing the Work. No payment will be made for work not verified by the Agency's representative.

No payment shall be made for any item not set forth above, including without limitation, Contractor's overhead, general administrative expense, supervision, or damages claimed for delay in prosecuting the remainder of the Work.

The completed change order, when signed by the Contractor and the Agency shall become a contractual extension of the Contract and all sureties, bonds and insurance in effect under the Contract shall be extended intact to include the work described in the change order.

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6.01 RESPONSIBILITY OF CONTRACTOR

The Work shall be under the Contractor's responsible care and charge. The Contractor shall bear all loss and damage whatsoever and from whatever cause, except that caused solely and exclusively by the fault or negligence of the Agency which may occur on or to the Work during the fulfillment of the Contract. If any loss or damage occurs, the Contractor shall immediately make good any such loss or damage and in the event of the Contractor refusing or neglecting so to do, the Agency may itself or by the employment of some other person made good any such loss or damage and the cost and expense of so doing shall be charged to the Contractor.

The Contractor alone shall at all times be responsible for the safety of employees and any Subcontractor's employees and for plant and equipment and any Subcontractor's plant and equipment and the method of prosecuting the Work.

6.02 LIABILITY OF CONTRACTOR

The Contractor shall be liable for all damages and injury which shall be caused to Agency or property on or in the vicinity of the Work or which shall occur to any person or persons or property whatsoever arising out of the performance of this Contract, whether or not such damage or injury be caused by the negligence of the Contractor and whether or not such damage or injury be caused by the inherent nature of the Work as specified except the willful misconduct or sole negligent acts of the Agency, its officers or agents.

In case any suit or legal proceedings shall be brought against the Agency or the Engineer or any of their officers, agents or employees on account of loss or damage sustained by any person or property as a result of the performance of the Work covered by this Contract, whether or not such injuries or damage be due to the negligence of the Contractor and whether or not such injuries or damage be caused by the inherent nature of the Work as specified, the Contractor agrees to assume the defense thereof and to pay all expenses connected therewith including reasonable attorneys' fees and any judgment that may be obtained against the Agency or the Engineer or any of their officers, agents or employees in such suits, and in the event that any lien is placed upon the property of the Agency or the Engineer or any of their officers, agents or employees, as a result of such suits, the Contractor agrees to at once cause the same to be dissolved and discharges by giving bond or otherwise.

6.03 LAWS, REGULATIONS AND PERMITS

The Contractor shall give all notices required by law and comply with all laws, ordinances, rules and regulations pertaining to the conduct of the Work. The Contractor shall be liable for all violations of the law in connection with work furnished by the Contractor. If the Contractor observes that the Drawings or Specifications are at variance with any law, ordinance, rule or regulation, the Contractor shall promptly notify the Engineer in writing and any necessary changes shall be made by instruction or change order. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations and without giving such notice to the Engineer, the Contractor shall bear all cost arising therefrom.

Unless otherwise specified herein, permits and licenses which are necessary only for and during

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the prosecution of the Work and the subsequent guaranty period thereafter shall be secured and paid for by the Contractor while those permits and licenses of regulatory agencies which are necessary to be maintained after the completion of the guaranty period of the Contract will be secured and paid for by the Agency.

6.04 PATENTS AND COPYRIGHTS

The Contractor shall hold harmless, indemnify and defend the Agency and Engineer, their officers, agents and employees against all claims of liability arising from the use of any patented or copyrighted design, device, material or process, furnished, or used by the Contractor or any Subcontractors in the performance of the Work.

6.05 PERMITS AND LICENSES

Unless otherwise provided in the Special Provisions, the Contractor shall obtain at the Contractor's own expense all permits and licenses required for prosecution of the Work and shall pay all fees and taxes properly assessed against equipment or property used in connection with the Work.

6.06 SALES AND USE TAXES

The Contractor shall pay all sales and use taxes assessed by the federal, state or local authorities on materials furnished by the Contract in the performance of the Work.

6.07 LABOR DISCRIMINATION

No discrimination shall be made in the employment of persons on the Work by the Contractor or by any Subcontractor because of race, color or religion of such persons.

6.08 WAGE DETERMINATIONS

As required by the California Labor Code, the Contractor shall pay not less than the prevailing rate of per diem wages as determined by the Director, Department of Industrial Relations, State of California. Copies of such prevailing rate of per diem wages are on file at the Agency office, which copies will be made available to any interested party upon request. The Contractor shall post a copy of such determination at each job site.

The Contractor shall forfeit to the Agency the amount of the penalty set forth in Labor Code Section 1777.7(b), or any subsequent amendments thereto, for each calendar day, or portion thereof, for each worker paid less than the specified prevailing rates for such work or craft in which such worker is employed, whether paid by the Contractor or by any Subcontractor.

In accordance with the provision of the California Labor Code, the Contractor shall secure the payment of compensation to employees.

6.09 APPRENTICES ON PUBLIC WORKS

The Contractor shall comply with all applicable provisions of the California Labor Code relating

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to employment of apprentices on public works projects.

6.10 WORKING HOURS

The Contractor shall comply with all applicable provisions of the California Labor Code relating to working hours. The Contractor shall, as a penalty to the Agency, forfeit $25.00 for each worker employed in the execution of the Contract by the Contractor or by any Subcontractor, for each calendar day during which such worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week, unless such worker received compensation for all hours worked in excess of 8 hours at not less than 1.5 times the basic rate of pay.

6.11 PUBLIC SAFETY AND CONVENIENCE

The Contractor shall at all times conduct work so as to assure the least possible obstruction to traffic and inconvenience to the general public and adequate protection of persons and property in the vicinity of the Work. No street shall be closed to the public without first obtaining permission of the Engineer and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise provided or shown. Toe boards shall be provided to retain excavated material. Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets and other drainage facilities.

The Contractor shall provide adequate barricades, signs, warning lights, watchmen and flagmen as required, as directed by the Engineer and agency having jurisdiction, to protect the Work and the safety of the public. Warning lights using inflammable liquids will not be permitted. Only electrically-operated warning lights will be approved for use. Warning lights shall operate from sunset to sunrise. Barricades shall be painted to increase their visibility at night.

"NO PARKING" signs with specific time frames shall be supplied and posted by the Contractor 48 hours prior to start of work. The Contractor shall notify the local Police Department of such restrictions and obtain approval for the posting.

6.12 TRENCH EXCAVATION

Prior to excavating any trench five feet or more in depth the Contractor shall submit to the Engineer a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. If such plan varies from the shoring system standards established by the Construction Safety Orders of the California Division of Industrial Safety, the plans shall be prepared by a civil engineer registered in California. In no case will the Contractor be permitted to use a shoring, sloping or other protection system less effective than that required by said Orders. Nothing contained herein shall be construed to impose a tort liability upon the Agency, Engineer or any of their officers, agents or employees.

Pursuant to Public Contract Code, Section 7104, any time during the excavation of a trench extending deeper than four feet, the Contractor shall promptly, and before the following conditions

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are disturbed, notify the Agency, in writing, of any:

Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required by law to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

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

(3) 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.

The Agency 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 the Contractor's cost of, or time required for performance of any part of the Work shall issue a change order under the procedures contained in Section 5.13 of the General Conditions.

In the event that a dispute arises between the Contractor and the Agency whether the conditions materially differ, or involve hazardous waste, or cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, the 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. The Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the parties.

6.13 CONCRETE FORMS, FALSEWORK AND SHORING

The Contractor shall comply with the requirements of CAL OSHA, Construction Safety Orders, regarding the design of concrete forms, falsework and shoring and the inspection of same prior to placement of concrete. The Contractor shall employ a civil engineer registered in California to prepare design calculations and working drawings of the falsework or shoring system, to inspect such system prior to placement of concrete and to certify in writing to the Engineer 24 hours prior to placing concrete that the falsework or shoring system complies with the design and that the materials and workmanship are satisfactory for the purpose intended.

6.14 SANITARY PROVISIONS

The Contractor shall provide and maintain sanitary facilities for the use of employees and Subcontractors necessary to comply with the requirements of state and local health departments.

6.15 SAFETY AND HEALTH REGULATIONS

All work shall be performed in accordance with requirements of the California Division of Industrial Safety, the California Occupational Safety and Health Act and the William Steiger Occupational Safety and Health Act of 1970, and all applicable Federal health and safety laws. The Contractor shall submit, to the Engineer, a Mandatory Injury/Illness Program as mandated by S.B. 198. The Contractor shall post at an appropriate location notices pursuant to Proposition 65

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or any hazardous chemicals listed by the State Health Department which are used as part of the construction of the project. The job safety conditions will be the responsibility of the Contractor.

6.16 LABOR, MATERIAL AND PERFORMANCE BONDS

The Contractor shall furnish two bonds each in the amount shown in the Notice Inviting Bids, one as security for the faithful performance of the Work and the other as security for the faithful payment and satisfaction of all persons furnishing materials and performing labor on the Work. The bonds shall be issued by a corporation duly and legally licensed to transact surety business in the State of California. Such bonds shall remain in force throughout the period required to complete the Work. The bond must be executed by a duly licensed surety company approved by the Agency.

6.17 CONTRACTOR NOT RESPONSIBLE FOR DAMAGE RESULTING FROM CERTAIN ACTS OF GOD

As provided in Section 7105 of the Public Contract Act, the Contractor shall not be responsible for the cost of repairing or restoring damaged portions of the Work determined to have been proximately caused by an act of God, in excess of five percent of the contracted amount, provided, that the Work damaged was constructed in accordance with accepted and applicable building standards and the Specifications and Drawings. The Contractor shall obtain insurance to indemnify the Agency for any damage to the Work caused by an act of God if the premium of said insurance coverage is called for as a separate bid item in the proposal for the Work. The term "Act of God" shall include only the following occurrences or conditions and effects: (1) earthquakes in excess of a magnitude 3.5 on the Richter Scale and (2) Tsunami.

6.18 INSURANCE

GENERAL. The Contractor shall procure and maintain for the duration of the Contract, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, Contractor's agents, representatives, employees or subcontractors. The cost of said insurance shall be paid for by the Contractor. The Contractor shall not commence work under this Contract until ALL insurances required herein are obtained and until such insurance has been approved by the Agency. The Contractor shall not allow any Subcontractor to commence work on any subcontract until the insurance required of the Subcontractor has been so obtained and approved.

The Insurance required herein shall be maintained continuously during the life of the Contract up to the date of acceptance of the Work by the Agency Board of Directors, governing body. However, the Contractor's liabilities under this Contract shall not be limited in any way to the insurance coverage required. Each insurance policy required herein shall be endorsed to state that coverage shall not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the Agency. Insurance is to be placed with insurer's having at least an "A:XIII" policyholder's rating in accordance with the current Best's Key Rating Guide or equivalent. In addition, any and all insurers must be authorized to conduct business in the State of California, as evidenced by a listing in the official publication of the Department of Insurance of the State of California.

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The insurance policies required by this section shall waive all right to subrogation against the Agency and its officers, employees, representatives, and volunteers.

The Contractor's insurance coverage shall be primary insurance with respect to the Agency, its directors, officials, employees, designated agents and volunteers. Any insurance or self-insurance maintained by the Agency, its directors, officials, employees, designated agents or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

GENERAL LIABILITY AND AUTOMOBILE LIABILITY COVERAGE. The policies are to contain, or be endorsed to contain the following provisions:

The Agency, its directors, officials, employees, designated agents and volunteers are to be covered as insures with the following: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, leased or used by the Contractor; or automobiles owned, leased or used by the afforded to the Agency, its directors, officials, employees, designated agents or volunteers.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Agency, its directors, officials, employees, designated agents or volunteers. 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.

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.

WORKER'S COMPENSATION INSURANCE. The Contractor shall procure and maintain workers' compensation insurance as required by applicable state law for all employees to be engaged in work at the site of the project under this Contract and, in case of any such work sublet, the Contractor shall require the Subcontractor to provide workers' compensation insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's coverages shall be subject to all of the same requirements stated herein for the Contractor's insurance coverage. In case any class of employees engaged in hazardous work under this Contract is not protected under the worker's compensation statue, the Contractor shall provide and shall cause each Subcontractor to provide adequate employers' liability insurance for the protection of such employees that are not otherwise protected.

CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE AND VEHICLE LIABILITY INSURANCE. The Contractor shall procure and maintain contractor's public liability insurance, contractor's property damage insurance and vehicle liability insurance.

SUBCONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE AND VEHICLE LIABILITY INSURANCE. The Contractor shall either: (1) require each subcontractor to procure and to maintain subcontractor's public liability and property damage insurance and vehicle liability insurance of the type and in amounts specified, or (2) insure the activities of Subcontractors in the Contractor's own policy, in like amount.

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BUILDER'S RISK INSURANCE (ALL RISK COVERAGE). The Contractor shall procure and maintain builder's risk insurance (all risk coverage) on a 100 percent completed value basis for the benefit of the Agency, the Contractor and Subcontractors as their interest may appear.

MINIMUM SCOPE OF INSURANCE. Coverage shall be at least as broad as:

Insurance Services Office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability; or Insurance Services Office Commercial General Liability Coverage ("occurrence" From CG 0001).

Insurance Services Office form number CA 0001 (Ed. 1/78) covering Automobile Liability, covering Automobile Liability, code 1 "any auto" and endorsement CSA 0025.

Workers' Compensation insurance as required by the State of California and Employers Liability insurance.

MINIMUM LIMITS OF INSURANCE. Contractor shall maintain limits no less than the following unless modified in the Special Provisions:

Comprehensive General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

Workers' Compensation: Limits as required by the State of California and Employers Liability limits of $1,000,000 per accident.

Contractors' Public Liability: $1,000,000 for all damages arising out of bodily injuries or death of one person, and, subject to that limit for each person, a total limit of $1,000,000 for all damages arising out of bodily injury to or death of two or more persons in any one accident.

Property Damage Liability: $1,000,000 for all damages arising out of injury to or destruction of property in any one accident, and subject to that limit per accident, a total limit of $1,000,000 for all damages arising out of injury to or destruction of property.

DEDUCTIBLE AND SELF-INSURED RETENTIONS. Any deductibles or self-insured retentions must be declared to and approved by the Agency. At the option of the Agency, either the insurer shall reduce or eliminate such deductibles or self-insured retentions with respect to the Agency, its directors, officials, employees, designated agents and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

VERIFICATION OF COVERAGE. The Contractor shall furnish the Agency with certificates of

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insurance and with original endorsements affecting coverage required by this Section. 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 on forms provided by the Agency and are to be received and approved by the Agency before work commences.

The certificates of insurance shall name as additionally insured the Agency agents listed in the Special Provisions.

Full compensation for all premiums which the Contractor and the subcontractors are required to pay on all the insurance described above shall be as included in the prices paid for the various items of work to be performed under the contract, and no additional allowance will be made therefor or for additional premiums which may be required by extension of the policies of insurance.

6.19 LIABILITY OF AGENCY AND ENGINEER

To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Agency, Engineer and their officers, agents and employees against and from all claims, suits or actions arising under or by reason of the Work agreed to be undertaken in the Contract or any performance of the Work from the sole negligence of the Contractor or employees or agents or negligence which could be jointly attributed to Agency employees or the Contractor, but not from the sole negligence or willful misconduct of the Agency or the Engineer.

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STANDARD SPECIFICATIONS

SPECIAL CONDITIONS

SECTION I GENERAL

1. Summary of Work

The work to be performed under this contract shall consist of all plant, labor, equipment, materials, tools, transportation, and services required for the fulfillment of the contract in strict accordance with the contract documents. The work shall be complete, and all work, materials, and services not expressly shown or called for in the contract documents which may be necessary for the complete and proper construction of the work in good faith shall be performed, furnished, and installed by the Contractor as though originally so specified or shown, at no increasing cost to the Owner.

2. Order of Work

The Contractor shall have the option of completing the work in any order unless noted otherwise within Section 01015 of the Technical Specifications. The order of work shall be consistent with the duration of contract to ensure that the work is completed within the time period allocated.

3. Completion of Work

The contract period shall commence fifteen (15) calendar days from the date established in the Notice-to-Proceed. All work shall be completed within 365 calendar days from the Contract start date stipulated in the Notice To Proceed.

4. Construction Surveying

A. Contractor Provided Surveying

(1) Notwithstanding any provision of the General Conditions indicating that the Agency will retain a surveyor, the Contractor shall retain and pay for a Land Surveyor or Civil Engineer licensed in the State of California to perform all surveying required for construction of the Work.

(2) Surveying services shall include, but not be limited to:

(a) Construction staking for lines and grades;
(b) Establishment and transfer of horizontal and vertical control;
(c) Offset stakes, hubs, blue tops, and slope stakes as required;
(d) Utility layout and structure staking;
(e) Verification of finished grades and elevations; and
(f) Preparation of cut sheets and grade verification documentation.

B. Basis of Control

(1) Horizontal Control. All staking shall conform to the Basis of Bearings and

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coordinate system shown on the Plans.

(2) Vertical Control. Contractor shall verify all benchmarks prior to use. Any discrepancy shall be immediately reported to the Engineer before proceeding.

(3) Contractor is responsible for all calculations required to translate plan information into field layout.

C. Preservation of Survey Control

(1) Contractor shall preserve all existing benchmarks, monuments, reference points, and survey control marks.

(2) If such control is disturbed, destroyed, or removed by Contractor or its subcontractors, Contractor shall:

(a) Immediately notify the Engineer; and

(b) Retain a California-licensed Land Surveyor to reestablish such control at Contractor's expense.

D. Cut Sheets / Verification

(1) Contractor's surveyor shall provide cut sheets or grade verification documentation to the Engineer upon request prior to placement of concrete, pipe bedding, base, asphalt, or other permanent improvements.

(2) The Engineer's review of cut sheets does not relieve Contractor of responsibility for accuracy.

E. Tolerances and Responsibility

(1) Contractor is solely responsible for constructing the Work to the lines and grades shown on the Plans within the tolerances specified in the Contract Documents.

(2) Correction of work found to be out of tolerance due to surveying errors shall be performed at Contractor's sole expense.

(3) Nothing in this Section transfers design responsibility to the Contractor.

F. Record (as-built) Survey

(1) Upon completion of Work, Contractor shall provide record (as-built) survey information including:

a) Horizontal and vertical location of improvements;

b) Rim and invert elevations for pipelines and structures;

c) Coordinates of valves, fittings, and appurtenances; and

d) Digital file (AutoCAD or compatible) and signed hard copy.

(2) Format shall be subject to Agency approval.

5. Special Requirements

A. Laws and Regulations

(1) In performing the work within the jurisdiction of other public and private agencies, the Contractor shall comply with all applicable rules, regulations, ordinances, and all other lawful requirements of said entities. Except as otherwise provided, the Contractor shall obtain such paving, excavation, and related permits as may be required by said rules, regulations, ordinances, and requirements.

(2) Wherever necessary or required for the convenience of the public or individual residents at street or highway crossings, private driveways, or

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elsewhere, the Contractor shall provide suitable temporary bridges over unfilled excavations, except in such cases as the Contractor shall secure the written consent of the individual or authorities concerned about owning such temporary bridges, or where bridges are impractical due to the limited width of the street, as determined by the Engineer. All such bridges shall be maintained in service until access is provided across the backfilled trench. Temporary bridges for street and highway crossings shall conform to the requirements of the authority having jurisdiction in each case, and the Contractor shall adopt designs furnished by the authority for such bridges, or shall submit designs to the authority for approval, as may be required.

(3) Neither the terms hereof nor anything shown on the drawings in connection with rights-of-way provided by the Owner shall be construed to entitle the Contractor to conduct operations in the rights-of-way in violation of any city or county ordinance or regulation restricting interference with watercourses and drainage channels. The Contractor shall take adequate precautions against obstructing storm water flow in any affected watercourse or channel and shall not deposit excavated materials on any area where they might interfere with or be subject to erosion from such flow.

(4) Except as may specifically be provided to the contrary, nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street or way during performance of the contract work, and he shall so conduct his operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets and ways.

(5) In addition to the requirements specified in the General Conditions, the Contractor shall, in particular and without limitation, comply with the Construction Safety Orders issued by the Division of Industrial Safety of the State of California and the Safety and Health regulations for Construction promulgated by the Bureau of Labor Standards of the United States Department of Labor, whichever is the more restrictive, and such other rules or regulations as now or in the future may be applicable to the work to be performed under the contract.

B. Improvements

(1) The Project construction is in close proximity to improvements such as buildings and other structures, fences, paved areas, driveways, sewers, water mains, utilities, and other substructures, including trees and other vegetation. All said improvements shall be maintained in place and shall not be disturbed or damaged, except for such removal of improvements within the right-of-way as is unavoidable in order to accommodate required excavation.

(2) Where necessary for purposes of construction, the Contractor shall move interfering structures, improvements, or portions thereof temporarily to

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provide space for his operations. Any such building, fence, block wall, sewer, storm drain, utility, traffic signal control pad, or other structure or improvement so moved, damaged, or disturbed by the Contractor shall be completely replaced and restored by him except as may otherwise be provided under this section, to a condition at least as good as its condition immediately prior to its disturbance by his operations, and the replacement and restoration of said improvements or structures shall be exactly in the respective positions which they occupied at the time of beginning of the work under the contract.

C. Bench Marks and Monuments. The Contractor, prior to commencing any construction whereby he might move or disturb survey monuments or bench marks of others, shall give the Owner at least 15 days prior notice, in writing, in order that these monuments may be referenced for replacement. Shall the Contractor accidentally disturb or destroy any such monuments or bench marks, he shall immediately notify the agency having jurisdiction. Any monuments disturbed or destroyed during the work without being referenced shall be replaced to the satisfaction of the Owner thereof or public agency having jurisdiction therefor, at the cost and expense of the Contractor.

D. Traffic

(1) For the protection of traffic in public streets and ways, the Contractor shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the State of California Department of Transportation.

(2) Prior to the start of construction, the Contractor shall notify the Police, Fire, Traffic, and Engineering Departments of all jurisdictional agencies involved giving the approximate starting date, approximate completion date expected, and the name and telephone number of a responsible person who may be contacted in the event of a condition requiring immediate attention. The Contractor shall likewise notify the agencies at least 48 hours in advance of completely or partially closing any public thoroughfare or of opening any public thoroughfare which has been completely or partially closed.

(3) Any shifting of traffic from one lane to another, which is necessary in order to maintain the required number of lanes, shall be directed in such manner that traffic may move smoothly across the work without any sudden changes. The minimum radius allowed for transitioning traffic from one lane to another shall be 250 feet.

(4) The Contractor may post “No Parking” signs within the construction areas, provided he has obtained permission therefor from the local agency having jurisdiction to regulate such parking.

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(5) Traffic lanes mentioned herein and not otherwise specified shall have a minimum width of 12 feet. Furthermore, all traffic lanes shall have 2 feet clearance from curbs and other obstructions, and 5 feet clearance form any excavation.

(6) Ingress to and egress from private driveways shall be maintained and, unless otherwise specified herein, intersecting highways and streets shall be kept open at all times.

(7) The Contractor shall protect and maintain in operation all street lighting systems and traffic signal control pads, and, shall these or other similar facilities be damaged in any way during construction, the Contractor shall repair or replace these facilities to the satisfaction of the agency having jurisdiction.

(8) Temporary striping of pavement shall be removed by the Contractor by wet sandblasting at his expense.

E. Fire Prevention and Control

(1) General. The Contractor, his employees, subcontractors and their employees, shall obey all Federal, State and local fire laws and ordinances. The Contractor shall abide by any requirements to clear away weeds, shrubs or other growth or debris, as may be made by the County and/or State fire prevention authorities, resulting from the Owner's pipeline construction. The Contractor shall furnish to the Engineer a current directory of available personnel and a list of project construction equipment suitable for fire-fighting purposes.

(2) Spark Arrestors. The exhaust pipes of all internal combustion engines used in the work shall be equipped with approved spark arrestors.

(3) Fire Suppression. If fire occurs in the construction area along the line of the work, the entire project crew shall immediately be alerted and, to the extent it can safely do so, the Contractor shall dispatch sufficient men and equipment, up to the total manpower and equipment available for fire-fighting on the project, to suppress said fire and prevent it from spreading.

(4) Hydrants and Valves. Free access shall be maintained at all times to fire hydrants and water and gas valves.

F. Utility Companies and Agencies

(1) Southern California Edison and The Gas Company. The Contractor's attention is directed to overhead power and underground gas distribution lines within the project area. The Contractor shall notify proper representatives from each of these agencies not less than 72 hours prior to

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starting any work in the vicinity of said facilities.

(2) General Telephone & Electric. The Contractor's attention is directed to the facilities owned by Verizon (formerly Frontier) and located in the vicinity of the proposed work. The Contractor shall notify Verizon and SCE not less than 72 hours prior to excavation in the vicinity of said facilities.

6. Pre-construction Verification of Underground Utilities

The Engineer has, by a search of known records, endeavored to locate and indicate on the Drawings all utilities which exist within the limits of the work. However, the accuracy or completeness of the utilities indicated on the Drawings is not guaranteed. Service connections to adjacent properties may or may not be shown on the drawings. It shall be the responsibility of the Contractor to determine the location of all utilities and their service connections which may interfere with construction. Within ten (10) calendar days of award of Contract, the Contractor shall submit to the Engineer a plan showing the Contractors proposed method and location of field verification (potholing) of utilities as deemed necessary by the Contractor. Contractor shall perform and complete field verification of utilities within 5 calendar days of approval, of the Contractors proposed plan, by the Engineer.

Upon completion of utility verifications, Contractor shall submit all utility verification findings to the Engineer. Upon review of findings by the Engineer, revisions to the design plans may be required as directed by the Engineer. Owner will have ten (10) working days to revise the design as may be required. Contractor shall allow sufficient time in the Contractor's schedule for performance of the above work.

7. Resolution of Construction Claims

A. In accordance with section 20104 et. Seq. of the California Public Contractor Code, this section applies to all claims of $375,000 or less which arise between the Contractor and the Agency under this Contract for:

(1) A time extension;

(2) Payment of money or damages arising from work done by or on behalf of the Contractor pursuant to this CONTRACT and payment of which is not otherwise expressly provided for as the Contractor is not otherwise entitled; or

(3) An amount the payment of which is disputed by the Agency.

B. For any claim set out in Paragraph "A", above, the following requirements apply:

(1) 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 herein is intended to extend the time limit or supersede

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notice requirements otherwise provide by Contractor for the filing of claims.

(2) For claims of less than Fifty Thousand Dollars ($50,000), the 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 or claims the Agency may have against the Contractor.

If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the Agency and the Contractor.

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

(3) For claims of over Fifty Thousand Dollars ($50,000) and less than or equal to Three Hundred Seventy-Five Thousand Dollars ($375,000), the 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 or claims the Agency may have against the Contractor.

If additional information is therefore required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the Agency and the Contractor.

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

(4) If the Contractor disputes the Agency's written response, or the Agency fails to respond within the time prescribed, the Contractor may notify the Agency, in writing, either within 15 days of receipt of the Agency response or within 15 days of the 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 Agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(5) If following the meet and confer conference, the claim or any portion remains in dispute, the Contractor may file a claim pursuant to Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section

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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 Contractor submits its written claim pursuant to the subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference.

C. In accordance with Public Contracts Code Section 9204, the following procedures are established for any claims that exceed Three Hundred Seventy-Five Thousand Dollars ($375,000):

(a) Upon receipt of such claim pursuant to this section, the Agency will conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, the Agency and Contractor may, by mutual agreement, extend the time period provided in this subsection.

(b) Contractor shall furnish reasonable documentation to support the claim.

(c) If the Agency needs approval from its Board of Directors to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the claim, and the Board of Directors 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 Agency shall have up to three days following the next duly publicly noticed meeting of the Board of Directorsafter 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 Agency issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) If the Contractor disputes the Agency's written response, or if the Agency fails to respond to a claim issued pursuant to this section within the time prescribed, the Contractor 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 Agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(a) 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 Agency shall provide the Contractor 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 Agency issues its written statement. Any disputed portion of the claim, as identified by the Contractor

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in writing, shall be submitted to nonbinding mediation, with the Agency and the Contractor sharing the associated costs equally. The Agency and the Contractor 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.

(b) 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.

(c) Unless otherwise agreed to by the Agency and the Contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under this Section 7 to mediate after litigation has been commenced.

(d) This section does not preclude the Agency 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 Agency to respond to a claim from the Contractor within the time periods described in this subsection 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 Agency'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 Contractor.

(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 the Agency because privity of contract does not exist, the Contractor may present to the Agency a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on their 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 Agency shall furnish reasonable documentation to support the

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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 Cntractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

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

(1) 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.

(2) 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 this subdivision consistent with the rules pertaining to judicial arbitration.

In addition to Chapter 2.5 (commencing with section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure (A) arbitrators shall, when possible, be experienced in construction law, and (B) any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that Chapter, also pay the attorneys' fees on appeal of the other party.

E. The Agency shall not fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in this Contract.

F. In any suit filed under section 9204 or 20104.4 of the California Public Contract Code the 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.

8. Digging Trenches or Excavations; Notice on Discovery of Hazardous Waste or Other Unusual Conditions; Investigations; Change Orders; Effect on Contract

If this contract involves digging trenches or other excavations that extend deeper than four feet below the surface, the following shall apply pursuant to Public Contract Code section 7104:

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The Contractor shall promptly, and before the following conditions are disturbed, notify the Agency in writing, of any:

A. Material that the 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. Subsurface or latent physical conditions at the site differing from those indicated.

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

D. The Agency 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 the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order for the procedures described in the Contract.

E. In the event that a dispute arises between the Agency and the 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, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, the Contractor shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

9. Retention Proceeds: Withholding; Disbursement

In accordance with section 7107 of the Public Contracts Code, the following shall apply to this Contract:

A. The retention proceeds withheld from any payment by the Agency from the original Contractor, or by the original Contractor from any subcontractor shall be subject to this paragraph 9.

B. Within 60 days after the date of completion of the Work, the retention withheld by the Agency shall be released. In the event of a dispute between the Agency and the original Contractor, the Agency may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For the purposes of this paragraph, "completion" means any of the following:

(1) The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup or commissioning, by the Agency, accompanied by cessation of labor on the work of improvement.

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(2) The acceptance by the Agency of the work of improvement.

(3) After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the Contractor.

(4) After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the Agency files for record of notice of cessation or a notice of completion.

C. Subject to subparagraph B(4), within 7 days from the time that all or any portion of the retention proceeds are received by the original Contractor, the original Contractor shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original Contractor is specifically designated for a particular subcontract, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.

D. The original Contractor may withhold from a subcontractor its portion of the retention proceeds if a bonafide dispute exists between the subcontractor and the original Contractor. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.

E. In the event that retention payments are not made within the time periods required by this section, the Agency or original Contractor shall be subject to a charge of two percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorneys' fees and costs.

F. Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.

10. Timely Progress Payments. Interest: Payment Requests

A. In accordance with the provisions of the Public Contract Code Section 20104.50, if the Agency fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from the Contractor, the Agency 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.

B. Upon receipt of a payment request, the Agency shall act in accordance with both of the following:

(1) Each payment request shall be reviewed by the Agency as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.

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(2) Any payment request determined not to be a proper payment request suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

C. The number of days available to the Agency to make a payment without incurring interest pursuant to this paragraph shall be reduced by the number of days by which the Agency exceeds the seven-day requirement set forth above.

D. For purposes of this paragraph:

(1) A "progress payment" includes all payments due the Contractor, except that portion of the final payment designated by the contract as retention earnings.

(2) A payment request shall be considered properly executed if funds are available for payment of the payment request, and payment is not delayed due to an audit inquiry by the financial officer of the Agency.

11. Public Works Contracts; Assignment to Awarding Body

In accordance with Section 7103.5 of the California Public Contract Code, the Contractor and Subcontractors shall conform to the following requirements. 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.

12. Certified Payroll Requirements

The Contractor and all subcontractors shall comply with California Labor Code Section 1776 and all applicable Department of Industrial Relations (DIR) requirements. Certified payroll records shall be submitted electronically through the DIR's electronic Certified Payroll Reporting (eCPR) system on a weekly basis. Each payroll record shall include a Statement of Compliance and shall be submitted within seven (7) days of the end of each payroll period. The Contractor shall be responsible for ensuring that all subcontractors submit certified payroll records in a timely manner.

Certified payroll records shall be maintained for a minimum of three (3) years and shall be made available for inspection by the Agency upon request. Failure to comply with certified payroll reporting requirements may result in withholding of progress payments and other remedies as allowed by law.

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SECTION II GRANT REQUIREMENTS – STATE REQUIREMENTS

1. Additional Insured

A. Certificates and required endorsements shall be provided to and approved by the Agency prior to commencement of work and as a condition precedent to issuance of the Notice to Proceed.

B. SWRCB (Agreement No. D2102065) – Additional Insured and Certificate Copies. For any policy of insurance concerning or covering construction of the Project, Contractor shall cause, and shall require all contractors and subcontractors of any tier to cause, a certificate of insurance to be issued showing the State Water Resources Control Board, its officers, agents, employees, and servants as additional insured. Contractor shall provide the Agency copies of all such certificates (and additional insured endorsements, if requested) sufficiently in advance to allow Agency transmittal to the State Water Resources Control Board Division of Financial Assistance, and in all cases prior to the commencement of construction.

C. DWR / IRWM (Grant Agreement No. 4600014979 via Mojave Water Agency) Additional Insured and Certificate Copies. For any policy of insurance concerning or covering construction of the Project, Contractor shall cause, and shall require all contractors and subcontractors of any tier to cause, a certificate of insurance to be issued showing the Mojave Water Agency, its officers, directors, employees, agents and its respective heirs, legal representatives, successors and assigns, from any and all claims, demands, liabilities, expenses (including reasonable attorney's fees and disbursements, court costs, judgement, settlements and fines) arising out of, resulting from, or in connection with the performance of this work.

2. Pipes Wash Biological Resources and Jurisdictional Areas

The following requirements are based on the California Department of Fish and Wildlife Streambed Alteration Agreement No. EPIMS-SBR-64495-R6, *Pipes Wash and Associated Streams*, included by reference in Attachment D. Prior to mobilization or commencement of any Project-related activity at the site, the Contractor shall attend a preconstruction biological coordination meeting with BDVWA and the Project Biologist to review the Contractor's responsibilities and applicable permit requirements. The Contractor shall not begin work until this meeting has been completed and authorization to proceed has been provided by BDVWA. The principal biological compliance and monitoring requirements affecting the Contractor's scheduling and construction activities are summarized below.

A. BIO-1 General Biological Compliance and Monitoring

(1) The following measures are based on the Project's Biological Resources Assessment and Jurisdictional Delineation for improvements within Pipes Wash.

(2) The Owner will furnish the CDFW-approved Designated Biologist(s), permit-required biological surveys and monitoring, and agency coordination, unless noted otherwise in the Contract Documents. Contractor shall provide access, cooperate with the Designated Biologist(s), and comply with directions applicable to

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Contractor's work.

(3) Contractor shall provide at least seven (7) calendar days' notice to Owner/Engineer before initial ground disturbance in sensitive areas and at least 48 hours' notice before re-initiating such work after a shutdown or relocation. Contractor shall not enter a sensitive area until Owner/Engineer confirms biological clearance.

(4) If the Designated Biologist(s) directs that work stop to avoid take or comply with permit, CEQA/MMRP, or other environmental requirements, Contractor shall stop work in the affected area immediately and shall not resume until Owner/Engineer confirms biological clearance and receipt of any required agency approval.

(5) The final CDFW Streambed Alteration Agreement EPIMS-SBR-64495-R6, including amendments, is incorporated herein by reference. Contractor shall keep a copy available at the Project site and comply with all provisions applicable to Contractor's work.

(6) Before accessing the work area, all personnel shall complete a project-specific Worker Environmental Awareness Program conducted by the Designated Biologist(s). Training shall address special-status wildlife and plants, western Joshua trees, work limits, invasive species, trash control, and encounter and reporting procedures. Contractor shall maintain sign-in records and ensure new personnel are trained before entry.

(7) The Owner's Designated Biologist(s) will perform permit-required surveys and pre-activity sweeps, including surveys for special-status plants and Le Conte's thrasher where applicable. Contractor shall not enter uncleared areas and shall immediately report wildlife or sensitive-plant observations, trapped wildlife, spills, disturbance outside approved limits, and potential permit violations to Owner/Engineer and the Designated Biologist(s).

B. BIO-2 Desert Tortoise – Preconstruction Surveys / Avoidance and Worker Awareness

(1) All Contractor personnel, including subcontractors, inspectors, equipment operators, and delivery personnel who will access desert tortoise habitat shall complete the project-specific Worker Environmental Awareness Program required under BIO-1 before performing work.

(2) Contractor shall enforce a maximum vehicle speed of fifteen (15) miles per hour for all on-road and off-road Project-related vehicles within the work area and on access routes within desert tortoise habitat, unless a lower speed is posted or directed by the Owner/Engineer.

(3) The CDFW-approved Designated Biologist(s) shall conduct a protocol-level presence/absence survey within the Project area and a 50-foot buffer, or any greater buffer required by the Contract Documents, no more than 48 hours before Project activities and at other times required by applicable permits, the CEQA/MMRP, or Owner/Engineer.

(4) Surveys shall be performed in accordance with USFWS 2019 desert tortoise survey methodology, providing 100 percent visual coverage using perpendicular transects.

(5) Results and Actions.

a. If absence is confirmed, the Designated Biologist(s) shall implement measures to minimize the potential for desert tortoise to enter the work area during active work.

b. If a desert tortoise, active burrow, or sign is detected, Contractor shall stop work in the affected area and fully avoid impacts unless and until

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Owner/Engineer confirms biological clearance and receipt of any required CDFW authorization.

C. BIO-3 Burrowing Owl – Focused and Preconstruction Surveys
   (1) A CDFW-approved Designated Biologist(s) shall conduct a western burrowing owl habitat assessment at least thirty (30) calendar days before Project activities. If suitable habitat, burrows, or sign are identified, focused surveys shall be completed consistent with the CDFW Staff Report on Burrowing Owl Mitigation (2012 or most current).
   (2) The Designated Biologist(s) shall inspect suitable burrows within three (3) days before Project initiation, including a final inspection within 24 hours before ground disturbance. Alternative focused-survey timing shall be subject to CDFW approval where the standard survey schedule is infeasible.
   (3) If a burrowing owl or evidence of occupancy is detected, Contractor shall stop work and fully avoid the occupied habitat. Contractor shall implement buffers and measures directed by the Designated Biologist(s) and Owner/Engineer. Exclusion or closure of occupied burrows shall not occur unless specifically authorized by CDFW and directed by Owner/Engineer.

D. BIO-4 American Badger – Burrow Surveys, Den Avoidance, and Inactive Den Procedures
   (1) Within 14 to 21 days before surface-disturbing activities, the CDFW-approved Designated Biologist(s) shall survey for American badger dens and sign within the Project site and a 50-foot buffer, subject to property-access limitations.
   (2) If an active or potentially occupied den is identified:
      a. Active natal dens shall not be disturbed, and a minimum 500-foot no-disturbance buffer shall be maintained during the breeding season unless CDFW approves a reduced buffer.
      b. Only confirmed inactive and unoccupied dens may be excavated. If the entire den cannot be visually inspected, the Designated Biologist(s) shall monitor the den for three consecutive nights using infrared cameras before authorizing excavation and backfill.
   (3) Contractor shall not block, excavate, or passively relocate an occupied den unless separately authorized by CDFW. Authorized excavation shall be performed cautiously under the direction of the Designated Biologist(s).

E. BIO-5 Desert Kit Fox – Pre-Activity Sweeps and Burrow Avoidance
   (1) Within 14 to 21 days before surface-disturbing activities, the Designated Biologist(s) shall survey for desert kit fox dens and sign within the Project site and a 50-foot buffer, subject to property-access limitations. The Designated Biologist(s) shall also conduct a pre-activity sweep of the work area, access routes, and an appropriate surrounding buffer within two (2) hours before initiating Project activities each day.
   (2) If a kit fox den or potential den is identified, work shall not proceed in the affected area until avoidance measures are established. Active natal dens shall receive a minimum 500-foot no-disturbance buffer unless CDFW approves a reduction. Contractor shall not capture, handle, block, or excavate wildlife or dens except as directed by the Designated Biologist(s) and authorized by CDFW.

F. BIO-6 Nesting Birds – Surveys, Buffers, and Monitoring
   (1) Nesting bird surveys shall be performed by the CDFW-approved Designated Biologist(s) no more than three (3) days before vegetation removal or ground

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disturbance, regardless of time of year.

(2) Buffers (Minimums).
   a. Passerines: minimum 300 feet
   b. Raptors: minimum 500 feet
   Buffers may be adjusted only as allowed by the applicable permit and CEQA/MMRP requirements and as directed by the Designated Biologist(s) and Owner/Engineer.

(3) Active nests and buffer adequacy shall be monitored daily until fledging or nest failure is confirmed. The biologist may stop work if nesting pairs show disturbance.

(4) Contractor shall secure open pipes, equipment, and construction materials as directed to discourage nesting. Deterrent materials shall not create an entanglement hazard. Contractor shall immediately report new nests or nesting behavior to the Designated Biologist(s).

G. BIO-7 Jurisdictional Area Limits and Permit Conditions (Pipes Wash)

(1) Work within the Pipes Wash jurisdictional area shall be performed only within the limits shown on the Plans, marked in the field, and allowed by permit conditions. Contractor shall use existing access routes and shall not conduct cross-country travel or disturb habitat outside approved limits.

(2) Contractor shall comply with conditions of all Owner-obtained permits and authorizations applicable to work in Pipes Wash, including the final CDFW Streambed Alteration Agreement. Contractor shall not place fill, spoil, equipment, staging, or stockpiles outside approved limits.

(3) Work within the streambed shall occur only during dry weather and no-flow conditions. Contractor shall cease work and install required erosion controls before anticipated precipitation. No streambed work shall occur within 24 hours after precipitation that results in stream flow.

(4) Open trenches, excavations, and holes shall be inspected at least twice daily and immediately before backfill. An escape ramp no steeper than 30 degrees shall be provided at each end of open trenches. Open pipes and similar materials shall be inspected for wildlife before movement, burial, or capping.

(5) Welded-weave and monofilament erosion-control netting are prohibited. Fiber rolls and wattles shall be certified weed-free and wildlife-safe. Fueling and equipment maintenance shall occur outside Fish and Game Code section 1602 resources; decontamination runoff shall be contained. Food and trash shall be stored in animal-resistant, closable containers, and dust control shall not create standing water or puddles.

(6) Contractor shall segregate and replace the upper approximately six (6) inches of topsoil where directed, restore preconstruction grades and contours, remove temporary materials and debris, replace natural materials or refugia where feasible, and reseed disturbed areas when required by the approved Restoration and Revegetation Plan.

(7) Contractor shall provide photographs, dates, quantities, and other construction information reasonably requested by Owner/Engineer for permit compliance and final reporting.

3. Western Joshua Tree Incidental Take Permit Conditions

A. Designated Biologist(s).

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The Agency shall submit to CDFW in writing the name, qualifications, business address, and contact information of the Designated Biologist(s) using the Biologist Resume Form (Attachment 7) or in another format containing the same information at least 5 days before starting Project Activities. The Agency shall ensure that the Designated Biologist(s) is/are knowledgeable and experienced in the biology, natural history, collecting, and handling of Wester Joshua Trees (WJT). The Designated Biologist(s) shall be responsible for monitoring Project Activities to help avoid and minimize impacts to, and the taking of, WJT, including any new stems or trunks arising from the ground that were not identified in the census, as well as to minimize disturbance of WJT habitat, to the maximum extent possible. The Agency shall obtain CDFW approval of the Designated Biologist(s) in writing before starting Project Activities and shall also obtain approval in advance, in writing, if the Designated Biologist(s) must be substituted.

B. Designated Biologist Authority.
To ensure compliance with all applicable permit Conditions of Approval, the Designated Biologist(s) shall immediately stop any activity that does not comply with the Permit and/or order any reasonable measure to avoid the unauthorized take of WJT. The Agency shall provide unfettered access to the Project Site and otherwise facilitate the Designated Biologist(s) in the performance of his/her/their duties. If the Designated Biologist(s) is/are unable to comply with the Permit, then the Designated Biologist shall notify the Designated Representative who shall notify CDFW immediately. The Agency shall not enter into any agreement or contract of any kind, including but not limited to a non-disclosure agreement or confidentiality agreement, with its contractors and/or the Designated Biologist(s) that prohibit or impede open communication with CDFW, including regarding the results of any surveys, reports, studies, take of WJT, or violation(s) of this Permit or the Fish and Game Code.

C. Compliance Monitoring.
(1) The Designated Biologist(s) shall be on-site weekly when trenching and paving Project Activities occur. The Designated Biologist shall conduct compliance inspections at least bi-weekly during periods of inactivity until trenching and paving activities are completed. The Designated Biologist(s) shall conduct compliance inspections to:
(2) Minimize take of WJT;
(3) Identify new WJT stems or trunks arising from the ground within the Project Site;
(4) Prevent unlawful take of WJT;
(5) Check for compliance with all measures of this Permit;
(6) Check all buffers; and ensure that signs, stakes, and fencing are intact, and that Project Activities are only occurring in the Project Site. The Designated Biologist(s) shall prepare weekly written observation and inspection records summarizing oversight activities and compliance inspections for days onsite.

D. Education Program.
The Agency shall conduct an education program for all persons employed or otherwise working on the Project Site before performing any Project Activities. The program shall consist of a presentation from the Designated Biologist(s) that includes a discussion of the biology of WJT, information about the distribution and habitat needs of WJT,

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sensitivity of WJT to human activities, and WJT's status pursuant to the WJTCA, including legal protection, recovery efforts, penalties for violations, and Project-specific protective measures described in this Permit. The Agency shall prepare and distribute wallet-sized cards, fact sheet handout, or digital document containing this information that workers shall carry on the Project Site. The Agency shall provide interpretation for non-English speaking workers. The same Education Program shall be provided to any new workers before they are authorized to perform work in the Project Site. Upon completion of the program, employees shall sign a form stating they attended the presentation and understand all protection measures. This training shall be repeated at least once annually while Project Activities are occurring for long-term and/or permanent employees that will be conducting work on the Project Site. This education program can be combined with and/or incorporated into other processes, such as the Worker Environmental Awareness Program for the Project.

E. Construction Monitoring Documentation.

The Designated Representative shall maintain construction-monitoring documentation on-site in either hard copy or digital format throughout the construction period, which shall include any Permit compliance inspection records or notes, a copy of this Permit with attachments, including the census, and a list of signatures of all personnel who have successfully completed the education program as specified in Condition of Approval 4.4. Permittee shall ensure a copy of the construction monitoring documentation is available for review at the Project Site or as otherwise requested by CDFW.

F. Additional Contractor's Environmental Management Practices

(1) Clearing of the Project area, including blading of new access or work areas, shall be minimized to the extent possible. Disturbance to shrubs shall be avoided where feasible. If shrubs cannot be avoided during equipment operation or vehicle use, they shall be crushed rather than excavated or removed, where feasible.

(2) All construction workers shall participate in a pre-construction desert tortoise awareness training.

(3) Project features that may trap or entangle desert tortoises (e.g., open trenches, pits, open pipes) shall be covered at the end of each work day or modified to prevent entrapment through installation of escape ramps or by sloping ends at a 3:1 ratio.

(4) Upon completion of the Project, trenches, pits, and other features that could entrap or entangle tortoises shall be filled, covered, or otherwise modified to eliminate hazards.

(5) Unleashed dogs shall be prohibited within Project areas.

(6) Temporary fencing (e.g., chicken wire, snow fencing, chain link, or similar materials) shall be installed in designated areas, as directed by the Project Biologist, to reduce encounters with tortoises.

(7) All vehicles within the construction zone shall not exceed 15 miles per hour on unpaved roads.

(8) Project personnel shall access the site using existing routes. Contractor shall restrict vehicle traffic to established roads, staging areas, and parking areas. If new access routes are required outside the Project Site, Contractor shall obtain written approval from the Designated Representative and coordinate with CDFW prior to construction.

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(9) Contractor shall confine all parking, storage, laydown, and equipment areas to previously disturbed areas to the maximum extent practicable. Fill materials shall only be placed in designated staging areas. Contractor shall not use or cross habitat outside the Project Site limits.

(10) Contractor shall prevent raw cement/concrete, wash water, asphalt, paint, petroleum products, hazardous waste, or other hazardous substances from contaminating soils within 25 feet of WJT. Any such materials placed within this area shall be immediately removed and properly disposed of off-site.

(11) In the event of a spill or leak of hazardous substances within 25 feet of WJT, Contractor shall immediately stop work and arrange for cleanup in accordance with applicable regulations. CDFW shall be notified immediately. Spill response equipment shall be maintained on-site at all times.

(12) Construction equipment and vehicles shall be inspected and maintained daily to prevent leaks of fuel, lubricants, solvents, or other fluids.

(13) Upon completion of Project activities, Contractor shall remove and properly dispose of all hazardous waste, temporary materials, and construction debris, including but not limited to equipment parts, packaging, cables, fencing, containers, and similar materials.

(14) Prior to commencing work in each area, Contractor shall clearly delineate Project boundaries using fencing, stakes, flags, or traffic control devices. Fencing shall be installed with a minimum 6-inch clearance above grade to allow wildlife passage. Rodent barrier fencing is prohibited. All activities shall be confined within delineated limits.

(15) During storm events, trenching activities shall not occur within 10 feet of avoided WJT. Trenching shall only occur during dry weather conditions (less than 40 percent chance of rain).

(16) Within 12 hours prior to forecasted rain (40 percent or greater probability), or immediately upon onset of unpredicted rain:
a. Cease all trenching activities.
b. Install all required erosion control measures.
c. Remove or relocate equipment and fueling materials to prevent contact with runoff.

(17) Contractor shall monitor the National Weather Service 72-hour forecast for the Project Site. Weather forecasts shall be documented and provided upon request.

(18) Personnel performing activities with potential to ignite fires (e.g., welding, grinding, equipment operation) shall have appropriate fire prevention and suppression equipment readily available, including fire extinguishers, water backpacks, shovels, welding shields, and fire-resistant mats.

4. Environmental Best Management Practices

A. BMP-1 - Best Management Practices for Construction Air Quality

(1) The contractor will use construction equipment that minimizes air emissions to the extent feasible such that overall fleet emissions are equal to or less than emissions compared to the most recent CARB fleet average. Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products,

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alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.

B. BMP-2 - Best Management Practices for Construction Emissions, Including Fugitive Dust Emissions

(1) The implementation of construction BMPs to limit construction emissions, particularly fugitive dust emissions, includes the following actions:

a. All exposed areas of bare soil (e.g., parking areas, staging areas, soil piles) shall be watered twice per day to minimize fugitive dust emissions.

b. All haul trucks transporting soil, sand, or other loose material off-site shall be covered or maintain at least two feet of free board space. Any haul trucks traveling along freeways or major roadways shall be covered.

c. All visible mud or dirt track-out onto adjacent paved public roads shall be removed using wet power-vacuum street sweepers at least once per day. The use of dry power sweeping shall be prohibited.

d. All vehicle speeds on unpaved roads shall be limited to 15 miles per hour (mph).

e. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13 CCR § 2485). Clear signage regarding this requirement shall be provided for construction workers at all access points.

f. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator and determined to be running in proper condition before it is operated.

C. BMP-3 - Best Management Practices for Sediment Control

(1) As applicable to the Work, Contractor will implement site specific BMPs to control sediments during construction activities, which may include but not be limited to:

a. Install, implement, and maintain BMPs consistent with the California Storm Water Quality Association Best Management Practice Handbook (California Storm Water Quality Association (CASQA) 2015) or equivalent to minimize the discharge of pollutants, consistent with the requirements of the National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water Permit 2009-0009-DWQ, as amended by 2010-0014-DWQ & 2012-0006-DWQ applicable to the State of California.

b. Implement practices to reduce erosion of exposed soil, including stabilization of soil stockpiles, watering for dust control, establishment of perimeter silt fences, and/or placement of fiber rolls.

c. Minimize soil disturbance area.

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d. Implement other practices to maintain water quality, including use of silt fences, stabilized construction entrances, and storm-drain inlet protection. Where feasible, limit construction to dry periods. Revegetate or repave disturbed areas.
e. BMPs will be regularly monitored for effectiveness using appropriate methods (visual observation, sampling) at appropriate intervals (e.g., daily or weekly) and corrected immediately if determined to not be effective.

D. BMP-4 - Best Management Practices for Hazardous Materials

(1) As applicable to the Work, Contractor will implement site-specific hazardous materials BMPs during construction activities, which may include but not be limited to:

a. Develop (before initiation of construction activities) and implement (during construction and operational activities) a spill prevention and emergency response plan to handle potential spills of fuel or other pollutants.
b. Install, implement, and maintain BMPs consistent with the California Storm Water Quality Association Best Management Practice Handbook (California Storm Water Quality Association (CASQA) 2015) or equivalent to minimize the discharge of pollutants, consistent with the requirements of the National Pollutant Discharge Elimination System (NPDES) General Construction Storm Water Permit 2009-0009-DWQ, as amended by 2010-0014-DWQ & 2012-0006-DWQ applicable to the State of California.
c. Implement practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater.
d. Limit fueling and other activities involving hazardous materials to designated areas only; provide drip pans under equipment and conduct daily checks of vehicle condition.
e. Require the proper disposal of trash and any other construction-related waste.
f. Ensure that any dewatered groundwater is not polluted prior to discharging into the local stormwater infrastructure or use; if dewatered groundwater becomes polluted, dispose of it off-site at an appropriate facility.

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SECTION III MEASUREMENT AND PAYMENT

1. General

Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. Unless otherwise provided herein, or in the Special Provisions, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension. All measurements for quantities of work performed will be made by the Owner's Representative.

The quantities listed in the bid schedule will not govern final payment. Payment to the Contractor shall be made only for the actual quantities of contract items constructed to the approval of the Owner's Representative and in accordance with the Plans and Specifications.

Payment will not be made for any wasted or disposed material. This shall include any and all items rejected by the Owner's Representative, loaded or unloaded from vehicles, and material rejected either before or after placement. No compensation will be made for all work outside the stated job site limits or for disposing of rejected or unused material. Whenever any portion of the work is performed by the Owner, or any materials furnished by the Owner, at the Contractor's request, the cost thereof shall be charged against the Contractor, and may be deducted from any amount due to becoming due from the Owner. Shall an emergency arise whereas, after attempting to contact the Contractor, the Owner must take steps to avoid impending injury, death, or property damage, the cost of said steps may be deducted from any amount due or becoming due from the Owner. No such Owner action shall relieve the Contractor of any liability.

Payment shall not relieve the Contractor from his obligation under the contract; nor shall such payment be construed to be acceptance of any of the Work. Responsibility of ownership shall remain with the Contractor who shall be obligated to store, protect, repair, replace, rebuild or otherwise restore any of his work damaged in whole or in part, whether or not payment has been made, subject to the guarantee period in effect upon final acceptance by the Owner.

A. Progress Payments. The Owner's Representative will, after award of contract, establish a closure date for the purpose of making progress payment. The Contractor may request, in writing that such monthly closure date be changed, at which time the Owner's Representative may approve such request provided that it is compatible with the Owner's payment procedure. The Owner's Representative will make an approximate measurement of the work performed to the closure date of each month, and as a basis for making monthly payments, estimate the amount due the Contractor for work performed during said period of time. This monthly payment due the Contractor will be based on the contract unit prices or as provided in the Contract Documents. The amount of each monthly progress payment will equal ninety-five (95) percent of the following summation: One hundred (100) percent of the work performed plus fifty (50) percent of the costs of the accepted

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materials delivered, and unloaded from their transport vehicles, to the job site, during the monthly closure period. Said value will be based on certified copies of paid invoices delivered by the Contractor to the Owner's Representative.

B. Breakdown of Contract Price. Prior to commencement of the work, if requested by the Owner's Representative, the Contractor shall submit a detailed price breakdown of any or all of his bid items for this work. Such price breakdown shall include quantities, unit prices, and other information requested in sufficient detail to enable the Owner's Representative to make accurate monthly progress estimates.

C. Overtime Work. The Contractor shall receive no additional compensation for overtime work even though such overtime work may be required under emergency conditions and may be ordered by the Owner's Representative in writing. Extra payment for overtime work may be paid if it falls under the extra work section and is specifically called for as overtime work, and then payment shall be to the extent as overtime work of a similar nature in the same locality.

D. Progress Schedule. Within 30 days after award of the Contract, the Contractor shall submit a progress schedule showing the order in which he proposes to carry on the Work and the dates when the various parts are to be begun and completed. The progress schedules shall be subject to the approval of the Owner's Representative.

E. Final Acceptance and Payment.

When the Owner's Representative is of the opinion that the Contractor has completely performed all work required Under the Contract, he will submit to the Contractor a draft of the final estimate. The Contractor will be expected to submit his written approval of said final estimate within five calendar days, or in the event of a disagreement, he shall file a written statement for all claims which he intends to present, also within said period. Upon receipt of the Contractor's written approval of the final estimate, the Owner's Representative will certify physical completion of the Contractor work to the Owner and will recommend acceptance of the work. Within sixty (60) days after completion of the Work, as defined by Public Contract Code Section 7107, the Owner will pay to the Contractor the amount remaining after all deductions permitted by the Contract Documents and applicable law are made.

As required by the California Code of Civil Procedure, and within 10 calendar days after date of acceptance of the work by the Owner, the Owner will file, in the County Recorder's Office, a Notice of Completion of the work.

F. Final Payment Terminates Liability of Owner. The acceptance by the Contractor of the final payment made under the terms of the Contract shall operate as, and shall be, a release to the Owner and its agents from all Claims of and/or liability to the Contractor for anything done or furnished for, or in relation to, the Work or for any act or neglect of the Owner or any person related to or affecting the Work, except

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for claims previously made in writing and identified as disputed by the Contractor at the time of the Contractor's request for final payment.

H. Contractor shall submit each Application for Payment on EJCDC C-620 (Contractor's Application for Payment), as modified for this Project, together with and updated schedule of values. Applications not submitted on the required form may be returned without processing. An EJCDC C-620 template is provided in Exhibit A.

2.

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EXHIBIT A – EJCDC C-620 Pay Request Form

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Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): **BDVWA**	From (Contractor):	Via (Construction Manager):
Project: **Water Systems Improvements and Consolidation Projects**	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

Application For Payment
Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS	$0.00	$0.00
NET CHANGE BY CHANGE ORDERS	$0.00	

1. ORIGINAL CONTRACT PRICE				
2. Net change by Change Orders			**$**	**-**
3. Current Contract Price (Line 1 ± 2)			**$**	**-**
4. TOTAL COMPLETED AND STORED TO DATE				
5. RETAINAGE:				
a. 5%	X	**Work Completed**	**$**	**-**
b. 5%	X	**Stored Material**	**$**	**-**
c. Total Retainage (Line 5a + Line 5b)			**$**	**-**
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)			**$**	**-**
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)			**$**	**-**
8. AMOUNT DUE THIS APPLICATION			**$**	**-**
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)			**$**	**-**

Contractor's Certification

The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
Inpsector (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
Engineer (Date)

is approved by: _____ _____
Owner (Date)

Approved by: _____ _____
Funding Agency (if applicable) (Date)

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ATTACHMENT A – California Department of Water Resources – IRWM (Prop 1/Round 2)
Implementation Grant Agreement
(Mojave Water Agency Subaward Agreement)

A pdf. copy of the Grant Agreement may be downloaded at the following URL:

https://drive.google.com/file/d/1oO417HSGj4Ph3OONP3yqkX0RAD3GCzbe/view?usp=sharing

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ATTACHMENT B – State Water Resources Control Board – Prop. 1 Drinking Water Construction Grant (and all future amendments)

A pdf. copy of the Grant Agreement may be downloaded at the following URL:

https://drive.google.com/file/d/1N4WOYqfC6HmCFOvvNuHXvmMidXq-U3P0/view?usp=drive_link

A pdf. copy of Amendment 1 to the Grant Agreement may be downloaded at the following URL:

https://drive.google.com/file/d/1iYQcKrFtpEQKwbpP_Qv8LsNh_07xB1Qb/view?usp=sharing

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ATTACHMENT C – NV5 Geotechnical Investigation Report

A pdf. copy of the document may be downloaded at the following URL:

https://drive.google.com/file/d/1QB8qiN6OXIIwAxC8mOqYJFrY3tE37Rj2/view?usp=drive_link

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ATTACHMENT D – CDFW Streambed Alteration Permit

A pdf. copy of the document may be downloaded at the following URL:

https://drive.google.com/file/d/1PlfXHcAkd3jI0KdJnqzE_e4YEzKUxVFU/view?usp=drive_link

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BIGHORN DESERT VIEW WATER AGENCY

Water System Improvements and Consolidation Projects

Technical Specifications

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SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1. SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Contract Documents Organization.
3. Supplemental Document.
4. Project contacts.
5. Use of premises and Owner occupancy.
6. Utilities and Agency contact information.
7. Work restrictions.

1.2 CONTRACT DOCUMENTS ORGANIZATION

These contract documents consist of a single Project Manual and three drawing sets, Volume 1, 2, and 3. The work of all three Volumes are bound by a single agreement between the BDVWA and the prime Contractor. The work of all three Volumes shall meet the requirements of the Technical Specifications within the Project manual. All work consists of improvements to the potable water distribution systems owned and operated by the BDVWA.

A. Contract Documents
1. Project Manual
a. Contains:
1) Bidding Documents
2) Other construction procurement documents, certifications, certain, the Agreement, bond forms, General Conditions, and Supplementary Conditions.
3) General Requirements.
4) Technical Specifications for drawing Volumes 1, 2, and 3.
2. Volume 1 Drawings – Transmission and Distribution Pipelines Improvement Project
a. General improvements in Volume 1 consist of:
1. Installation of a 6-inch transmission main to convey water from the proposed Zone B Booster Station located at Winters Road and Balsa Avenue to the west end of pressure Zone B at Winters Road and Gill Road.
2. Installation of 6-inch distribution piping to complete Zone D loops on Warren Vista Avenue, Winters Road, Rainbow Drive, and Lanes End.
3. Installation of 6-inch intertie pipeline connecting the HDWD potable water system with the BDVWA.

3. Volume 2 Drawings – Consolidation of BDVWA and GM Systems
a. General improvements in Volume 2 consist of:
1. Installation of PRV stations and 6-inch pipelines located on Alta Avenue

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and Kuna Avenue to create Pressure Zone F.
2. Installation of 6-inch pipelines to extend to interconnect Pressure Zones E and B.
3. Additional installation of 6-inch pipelines and interties to better loop Pressure Zone B.
4. Installation of a 6-inch pipeline from the proposed D1 booster pump, located in the existing R1 booster pump station, to Pressure Zone D located on Reche Road.
5. Abandonment and removal of existing asbestos cement pipe.

4. Volume 3 Drawings – Zones B and D1 Pump Stations Improvements
   a. General improvements in Volume 3 consist of:
      1. Installation of the Zone B Booster Pump Station: a CMU pump house complete with two multi-stage vertical in-line pumps including power distribution panels, control panels, various valving, motorized valve actuators, various ductile iron piping, instrumentation, controls panels, HVAC equipment, conductors, conduits, other electrical improvements, site piping, site grading, site utilities and new power service.
      2. Installation of the D1 booster pump at the existing R1 pump station consisting of installing a vertical turbine pump in the existing spare can along with discharge piping and appurtenances. Installation of power panel, control panel, conductors, conduits, and other electrical improvements.

B. SUPPLEMENTAL DOCUMENTS

1. Geotechnical Investigation Report – Prepared by NV5, November 14, 2019. Project No. 226815-0000025.07

2. Topographical Exhibit – Prepared by Fomotor Engineering, September 19, 2024. Project No. 24062

1.3 PROJECT CONTACTS:

A. Owner:
Marina West
Bighorn-Desert View Water Agency
622 Jemez Trail,
Yucca Valley, CA

B. Engineer:
California Rural Water Association

C. Owner's Representative during Construction:
California Rural Water Association

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D. Contractor: To be determined.

1.4 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as required for execution of the Work. Contractor shall maintain operations of BDVWA facilities throughout construction.

B. Use of Site: Limit use of premises to work in areas at the construction sites indicated. Do not disturb portions of Owner property beyond areas in which the Work is indicated. Project location is for an operating water system. Contractor must not disturb Owner's operations.
   1. Owner Occupancy: Allow for Owner occupancy of Project site.
   2. Roads and Entrances: Keep roads and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of roads and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
      c. Maintain Owner's entry roads available at all times.

1.5 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed on site during normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.

B. Shutdowns affecting customer service shall be scheduled off-hours when possible; anticipate some after-hours and weekend work to maintain service continuity.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

   1. Notify Construction Manager and Owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

1.6 OWNER OCCUPANCY

A. Owner Occupancy: Owner will occupy site during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations
   1. Provide not less than 7 days' notice to Owner of activities that will affect Owner's operations.

B. Immediately prior to Full Owner occupancy of new facilities, Engineer shall issue a certificate of Substantial Completion designating a date of occupancy and defining the area occupied:

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1. Contractor's responsibilities:
   a. Allow access for Owner's personnel.
   b. Allow access for public.
2. Owner's responsibilities:
   a. Assume responsibility for power requirements.
   b. Assume responsibility for property insurance on occupied areas.
   c. Assume responsibility for security and fire protection in occupied areas, but not extending to protection of Contractor's materials and equipment in occupied areas.
3. Other conditions of occupancy:

C. The correction period for the occupied Work shall commence at the date of full Owner occupancy.

1.7 UTILITIES AND AGENCY CONTACT INFORMATION

Utility Type	Agency / Company	Contact / Department	Phone
Water	Bighorn-Desert View Water Agency	Marina West	(760) 365-2315
Natural Gas	Southern California Gas Company	Bruce Lombardi	(760) 228-1400
Disposal	Burrtec	Jennifer Salcicciola	(760) 365-2015
Water	Hi-Desert Water District	Ron Wortham	(760) 365-8333
Electricity	Southern California Edison	Map Requests / Public Works	(714) 796-9932
Telephone	Verizon California	Larry Moore	(760) 778-3610
Cable	Time Warner Cable	Cynthia Franklin	(760) 674-5404
Highway	Caltrans District 8	District Office – Martin Morris	(909) 645-0579
Highway (General)	Caltrans	General Hotline	(866) 383-4631
Non-Potable Water	Mojave Water Agency	Adnan Anabtawi	(760) 946-7000
County Roads	SBCO Public Works Transportation Division	Joseph E. Brady	(909) 387-7910
Special Districts Department	SBCO Permitting	Carlos Martinez	(909) 386-8821
County Water & Sewer	SBCO Special Districts	Ted S. Moreno	(909) 386-8800
County Roads	Permits/Operations Support Division-Transportation	Silvia Gomez (DPW)	(909) 387-8212
Flood Control	SBCO Flood Control District	Stacy Serrano	(909) 387-8005

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1.8 SEQUENCING

A. Coordinate sequencing with Section 01015.

1.9 PRECONSTRUCTION MEETING

A. Construction Manager shall schedule and administer preconstruction meeting and specially called meetings throughout the progress of the Work:
   1. Prepare agenda for meetings.
   2. Distribute written notice of each meeting 4 days in advance of meeting date.
   3. Make physical arrangements for meetings.
   4. Preside at meetings.
   5. Record the minutes; include all significant proceedings and decisions.
   6. Reproduce and distribute copies of minutes within 3 days after each meeting:
      a. To all participants in the meeting.
      b. To all parties affected by decisions made at the meeting.
      c. Furnish 3 copies of minutes to Engineer.

B. Schedule within 20 Days After Effective Date of Agreement.

C. Location: A central site, convenient for all parties, designated by Engineer.

D. Attendance:
   1. Owner's representative.
   2. Engineer and his professional consultants.
   3. Construction Manager.
   4. Contractor's superintendent.
   5. Major subcontractors.
   6. Major suppliers.
   7. Others as appropriate.

E. Suggested Agenda:
   1. Distribution and discussion of:
      a. List of major subcontractors and suppliers.
      b. Projected construction schedules.
   2. Critical Work sequencing.
   3. Major equipment deliveries and priorities.
   4. Project coordination:
      a. Designation of responsible personnel.
   5. Procedures and processing of:
      a. Field decisions.
      b. Proposal requests.
      c. Submittals.
      d. Change Orders.
      e. Applications for Payment.
   6. Adequacy of distribution of Contract Documents.
   7. Procedures for maintaining record documents.
   8. Use of premises:
      a. Office, work, and storage areas.
      b. Owners's requirements.
   9. Construction facilities, controls, and construction aids.
   11. Temporary utilities.
   12. Safety and first-aid procedures.
   13. Security procedures.
   14. Housekeeping procedures

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15. Contractor's Work Plan
    a. Safety Plan
    b. Traffic Plan
    c. Noise and Dust Control Plan

1.10 PROGRESS MEETINGS

A. Hold weekly Progress Review meetings.
B. Location of the Meetings: Construction Trailer.
C. Attendance:
    1. Engineer and his professional consultants as needed.
    2. Subcontractors as appropriate to the agenda.
    3. Suppliers as appropriate to the agenda.
    4. Others.
D. Suggested Agenda:
    1. Review of Work progress.
    2. Field observations, problems, and conflicts.
    3. Problems that impede construction schedules.
    4. Review of off-site fabrication and delivery schedules.
    5. Corrective measures and procedures to regain projected schedules.
    6. Revisions to construction schedules.
    7. Plan progress schedules during succeeding Work period.
    8. Coordination of schedules.
    9. Review submittal schedules; expedite as required.
    10. Maintenance of quality standards.
    11. Review proposed changes for effect on construction schedules and on completion dates.
    12. Other business.
    13. Review of current 'As-Built' record set maintained by Contractor.

1.11 PROTECTION AND MAINTENANCE OF SITE

A. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by construction operations.
B. Restore to their original condition, pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with sod and shrubs in yards and parking areas, whether within or outside the easement.
C. Use New Materials for Replacements.

1.12 PRESERVE AND RESTORE EXISTING SURVEY MONUMENTS

A. The Contractor shall not disturb permanent survey monument or bench mark. The Contractor shall bear the expense of replacing any monument or benchmark that may be disturbed without permission. Replacement shall be done only with the direction of and in the presence of the Engineer.
B. Should the Contractor during the course of construction encounter a survey monument or benchmark not shown on the plans, he/she shall promptly notify the Engineer so that the monument or bench marks may be referenced accordingly.

1.13 SUBSTANTIAL COMPLETION

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A. For the purposes of establishing when the Project is substantially complete and suitable for its intended purpose, the following functional components and Work elements shall be completed including testing:

1. All new interconnection pipelines installed, pressure tested, disinfected, and in service.
2. PRV stations installed, tested, and commissioned; pressure zones operational.
3. Zone B Booster Station built, installed, tested, and operational in automatic mode; operator training completed.
4. R-1 Pump Station upgrades installed, tested, and operational in automatic mode; operator training completed.
5. Access road paved and capable of supporting traffic.
6. All electrical, lighting, instrumentation and control panels installed and operable.
7. Factory training provided to Owner's staff for all mechanical and electrical equipment and systems furnished and demonstrated to be fully functional in automatic mode.
8. SCADA modifications tested, demonstrated functional, and operator training completed.
9. Approved closeout of all permits and plans for which the Contractor is responsible for closeout, including County Encroachment Permits and the Storm Water Pollution Prevention Plan; and completion of, and documentation demonstrating compliance with, all Contractor responsibilities and applicable conditions of the CDFW Streambed Alteration Agreement, Western Joshua Tree Incidental Take Permit, and County Flood Control District Permit, including requirements necessary to support Agency closeout of those permits.

B. Items of work that may follow substantial completion:

1. Submittal and approval of up to date 'As-Built' redlines.
2. Submittal and approval of all O&M manuals as required.
3. Final touch-up work, touch-up painting, caulking, and cleanup.
4. Identifying Devices.
5. Punch list items completed.
6. File notice of completion.

END OF SECTION

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SECTION 01015

SEQUENCE OF CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. The construction of this project will occur while the Water System is operating to meet specific, critical permit requirements. The operations necessary to meet these requirements are of higher priority than construction activities. Schedules of connections, piping modifications, PRV installations, and pipeline installations shall be submitted to the Owner for approval, and all such items shall be coordinated throughout the entire construction period.

B. The Contractor shall not operate any distribution system valves or equipment unless authorized and supervised by BDVWA operations personnel.

C. The Contractor shall prepare and submit a project schedule, as called for in Section 01310, prior to the initial estimate for partial payment for all new work as well as outlining the schedule and time requirements for each item involving an existing treatment unit, piece of equipment, and conveyance system. The project schedule, schedule of values, bypass plan, traffic plan, and safety plan must be approved by the Owner before the initial estimate for partial payment is submitted.

D. The Contractor shall perform all potholing as specified in Section 310523 – Utility Potholing.

E. The Contractor shall notify the Owner in writing a minimum of 14 calendar days prior to beginning work in a particular area, and again a minimum of 3 calendar days prior. Coordinate with the Owner the specific items to be isolated and the planned duration for each. Obtain written approval from the Owner prior to each shutdown. High flow conditions or equipment outages may require rescheduling of an approved shutdown. Any costs associated with rescheduling shall be incidental to the Contract.

F. The Contractor shall notify the Owner in writing a minimum of 3 calendar days prior to any testing of a unit, facility, or pipeline segment, and shall coordinate with the Owner the specifics of the testing (test method, duration, instrumentation, discharge location, and pass/fail criteria). Obtain written approval from the Owner prior to each test.

G. Prior to beginning work on shutdowns and process connections, the Contractor shall have on-site all materials, equipment, and personnel necessary to complete the work in the time scheduled. The Contractor shall also perform all possible tasks to the most complete state possible. For example, all exposed bolts and nuts on valves, flanges, or fittings which are to be disassembled shall be removed and replaced one at a time prior to shut down and connections; thus, allowing for as timely completion as possible.

H. For connections to existing AC pipe or during potholing the Contractor shall have spare on-site material and equipment necessary to make emergency repairs to existing AC pipe which may unexpectedly fail during construction activities.

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I. Access by Owner to all existing Owner facilities must be maintained at all times.

J. Plugged pipelines, in which water has been standing, shall be cleaned of debris prior to conducting Work by Contractor in the project area/locations.

K. The Contractor shall be required to maintain the access roads utilized during construction in a reasonably clean condition. As needed street cleaning and scraping will be required as directed by the Owner.

L. Access roads shall not be utilized for storage of materials.

M. The Contractor shall exercise all isolation valves, and verify their functionality, a minimum of three (3) calendar days prior to construction activities requiring the operation of valves.

1.2 SUBMITTALS

A. The Contractor shall include the Sequence of Construction in the overall project schedule called for in Section 01310, Construction Schedules.

B. Additional submittals related to shutdowns and diversions shall include, at a minimum:

1. Shutdown/Diversion Request: Proposed date/time, duration, location limits, valves to be operated, and expected customer impacts.
2. Isolation and Tie-In Plan: Step-by-step sequence, staffing plan, contingency plan, and restoration steps.
3. Temporary Bypass Plan (when required): Pump sizing basis, hoses/piping, fittings, thrust restraint, discharge routing, and backflow prevention.
4. Customer Notification Plan: Proposed notification method(s), draft notice content, and contact log format.
5. Valve Exercise/Operation Log: Record of valves exercised and operated, including dates and observed condition.

1.3 CONTRACTOR'S RESPONSIBILITIES DURING SHUTDOWNS AND DIVERSIONS

A. The Contractor's responsibilities during any and all shutdowns or diversions are outlined below. A diversion is defined as any operation which makes necessary diversion of flow around any structure or process which is normally in service. A shutdown is defined as taking any process or piece of equipment out of service whether flows are or are not diverted around any process.

B. Supply of Equipment:

1. The Contractor shall be responsible for providing all equipment, labor, and materials for accomplishing the diversion or shutdown on schedule. Contractor shall have on hand additional equipment replacement parts, couplings, and hose in case of breakdown or emergency.

C. Dewatering:

1. The Contractor shall be responsible for dewatering of any structures and excavations necessary for completion of construction, including dewatering for all diversions and shutdowns. Contractor shall also be responsible for maintaining dewatering of the excavation, if necessary, for completion of the

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work. Contractor shall also maintain watertight any dam or bulkhead, temporary or otherwise, if leakage from the dam or bulkhead will result in adverse impacts on the Owner's operations or require maintenance by Owner's personnel. The Contractor shall be responsible for supplying all pumps, piping (temporary or otherwise), and any other items necessary for the above dewatering. Dewatering shall be defined as removal of all liquid, sludge, grit, and any other solids or liquids as necessary to accomplish construction. The Contractor is cautioned that the existing facilities may contain significant quantities of grit and other solids that the Contractor is required to remove and dispose of off-site.

D. Timely Completion:

1. The Contractor shall be responsible for the manning and scheduling of all shutdowns and diversions to accomplish them within the approved outage window. This responsibility includes coordination with all applicable utility companies, Owner's staff, and other Contractors working onsite. If any overtime or shift work is required to accomplish the shutdown or diversion within the required time limits, the cost of such overtime or shift work shall be at the Contractor's sole expense.

E. Coordination with Owner

1. All pipeline shutdowns must be coordinated with and approved by the Owner. Contractor shall submit a proposed shutdown schedule at least 14 calendar days in advance and shall not perform shutdowns without written approval from the Owner for each shutdown event.
   a. The Owner will not permit work to be performed in a manner that requires a series of system shutdowns on consecutive calendar days.
   b. In the event of an unplanned service interruption, Contractor shall immediately notify the Owner and implement emergency measures to restore service and maintain water quality as quickly and safely as practicable.
2. Water System pipe connections at pumping stations and distribution areas shall be coordinated with the Owner and shall be performed during off-peak or low-flow periods, or alternate means to divert flow shall be provided.
3. If pumps are used for diversions, the pumps must be sized for the range of flows the system is experiencing at the time.
   a. The Contractor shall have an employee on site 24 hours a day to observe that flow diversion pumps are operating continuously.
   b. Owner may also require cellular auto dialer or other alarms in the Emergency notification plan.

F. Contractor shall coordinate all customer/public notifications with the Owner prior to distribution. At a minimum:

1. Provide a list/map of affected services and anticipated outage durations.
2. Provide initial notice to affected customers a minimum of 14 calendar days prior to the shutdown and provide a reminder notice 24 to 48 hours prior.
3. Notices shall include the planned outage window, expected impacts, precautions (e.g., water use), and an emergency contact number.
4. Schedule off-hours shutdowns when feasible (generally after 5 PM and before 7 AM and/or weekends), as directed by the Owner.
5. Provide advance signage and warning to the public as required by the Owner

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and applicable encroachment permit conditions.

PART 2 - CONSTRUCTION SEQUENCE FOR SPECIFIC ITEMS

2.1 GENERAL

A. The Contractor shall submit a Work Plan for specific work items. The Work Plan shall list the sequence of operations for each phase of work, including (as applicable) demolition, temporary bypass/diversions, dewatering, isolation boundaries, tie-ins, disinfection, pressure testing, and restoration/return-to-service for each installed pipe segment and improvement. The Work Plan shall be incorporated into the Contractor's schedule. The Work Plan shall be submitted for the Owner's approval prior to starting any work at the work areas described in the Work Plan.

B. The Work Plan shall incorporate:

1. Safety Plan, per Section 01950
2. Traffic Control Plan, per Section 01500
3. Confined Space Entry Plan, per Section 01950
4. Noise and Dust Control Plan, per Section 01500
5. Emergency Notification and Response Plan (including on-call contact list and procedures for unplanned service interruptions)
6. Water Quality Protection Plan for temporary bypasses and system tie-ins (backflow prevention, flushing, and disinfection coordination).

C. The Contractor shall coordinate and schedule each task necessary to complete all work within the time allowed for the Project. Coordination and time limitations for individual facilities are described in the following paragraphs. If and when necessary, limitations shall be discussed and approved by Owner.

D. Each phase may require the Contractor to perform work such as installing temporary or permanent plugs and/or diversion facilities in structures that are in service. The specifics related to flow diversion and temporary plugging means and methods are the responsibility of the Contractor; however, the Contractor's plans and schedules shall be submitted to the Owner for review and approval.

2.2 GENERAL CONSTRUCTION SEQUENCING

A. The contract times for this project assume that, in general, Volumes 1 and 2 pipeline improvements may occur in parallel with the pump station improvements of Volume 3.

B. Construction sequencing requirements specific to each Volume are described in parts 2.3, 2.4, and 2.5 below.

2.3 VOLUME 1 DRAWINGS – RECOMMENDED CONSTRUCTION SEQUENCING AND SCHEDULING

A. Prior to mobilization or commencement of any Project-related activity at the site, the Contractor shall attend a preconstruction biological coordination meeting with BDVWA and the Project Biologist to review the Contractor’s responsibilities and applicable permit requirements. The Contractor shall not begin work until this meeting has been completed and authorization to proceed has been provided by BDVWA. An overview

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of the Streambed Alteration Permit and Western Joshua tree Incidental Take Permit and CEQA MMP requirements is presented within Section II of the Special Conditions, the full document is included by reference in Attachment D.

B. Construction sequencing of the Zone B Transmission pipeline, Zone D distribution improvements, and HDWD intertie pipeline may be scheduled at the Contractor's discretion. The Contractor's sequencing and scheduling shall conform to all applicable permit times requirements (San Bernardino County Encroachment Permit, Western Joshua tree Incidental Take Permit conditions, Streambed Alteration Permit, SWPPP, and BDVWA requirements).

2.4 VOLUME 2 DRAWINGS – RECOMMENDED CONSTRUCTION SEQUENCING AND SCHEDULING

A. The purpose of the Volume 2 pipeline and PRV improvements is to consolidate separate parts of the distribution system by installation of interconnection pipelines. This consolidation will also require the creation of a new pressure zone by installation of PRV stations and additional pipelines. Therefore, the Contractor shall follow the recommended sequential order of improvements as enumerated below and shall maintain clear communication with BDVWA and the Engineer regarding scheduled shutdowns, as required to maintain a functioning and safe operating water distribution system during construction. No alternative sequencing shall be acceptable without formal review and written approval by the Owner and Engineer

1. Install PRVs and pipelines to establish Pressure Zone F.
    a. Complete installation of PRV station F2 and F3 complete with bypass piping, isolation valves, ductile iron fittings, and connections to existing pipelines as shown on Details 2 and 3 on Drawing C-22 of Volume 2. Maintain bypass piping open such that flows bypass the PRV.
    b. Complete installation of Alta Avenue pipelines as shown on Volume 2 Drawings C-06, C-07, and C-08.
    c. Complete installation of Kuna Avenue pipelines as shown on Volume 2 Drawings C-10, C-11, and C-12.
2. Bring Pressure Zone F into service.
    a. Coordinate with the BDVWA to close bypass piping at PRV stations F2 and F3 effectively directing all flow through each PRV and adjust downstream pressure set points as directed by BDVWA or Engineer.
3. Install interconnection pipelines between Pressure Zone E-1 and Pressure Zone B.
    a. Installation of pipeline from Osgood Avenue to Mitch Road / Bearing Tree Road as shown on Volume 2 Drawings C-03 and C-04. Maintain isolation valve in closed position as indicated on C-04.
    b. Installation of pipeline on Camulis/Sterman Road as shown on Volume 2 Drawings C-02. Maintain isolation valve in closed position as indicated on C-02.
4. Interconnect Zone E-1 and Zone B.

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a. Coordinate with the BDVWA to isolate the R1 reservoir from Zone B by closure of isolation valve No. 543 on Jana Lane.

b. Coordinate with BDVWA to open isolation valves on Mitch Road / Bearing Tree Road and Camulis / Sterman Road.

5. Connect Jana Lane to Pressure Zone E-1

a. Complete installation of PRV station F1 complete with bypass piping, isolation valves, ductile iron fittings, and connections to existing pipelines as shown on Details 1 Drawing C-22 of Volume 2.

b. Complete Yucca Mesa interties as shown on Drawing C-13 of Volume 2.

c. Complete Jana Lane connection as shown on Drawing C-21 of Volume 2.

2.5 VOLUME 3 DRAWINGS – RECOMMENDED CONSTRUCTION SEQUENCING AND SCHEDULING

1. Startup of the Zone B Booster Pump Station (Volume 3) may not be initiated until all Volume 1 improvements are complete and in service.

2. Startup of the D1 Booster Pump Improvements (Volume 3) may not be initiated until completion of the 8" PVC main from the existing R1 booster pump house to Reche Road as shown on drawing C-01 of Volume 2.

2.6 GENERAL PIPELINE SEQUENCE OF CONSTRUCTION

A. Locate all utilities as specified in Section 310523 – Utility Potholing.

B. Perform clearing, grubbing, and site preparation within the pipeline work limits, including removal of surface improvements as required.

C. Install traffic control, erosion control, and temporary access measures necessary to safely support construction activities and maintain public and utility access.

D. Excavate trenches for pipelines and appurtenances. Provide trench shoring, trench boxes, or other excavation support in accordance with OSHA requirements. Prepare subgrade and install bedding material.

E. Furnish and install new water pipelines, including pipe, fittings, valves, appurtenances, restrained joints, and thrust restraint, in accordance with the approved drawings and specifications.

F. Coordinate with the Owner and fully isolate the work area by shutting down all water at the nearest upstream and downstream isolation valves serving the work limits, as required. Confirm valve status and system isolation under Owner supervision prior to commencing tie-in activities. All work shall conform to Part 1 - General of this Section 01015.

G. Make approved shutdown connections to existing water lines, as authorized by the Owner, while minimizing service disruptions.

H. Remove and dispose of asbestos cement pipe as required in Section 028213.19.

I. Perform initial cleaning, flushing, and disinfection of all installed pipelines, valves, and appurtenances in accordance with Section 15140.

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J. Prepare temporary restraints and conduct hydrostatic pressure testing of installed pipelines in accordance with Section 15042, correct deficiencies and retest until approved by Engineer.

K. After successful hydrostatic pressure testing , perform final flushing, disinfection, and bacteriological testing in accordance with Section 15140.

L. Following successful completion of bacteriological testing complete final connections to existing water mains.

M. Perform final paving, grading, surface restoration, and repair of affected improvements to match or exceed pre-construction conditions.

N. Provide startup and commissioning services as required and place the pipelines into operation in coordination with the Owner.

O. Achieve Substantial Completion.

P. Final Completion.

2.7 PUMPING AND DEWATERING OPERATIONS

A. Work to be performed may require draining, pumping and dewatering, and certain cleaning operations necessary to complete the work as specified and as indicated on the drawings. It is the intent of these specifications that such draining, pumping and dewatering, and cleaning operations shall be the obligation of the Contractor.

B. The Contractor shall provide all necessary pumping as required to remove all surface water, groundwater, leakage, and water from other sources from excavations. Excess water from dewatering operations shall be disposed of in a manner acceptable to the Owner. Contractor shall comply with Best Management Practices and industry standards.

C. The Contractor shall provide all necessary pumping and piping as required to fill and/or refill facilities for placement into operation.

2.8 WATER FOR CONSTRUCTION

A. The Contractor may use Owner potable water for construction purposes only upon pre-approval by the Owner. Coordinate in advance with the Owner on the location(s) and amount of water available. Contractor is responsible for all associated costs unless otherwise stated.

B. Contractor shall take adequate precautions to protect the Owner's lines from contamination or damage.

C. If the Contractor desires to utilize Owner water at fire hydrants, he shall only use water from a hydrant predetermined for use by the Agency that has been equipped with a meter and slow closing valve, both of which are furnished and installed by the Agency. When the Contractor is using water from the hydrant, he shall open the hydrant valve in the morning and use the valve which has been installed for control at all other times. At night, upon cessation of construction operations, the hydrant valve shall be closed. At all other times when the Contractor's valve remains on the outlet, the Contractor shall keep necessary wrenches available at the hydrant so that the valve can be quickly removed by the Owner in case of fire. The Owner will not allow use of existing fire hydrants unless

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the Contractor adheres to the above-described requirements. At any time, Owner's use of hydrant water shall not be hindered by the Contractor. Fire hydrants suitable for use by the Contractor will be identified by the Owner during mobilization.

2.9 EQUIPMENT STARTUP AND COMMISSIONING

A. Equipment Startup and Commissioning:

1. All equipment installations shall be inspected and tested by the Manufacturer's Representatives in accordance with the equipment specifications prior to placement into operation. Performance testing of the equipment shall be completed by the equipment Manufacturer's Representatives after placement into operation in accordance with the equipment specifications.
2. Submit startup and commissioning schedule and manufacturer field service reports to the Owner for record.

PART 3 - EXECUTION – NOT USED

END OF SECTION

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SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 - APPLICATIONS FOR PAYMENT

1.1 SUMMARY

A. General work included in this Section:
   1. Measurement and Payment.

1.2 GENERAL

A. Measurement and Payment shall be in accordance with Section III of the Special Conditions of Division 0. In the event of conflict between the technical specifications and the Section III of the Special Conditions, Section III shall govern.

B. Submit Applications for Payment to Engineer in accordance with the schedule established by conditions of the Contract and Agreement between Owner and Contractor.

C. Additional requirements specified elsewhere.
   1. Total Bid Price: Agreement.
   2. Progress payments, retainages, and final payment: Conditions of the Contract and Agreement.
   3. Schedule of Values: Section 01370.

1.3 FORMAT AND DATA REQUIRED

A. Submit applications per form included Application for Payment with itemized data typed on 8-1/2 IN x 11 IN white paper continuation sheet.

B. Provide itemized data on continuation sheet.
   1. Format, schedules, line items, and values: Those of the Schedule of Values.

1.4 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application form:
   1. Fill in the required information, including that for Change Orders executed prior to the date of submittal application.
   2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.
   3. Execute certification with the signature of a responsible officer of the Contractor's firm.

B. Continuation Sheets:
   1. Fill in total list of all scheduled component items of work with item number and the scheduled dollar value for each item.
   2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored.
   3. List each Change Order executed prior to the date of submission at the end of the continuation sheets.
      a. List by Change Order number and description, as for an original component item of work.

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1.5 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When Owner or Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
   1. Project.
   2. Application number and date.
   3. Detailed list of enclosures.
   4. For stored products:
      a. Item number and identification as shown on application.
      b. Description of specific material.

B. Submit one copy of data and cover letter for each copy of application.

1.6 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in application form as specified for progress payments.

1.7 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to Engineer as described in General Conditions.

B. When Engineer finds the application properly completed and correct, he will transmit a Certificate for Payment to Owner, with a copy to Contractor.

PART 2 - PAYMENT FOR BID ITEMS

2.1 SUMMARY

A. The Bid Amounts for Each Bid Item will be used for comparative bid analysis.

B. The Bid Amounts will also form the basis of monthly progress payments. Each Lump Sum bid amount will undergo further breakdown as described in Section 01370, Schedule of Values.

C. Quality of Work to be paid for under any items for which a unit price is fixed in Contract Documents shall be a number, as determined by Owner, of units of work satisfactorily completed in accordance with Contract Documents or as Directed by Owner. Unless otherwise provided, determination of number of units of work completed will be based, so far as practicable, on actual measurement or count within prescribed or ordered limits, and no payment will be made for work done outside of limits.

D. Payment of Work governed by unit prices will be made on the basis of the actual measurements and quantities determined by the Engineer multiplied by the unit price of the Work which is incorporated in or made necessary by the Work.

E. Progress payments on account of Unit Price Work will be based on the number of units completed during the monthly pay period.

F. Bid Items are not intended to be exclusive descriptions of work categories, and the Contractor shall include in its pricing all labor, materials, equipment, overhead, profit, and incidentals necessary to complete the Work as shown on the Drawings and specified in the Contract Documents.

BID SET - NOT FOR CONSTRUCTION

G. Bid Items are established for the purpose of measurement and payment only and are not intended to define or limit the full extent of the Work required by the Contract Documents. Work shown on the Drawings or specified in the Specifications shall be considered included in the appropriate Bid Item, or in Bid Item No. 27 where not specifically measured under another Bid Item.

H. No additional or separate payment will be made for work that is reasonably inferable from the Drawings and Specifications as being required for a complete and operable Project.

I. All elements of the Work shall be encompassed within the sum of all bid items for a complete and working Project as shown on the Drawings and Specifications. No Additional Payment will be made for work shown on the Drawings and Specifications not specifically identified within a bid item description.

J. Compensation for cleaning the trash removal associated with individual bid items shall be included within the price for that bid item.

K. Compensation for excess excavation hauling to disposal site associated with individual bid items shall be included within the price for the bid item.

L. Rock excavation, if any, is to be included with each bid item that contains excavation. No additional payment will be made for rock excavation.

2.2 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:
1. Products wasted.
2. Products disposed of in a manner that is not acceptable.
3. Products determined as unacceptable before or after placement.
4. Products not completely unloaded from the transporting vehicle.
5. Products placed beyond the lines and levels of the required Work.
6. Products remaining on hand after completion of the Work.
7. Loading, hauling, and disposing of rejected products, notwithstanding that payment shall be made for excess excavation within individual bid items, where the material is not usable as native fill, properly disposed, and made within the lines and levels of the Work.

2.3 BID ITEM NO. 1 – BONDS AND INSURANCE

A. Measurement and payment shall be on a Lump Sum basis.

B. The Lump Sum bid price shall include full compensation for furnishing and maintaining all required Performance, Payment, and Maintenance Bonds, and all insurance required by the Contract Documents, including premiums and administrative costs.

C. Payment for bonds and insurance will be made upon receipt and acceptance of required bonds, insurance certificates, and endorsements. Payment shall not exceed the actual cost substantiated by invoices, and shall be subject to applicable retainage.

2.4 BID ITEM NO. 2 - MOBILIZATION/DEMOBILIZATION (MAXIMUM AMOUNT 5% OF TOTAL BID PRICE)

BID SET - NOT FOR CONSTRUCTION

A. The lump sum bid for mobilization/demobilization shall not exceed five percent (5%) of the total bid price. Mobilization shall include: moving onto the site of all equipment; submittal and approval of initial project schedule and safety plan; obtaining and paying for all permits by other agencies as applicable; furnishing temporary construction utilities (temporary power, toilets, water, fences, etc.); installing construction signs; temporary buildings and field office trailer(s); and other construction all as required for the proper performance and completion of the work.

B. Demobilization shall include site cleaning and restoration of surfaces within the job site, post-construction meeting, removal of all temporary facilities and equipment from the work area, disconnection of the temporary construction utilities, record drawings, and turnover of Project to the Owner.

C. Contractor shall remove all debris, trash, excess soil, and unused material generated during construction. The contractor shall be responsible and pay for all hauling and applicable disposal costs.

D. Mobilization/Demobilization will be paid in installments as follows
   1. Twenty-five percent (25%) upon issuance of Notice to Proceed and completion of initial mobilization activities (including delivery of major equipment, establishment of field office/temporary facilities, and submittal of initial project schedule and safety plan).
   2. Fifty percent (50%) when the Work is twenty-five percent (25%) complete.
   3. Twenty-five percent (25%) upon Substantial Completion and completion of demobilization activities, including site cleanup and removal of temporary facilities.
   4. Payment shall be subject to applicable retainage.

E. Contractor may apply for payment of demobilization after the overall Project Substantial Completion is achieved and the Project begins to demobilize.

F. The lump sum price shall be full compensation for the preparation and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

2.5 BID ITEM NO. 3 – TRAFFIC CONTROL PLAN PREPARATION AND IMPLEMENTATION

A. Measurement and payment for Traffic Control Plan Preparation and Implementation shall be lump sum. Payment will be made in proportion to the progress of the Work requiring traffic control, as determined by the Engineer.

B. Traffic control shall conform to the California Manual on Uniform Traffic Control Devices (CA MUTCD), applicable permit requirements, and all Owner specifications. Traffic control shall be provided at all locations where construction activities occur within or adjacent to the traveled way or otherwise affect vehicular, bicycle, or pedestrian traffic, including but not limited to County roads, local streets, private access roads, driveways, and other areas where the Work encroaches upon the path of travel. Where work occurs within San Bernardino County right-of-way, traffic control shall also comply with the requirements of the County Encroachment Permit and/or Excavation Permits and applicable County

BID SET - NOT FOR CONSTRUCTION

standards. The Contractor shall prepare and submit a Traffic Control Plan (TCP) for review and approval prior to beginning work in any area requiring traffic control.

C. The lump sum price shall include furnishing all labor, materials, equipment, and incidentals necessary to prepare, implement, maintain, adjust, relocate, and remove the approved Traffic Control Plan. Work shall include, but is not limited to, preparation and submittal of Traffic Control Plans, all required signage and temporary traffic control devices, flaggers and flagging operations, temporary signals, arrow boards, and portable changeable message signs, barricades, cones, drums, delineators, and channelizing devices, K-rail concrete barriers and associated anchorage where required, temporary pavement markings and striping where required, maintenance and adjustment of traffic control throughout construction, removal of all temporary traffic control devices, and restoration of surfaces disturbed by traffic control operations. The Contractor shall provide all traffic control necessary to safely perform the Work, whether or not specifically shown on the Drawings, and as required by applicable standards, permits, or field conditions. Traffic control required for the Contractor's convenience or construction operations shall be included in this bid item and shall not be paid for separately.

D. The lump sum price shall include all coordination necessary for implementation of traffic control, including coordination with agencies and service providers as required, including but not limited to: County agencies, Police and Fire Departments, School Districts, Utility companies, Postal service and waste collection providers, and adjacent property owners when access restrictions occur. This includes preparation and distribution of any required public notifications or advance notice of lane closures or road restrictions required by permits or applicable standards.

E. The lump sum price shall include all traffic control required for the duration of the project, including initial installation, relocation, adjustment, maintenance, replacement, and removal of traffic control devices as construction operations progress or shift locations. No additional compensation will be provided for moving, resetting, or modifying traffic control devices required to accommodate the Contractor's operations.

BID SET - NOT FOR CONSTRUCTION

2.6 BID ITEM NO. 4 – STORM WATER POLLUTION CONTROL

A. Measurement and Payment by Lump Sum Paid on a Percent of Work Complete.
B. Payment Basis Lump sum price for "Storm Water Pollution Control" includes full compensation for all labor, materials, equipment, services, and incidentals to comply with Section 01503 and applicable permits. This includes all Contractor services necessary to support obtaining and maintaining CGP coverage (Order WQ

2022-0057-DWQ), including preparation and management of NOI/WDID and SMARTS submittals (SWPPP upload, amendments, REAPs, reports, and NOT), and coordination with the Agency's Legally Responsible Person (LRP) or Duly Authorized Representative (DAR) for required electronic certification and submittal; preparation, certification, implementation, and updates of the SWPPP by a Qualified SWPPP Developer (QSD); retention of qualified QSD/QSP consultant(s) for inspections, monitoring, sampling, reporting, and LRP coordination; compliance with Flood District Permit No. FCCON-2025-00075 and CDFW LSAA requirements; installation, maintenance, inspection, repair, and removal of BMPs for erosion/sediment control, non-storm water pollution prevention, dewatering, waste handling, and pollutant discharge prevention; required inspections, training, preconstruction meeting, on-site records, reporting, and final stabilization/cleanup; and all permitting fees, QSD/QSP services, and corrective measures directed by the Engineer or regulatory agencies. No separate payment for components; all work included in lump sum unless otherwise specified.

C. The lump sum price shall include all coordination necessary for implementation of traffic control and work within public rights-of-way, including coordination with agencies and service providers as required, including but not limited to: San Bernardino County Department of Public Works, County Road Inspector, Police and Fire Departments, School Districts, Utility companies, Postal service and waste collection providers, and adjacent property owners when access restrictions occur. This includes preparation and distribution of any required public notifications or advance notice of lane closures, road restrictions, or work within County right-of-way required by permits or applicable standards. For work subject to San Bernardino County Excavation Permit No. TREXC-2025-00579, and CoSB Special Districts Permit the lump sum price shall include required County inspector notification, public notification, maintaining required permit documents and traffic control plans on site, coordination with County field personnel, and adjustment of traffic control measures as required by the County permit, CA MUTCD, actual field conditions, or direction from the County Inspector or Engineer.

2.7 BID ITEM NO. 5 - ADEQUATE SHEETING, SHORING, AND BRACING, OR EQUIVALENT METHOD, FOR THE PROTECTION OF LIFE OR LIMB, CONFORMING TO APPLICABLE CALIFORNIA SAFETY ORDERS FOR ALL BID ITEMS, INCLUDING DEDUCTIVE ALTERNATIVES.

A. Measurement and Payment by Lump Sum Paid on a Percent of Work Complete.

B. Adequate Sheeting, Shoring, and Bracing shall include full compensation for furnishing all labor, materials, tools and equipment and for doing all the work required for providing necessary shoring and bracing per State of California Labor Code 6705 – Protection of Workers in Excavations.

BID SET - NOT FOR CONSTRUCTION

C. As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches 5 feet or more in depth, the Contractor shall submit for acceptance by the Owner or by a registered civil or structural engineer, employed by the Owner, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for work protection from the hazard of caving ground during the excavation, of such trench or trenches.

D. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, the plan shall be prepared by a registered civil or structural engineer employed by the Contractor, and all costs therefore shall be included in the price named in the Contract for completion of the Work as set forth in the Contract Documents.

E. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders.

F. Nothing in this Section shall be construed to impose tort liability on the Owner, or any of their officers, agents, representatives, or employees.

2.8 BID ITEM NO. 6 – Zone B 6-inch Transmission Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 14 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, service connections, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for potholing, trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 1, sheets C205-C214 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

BID SET - NOT FOR CONSTRUCTION

F. This bid item does not include the Zone B Flush Out Station (covered in bid item 11), PRV Station (covered in bid item 19), CAV assembly (covered in bid item 20), Blow Off Assembly (covered in bid item 21), and Trench Cutoff Walls (covered in bid item 22).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and work zone buffers shown within the drawings.

I. The Contractor's bid price shall include all costs necessary to perform and complete the Work in compliance with the environmental requirements of the Contract Documents and all requirements applicable to the Contractor's Work under the California Department of Fish and Wildlife Streambed Alteration Agreement No. EPIMS-SBR-64495-R6, *Pipes Wash and Associated Streams*, the Western Joshua Tree Incidental Take Permit, and the San Bernardino County Flood Control District Permit, including required coordination, scheduling, access restrictions, work limits, and temporary protective measures. Prior to mobilization or commencement of any construction activity at the site, the Contractor shall attend a preconstruction biological coordination meeting with BDVWA and the Project Biologist to review the Contractor's responsibilities and applicable permit requirements. An overview of the Streambed Alteration Permit requirements is presented within Section II of the Special Conditions. The full document is included by reference in Attachment D.

2.9 BID ITEM NO. 7 – Warren Vista 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 14 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for potholing, trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 1, sheets C301-C304 for pipeline details.

BID SET - NOT FOR CONSTRUCTION

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include CAVs (covered in bid item 20) and Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.10 BID ITEM NO. 8 – Winters Road (3) 6-inch Pipelines Common Trench

A. Measurement and Payment shall be by Unit Price per Linear Foot (LF) of common trench installation.

B. Work shall conform to the Contract Plans and Specifications.

C. The footage to be paid for shall be the number of linear feet of common trench run in which three (3) 6-inch DR 14 AWWA C900 PVC pipelines are installed complete and approved. The LF quantity shall be measured once along the alignment (centerline of trench / pipeline baseline as shown) from one end connection to the other, or from connection to existing piping to connection to new piping, whichever is applicable. The measured LF shall not be multiplied by three (3) for the number of pipelines installed within the common trench. The unit price per linear foot shall include full compensation for furnishing and installing associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials, and equipment required for trenching, saw cutting, pavement demolition and disposal, dewatering, excavation and backfill, bedding and pipe zone materials, backfill above the pipe zone, compaction, and trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 1, Sheets C401–C403 for pipeline details.

BID SET - NOT FOR CONSTRUCTION

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

G. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.11 BID ITEM NO. 9 – Rainbow Drive 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 14 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 1, sheets C501-C502 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

BID SET - NOT FOR CONSTRUCTION

H. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.12 BID ITEM NO. 10 – Lanes End 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 14 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 1, sheet C601 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.13 BID ITEM NO. 11 – Zone B Flush Out Station

A. Measurement and Payment by Lump Sum Paid of Full Compensation for Each assembly.

BID SET - NOT FOR CONSTRUCTION

B. The Zone B Flush Out Station shall be measured by a complete and in-place assembly Per Volume 1 Detail 2/C705 as shown on the drawings. The contractor is responsible for coordinating final location with owner prior to installation and shall coordinate all installation with final road restoration work.

C. The payment for each Flush Out Station assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the Flush Out Station assembly complete and in-place from the main pipeline to the Flush Out Station location. This shall include, but not limited to, pipe, pipe saddle, fittings, thrust blocks, mechanical restraints; pre-cast concrete for vault; magnetic flow meters, pressure reducing valve, and any appurtenances and incidentals necessary to complete the Flush Out Station assembly. This item includes box adjustments to grade. The standpipe associated with this flushout shall be incidental to this bid item and is not counted under Bid Item 21.

D. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

E. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.14 BID ITEM NO. 12 – Reche Road and D-1 Pumpstation 8-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **8-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, all trench plating, temporary cold patch asphalt and hot mix asphalt pavement restoration. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheet C-01 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include the Blow Off Assembly (covered in bid item 21).

BID SET - NOT FOR CONSTRUCTION

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

J. The Contractor's bid price shall include all labor, materials, equipment, and incidentals necessary to perform the work within San Bernardino County right-of-way in compliance with the County Excavation Permit and applicable County requirements. This includes protection of existing pavement, shoulders, drainage facilities, signs, striping, monuments, utilities, and other existing improvements; restoration of disturbed shoulder and roadside areas; compaction and grading of trench backfill; removal of loose material from paved surfaces; and repair of pavement, shoulder, drainage, or roadway damage caused by Contractor operations to the satisfaction of San Bernardino County Department of Public Works. No separate payment will be made for such protection, coordination, cleanup, or restoration.

2.16 BID ITEM NO. 13 – Stearman Road 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheet C-02 for pipeline details.

BID SET - NOT FOR CONSTRUCTION

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include CAVs (covered in bid item 20) and Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

H. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.17 BID ITEM NO. 14 – Osgood Avenue 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheet C-03 & C-04 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include CAVs (covered in bid item 20).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

BID SET - NOT FOR CONSTRUCTION

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.19 BID ITEM NO. 15 – Reche Road 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheet C-05 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

J. The Contractor's bid price shall include all labor, materials, equipment, and incidentals necessary to perform the work within San Bernardino County right-of-way in compliance with the County Excavation Permit and applicable County requirements. This includes protection of existing pavement, shoulders, drainage facilities, signs, striping, monuments, utilities, and other existing improvements; restoration of disturbed shoulder

BID SET - NOT FOR CONSTRUCTION

and roadside areas; compaction and grading of trench backfill; removal of loose material from paved surfaces; and repair of pavement, shoulder, drainage, or roadway damage caused by Contractor operations to the satisfaction of San Bernardino County Department of Public Works. No separate payment will be made for such protection, coordination, cleanup, or restoration.

2.20 BID ITEM NO. 16 – Alta Avenue 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheets C-06, C-07, C-08 and C-09 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include the PRV Station (covered in bid item 19), CAVs (covered in bid item 20), the Blow Off Assembly (covered in bid item 21), and Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

BID SET - NOT FOR CONSTRUCTION

2.21 BID ITEM NO. 17 – North Kuna Avenue 6-inch Pipeline

A. Measurement and Payment shall be by Unit Price Per Linear Foot installed.

B. Work shall conform to these contract plans and specifications.

C. The footage of pipe to be paid for shall be the number of linear feet of pipe installed in-place complete, and approved. The footage of pipe shall be measured along the centerline of the pipe from one end, or connection to existing pipe, to the other end, or connection to new pipe, whichever is applicable. The unit price per linear foot shall include full compensation for furnishing and installing all **6-inch DR 18 AWWA C900 PVC** pipe and associated ductile iron fittings, tees, elbows, couplings, reducers; joint restraints, thrust blocks, connections, locating wire, and all appurtenances required to complete the pipeline installation regardless of the number, type, or configuration required. The unit price shall include all labor, materials and equipment required for trenching, saw cutting, paving demolition and disposal, dewatering, excavation and backfill, sand bedding and backfill in the pipe zone, backfill above the pipe zone, compaction, and all trench plating. Excavation unit prices exclude shoring/bracing, which shall be paid under bid item 5.

D. Refer to Volume 2, sheets C-10, C-11, and C-12 for pipeline details.

E. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

F. This bid item does not include the PRV Station (covered in bid item 19), CAVs (covered in bid item 20), and Fire Hydrants (covered in bid item 23).

G. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

H. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

I. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.22 BID ITEM NO. 18 – Yucca Mesa Road Interties

A. Measurement and Payment by Lump Sum Paid of Full Compensation for Each assembly, (2) two assemblies in total.

BID SET - NOT FOR CONSTRUCTION

B. The Yucca Mesa Road Interties shall be measured by a complete and in-place installation per Volume 2 Sheet C-13 Details 1 and 2. The contractor is responsible for coordinating final location with owner prior to installation and shall coordinate all installation with final road restoration work.

C. The payment for each Yucca Mesa Road Intertie shall include full compensation for furnishing all labor, material, tools, and equipment required to install the Interties complete and in-place from the main pipeline to the Intertie location. This shall include, but not limited to, pipe, fittings, restraints, adapters, thrust blocks, valves, and any appurtenances and incidentals necessary to complete the Interties.

D. The Contractor's bid price shall include all labor, equipment, and materials necessary to verify the location of existing utilities as required in Section 310523 of the Technical Specifications, including Utility Service Alert notifications, coordination with utility owners, and potholing required to expose and confirm existing utilities prior to installation of new pipe, fittings, and associated appurtenances.

E. The Contractors bid price shall include all costs for asbestos cement pipe removal, handling, and disposal for work at locations where the pipeline installation requires connecting to existing asbestos cement pipe. The contractor shall remove, handle, and dispose of asbestos cement pipe as outlined in Section 028213.19 of these contract documents.

F. This bid item does not include the PRV Station (covered in bid item 19).

G. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

H. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.23 BID ITEM NO. 19 – PRV Station

A. Measurement and Payment by Lump Sum Paid of Full Compensation for Each assembly.

B. The PRV Station assembly shall be measured by a complete and in-place assembly as shown in Volume 2 Details 1, 2, and 3 on sheet C-23 and as shown in Volume 1 on sheet C708. The contractor is responsible for coordinating final location with owner prior to installation and shall coordinate all installation with final road restoration work.

C. The payment for each PRV Station assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the PRV Station assembly complete and in-place from the main pipeline to the PRV Station location. This shall include, but not limited to, site piping to adjacent mainline, ductile iron pipe fittings, pipe saddle, fittings, restraints including bolts and washers; valves, and any appurtenances and incidentals necessary to complete the PRV Station assembly. This item includes box adjustments to grade. This bid item also includes flow meter stations as indicated on each PRV station site plan. This bid item does not include Combination Air Valve assemblies.

BID SET - NOT FOR CONSTRUCTION

D. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

E. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.24 BID ITEM NO. 20 – Combination Air Valve

A. Measurement and Payment by Lump Sum Paid of Full Compensation for Each assembly.

B. The combination air valve (CAV) assembly shall be measured by a complete and in-place assembly Per Volume 1 Detail 1 Sheet C703 and Per Volume 2 Detail 4 Sheet C-16; as shown on the drawings. The contractor is responsible for coordinating the final location with the owner prior to installation.

C. The payment for the CAV assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the CAV assembly complete and in place from the main pipeline to the valve, to the setting of the foundation. This shall include, but not limited to, valves; enclosure; pipe, pipe saddle, fittings, restraints including bolts and washers; tracer wire; 10-mil polyethylene wrap; excavation and backfill; utility marker, and any appurtenances and incidentals necessary to complete the CAV assembly. This item includes box adjustments to grade.

D. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

E. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.25 BID ITEM NO. 21 – Blow Off

A. Measurement and Payment by Lump Sum of Full Compensation for Each assembly.

B. The blow-off assembly shall be measured by a complete and in-place assembly Per Volume 1 Detail 2 Sheet C703 and Per Volume 2 Detail 2 Sheet C-15: as shown on the drawings. The contractor is responsible for coordinating final location with the owner prior to installation.

C. The payment for the blow-off assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the blow-off assembly complete and in place from the new waterline to the setting of the per-cast box. This shall include, but not limited to, valves; pre-cast traffic box and lid; pipe, pipe saddle, flushing hydrant connection, fittings, restraints including bolts and washers; tracer wire; concrete; valve boxes and covers, 10-mil polyethylene wrap; excavation and backfill; thrust blocks, and any appurtenances and incidentals necessary to complete the blow-off. This item includes box adjustments to grade.

D. This bid does not include the permanent pavement replacement that will be paid under separate bid items.

BID SET - NOT FOR CONSTRUCTION

E. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

F. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.26 BID ITEM NO. 22 – Trench Cutoff Wall

A. Measurement and Payment by Lump Sum of Full Compensation for Each assembly.

B. The Trench Cutoff Wall Assembly shall be measured by a complete and in-place assembly Per Volume 1 Detail 1Sheet C704 as shown on the drawings. The contractor is responsible for coordinating final location with owner prior to installation.

C. The payment for each Trench Cutoff Wall assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the Trench Cutoff Wall assembly complete and in-place from the main pipeline to the Trench Cutoff Wall location. This shall include, but not limited to, concrete, plywood (for casting a mold), and any appurtenances and incidentals necessary to complete the Trench Cutoff Wall assembly. This item includes box adjustments to grade.

D. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

E. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.27 BID ITEM NO. 23 – Fire Hydrant

A. Measurement and Payment by Lump Sum of Full Compensation for Each assembly regardless of connection size.

B. The Fire Hydrant assembly shall be measured by a complete and in-place assembly Per Volume 1 Detail 5 Sheet C703 and Per Volume 2 Detail 3 Sheet C-16; as shown on the drawings. Contractor is responsible for coordinating final location with owner prior to installation and shall coordinate all installation with final road restoration work.

BID SET - NOT FOR CONSTRUCTION

C. The payment for each Fire Hydrant assembly shall include full compensation for furnishing all labor, material, tools, and equipment required to install the fire hydrant assembly complete and in place from the main pipeline to the fire hydrant location. This shall include, but not limited to, saw cutting, paving demolition and disposal, hard scrap restoration, new fire hydrant, isolating valve and valve box, concrete pad around valve box (when specified in specifications or plans), piping, anchoring tee at main, anchoring couplings, fire hydrant extension, excavation, concrete blocking, granular drainage material, backfill, restoration, testing, and flushing, to install a new fire hydrant assembly as indicated on plans and on standard drawings complete and ready for use.

D. This bid item does not include the permanent pavement replacement that will be paid under separate bid item.

E. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

F. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.28 BID ITEM NO. 24 – Zone B Booster Pump Station

A. Measurement and Payment by Lump Sum Paid on a Percent of Work Complete.

B. The Zone B Pump Station shall be measured and paid per complete in-place as shown in the Plans and Details of Volume 3 Drawings. The Contractor shall include all labor, equipment, and materials necessary for a complete and operating booster pump station.

C. The payment for the Zone B Pump Station shall include full compensation for furnishing all labor, material, tools, and equipment required to provide and install the pump station building, pumps, electrical equipment, and accessories. This item shall include all structures, (2) multi-stage vertical inline pumps, piping, fittings, instrumentation, valves, actuators, electrical service, electrical components, flow meters, telemetry, building materials, concrete, site grading, site improvements, fencing and gates, potholing, excavation, backfill, testing and disinfection, and any other appurtenances, labor, equipment, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready for use.

D. This bid item includes pump and instrumentation Manufacturer's field, startup and training services.

E. This bid item does not include SCADA and PLC Customized Programming Work.

F. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

G. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

BID SET - NOT FOR CONSTRUCTION

2.29 BID ITEM NO. 25 – Zone D1 Booster Pump Station Improvements

A. Measurement and Payment by Lump Sum Paid on a Percent of Work Complete.

B. The Zone D1 Booster Pump Station Improvements shall be measured and paid per complete in-place as shown in the Plans and Details of Volume 3 Drawings. The Contractor shall include all labor, equipment, and materials necessary for a complete and operating booster pump station.

C. The payment for the Zone D1 Pump Station Improvements shall include full compensation for furnishing all labor, material, tools, and equipment required to provide and install the vertical turbine pump, electrical equipment, and accessories. This item shall include all structures, piping, fittings, valving, instrumentation, valves, electrical service, electrical components, flow meters, telemetry, building materials, concrete, site improvements, potholing, excavation, backfill, testing and disinfection, and any other appurtenances, labor, equipment, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready for use.

D. This bid item includes pump and instrumentation Manufacturer's field, startup and training services.

E. This bid item does not include SCADA and PLC Customized Programming Work.

F. The Contractors bid price shall include all costs to perform and complete the work within the easements and shown within the drawings.

G. The Contractors bid price shall include all costs to perform and complete the work while meeting the environmental requirements specified within the Special Provisions and as required by the WJT Incidental Take Permit.

2.30 BID ITEM NO. 26 – FORSHOCK FOR ALL SCADA AND PLC CUSTOMIZED PROGRAMMING WORK

A. Measurement and Payment by a lump sum allowance paid in the amount of **$41,750** shall be included in the Contract Price for Forshock PLC/SCADA control system work associated with the D1 Booster Pump Improvements and Zone B Booster Pump Station Improvements, as shown on the Volume 3 Drawings and described in the Contract Specifications. This allowance includes the Contractor's markup of thirteen percent (13%) for overhead and profit. Forshock shall perform the following work as the Owner-designated PLC/SCADA subcontractor retained by the Contractor.

B. This bid item shall include payment for the D1 Booster Pump Improvements consisting of full compensation for PLC and SCADA programming services furnished by Forshock. The allowance shall include all labor, software development, programming, startup assistance, mileage, travel, and other incidentals required to modify, test, and commission the existing PLC/SCADA system for the D1 Booster Pump Improvements.

BID SET - NOT FOR CONSTRUCTION

C. This bid item shall also include payment for the Zone B Booster Pump Station Improvements consisting of full compensation for furnishing the Forshock PLC/SCADA Control System, including the PLC/RTU control panel and enclosure, associated radio communications equipment, PLC and HMI programming, software development, startup assistance, mileage, travel, and all other labor, materials, equipment, and incidentals required to provide the Forshock PLC/SCADA Control System complete. The PLC/RTU control panel enclosure and HMI enclosure shall be furnished by Forshock and installed by the Contractor as indicated on the Drawings.

D. The Contractor shall coordinate procurement, delivery, installation, testing, and commissioning of the Forshock PLC/SCADA Control System directly with Forshock, the electrical work, and all other affected trades to provide a complete and fully operational control system.

2.31 BID ITEM NO. 27 – ALL REMAINING WORK INCLUDED IN THE CONTRACT DRAWINGS AND SPECIFICATIONS NOT INCLUDED IN BID ITEMS NO. 1 THROUGH 26

A. **Measurement**: Bid Item No. 27 shall be measured as a single lump sum item for completion of ALL WORK shown in the Contract Drawings and specified in the Technical Specifications and Division 0 of the Project Manual that is required for the completion of the finished and operable pipeline and pump station improvements presented in the drawings not including, Bid Items No. 1 through 26.

B. **Payment:** Payment for Bid Item No. 27 shall constitute full compensation for furnishing all labor, materials, equipment, tools, incidentals, overhead, profit, coordination, supervision, and administrative costs necessary to perform and complete all Work described above, including but not limited to miscellaneous and ancillary work, construction surveying, permitting, appurtenances, connections, adjustments, minor removals and reinstatement, and all other items required to deliver a complete Project in accordance with the Contract Documents, whether or not such items are specifically called out in the Bid Item descriptions.

C. **Coordination with Other Bid Items:** This Bid Item is intended to capture only those elements of the Work not paid for under Bid Items No. 1 through 26. No separate or additional payment will be made for Work properly included in other Bid Items.

D. Contractor shall include adequate value in Bid Item No. 27 to cover all miscellaneous work not specifically measured or paid for under other Bid Items.

2.32 BID ITEM NO. 28 – D-1 – DEDUCTIVE ALTERNATIVE NO. 1: ZONE B 6-INCH TRANSMISSION PIPELINE STA 157+50 TO STA 174+68

A. Bid Item D-1 is Deductive Alternative No. 1 as indicated in the Bid Form. This deductive alternative is provided so the Owner may delete the portion of the Zone B 6-inch Transmission Pipeline from Station 157+50 to Station 174+68, together with the associated appurtenances to meet budget constraints.

BID SET - NOT FOR CONSTRUCTION

The Work subject to deletion under Deductive Alternative D-1 consists of the following:

1. 1,718 linear feet of Zone B 6-inch Transmission Pipeline;
2. One (1) Pressure Reducing Valve Station;
3. Three (3) Combination Air Valve Assemblies;
4. One (1) Blow Off Assembly; and
5. Two (2) Trench Cutoff Walls.

B. The deductive price for the Zone B 6-inch Transmission Pipeline component shall include deletion of all Work associated with the pipeline between Station 157+50 and Station 174+68, including pipe, fittings, valves and connections not otherwise included under separate Bid Items, trenching and excavation, dewatering, bedding, backfill, compaction, surface restoration, testing, disinfection, and all labor, materials, equipment, overhead, profit, and incidentals associated with this segment.

The deductive prices for the Pressure Reducing Valve Station, Combination Air Valve Assemblies, Blow Off Assembly, and Trench Cutoff Walls shall include deletion of all Work associated with those respective facilities as shown on the Drawings and specified in the Contract Documents.

C. The unit price entered for each component of Deductive Alternative D-1 shall be equal to the unit price bid for the corresponding Base Bid Item, as follows:

1. Zone B 6-inch Transmission Pipeline – Bid Item No. 6;
2. Pressure Reducing Valve Station – Bid Item No. 19;
3. Combination Air Valve Assembly – Bid Item No. 20;
4. Blow Off Assembly – Bid Item No. 21; and
5. Trench Cutoff Wall – Bid Item No. 22.

D. The total amount of Deductive Alternative D-1 shall be the sum of the extended prices for the quantities indicated in the Bid Form. Separate, reduced, or otherwise modified unit prices shall not be used for the deductive alternative. Unit prices that are not equal to the corresponding Base Bid unit prices may be considered irregular or non-responsive at the Owner's discretion.

E. If Deductive Alternative No. 1 is accepted, the Contractor shall omit the Work identified above from construction, and the Contract Price shall be reduced by the total amount bid for Deductive Alternative D-1. The corresponding Base Bid quantities shall be reduced accordingly. All remaining Work shall be completed as shown and specified in the Contract Documents.

BID SET - NOT FOR CONSTRUCTION

2.33 BID ITEM NO. 29 – D-2 – DEDUCTIVE ALTERNATIVE NO. 2: LANES END 6-INCH PIPELINE

A. Bid Item D-2 is Deductive Alternative No. 2 as indicated in the bid form. Bid Item D-2 is provided so the Owner may delete the Lanes End 6-inch pipeline portion of the Work if necessary to meet budget constraints. Bid Item D-2 shall include deletion of all Work shown and specified for the Lanes End 6-inch pipeline segment, including all associated appurtenances, fittings, valves, connections, trenching/excavation, dewatering, bedding, backfill, compaction, traffic control associated with this segment, surface restoration (as applicable to this segment), testing, disinfection, and all incidentals necessary for a complete deletion of this segment as shown on the Drawings and specified in the Contract Documents.

B. If Deductive Alternative No. 2 is accepted, the Contractor shall omit the Lanes End 6-inch pipeline Work described above from construction, and the Contract Price will be reduced by the amount bid for Bid Item D-2. All remaining Work shall be completed as shown and specified.

C. Bid Item D-2 corresponds directly to Bid Item No. 10 – Lanes End 6-inch Pipeline. The amount bid for Bid Item D-2 shall represent the full value of deleting the Work included under Bid Item No. 10. The deductive amount shall be equal to the Contractor's price for Bid Item No. 10 and shall include all labor, materials, equipment, overhead, profit, and incidentals associated with that Work. Deductive amounts that are not consistent with the value of Bid Item No. 10 may be considered irregular or non-responsive at the Owner's discretion.

2.34 BID ITEM NO. 30 – DEDUCTIVE ALTERNATIVE 3: RECHE ROAD 6-INCH PIIPELINE

A. Bid Item D-3 is Deductive Alternative No. 3 as indicated in the bid form. Bid Item D-3 is provided so the Owner may delete the Reche Road 6-inch pipeline portion of the Work if necessary to meet budget constraints. Bid Item D-3 shall include deletion of all Work shown and specified for the Reche Road 6-inch pipeline segment, including all associated appurtenances, fittings, valves, connections, trenching/excavation, dewatering, bedding, backfill, compaction, traffic control associated with this segment, surface restoration (as applicable to this segment), testing, disinfection, and all incidentals necessary for a complete deletion of this segment as shown on the Drawings and specified in the Contract Documents.

B. If Deductive Alternative No. 3 is accepted, the Contractor shall omit the Reche Road 6-inch pipeline Work described above from construction, and the Contract Price will be reduced by the amount bid for Bid Item D-3. All remaining Work shall be completed as shown and specified.

C. Bid Item D-3 corresponds directly to Bid Item No. 15 – Reche Road 6-inch Pipeline. The amount bid for Bid Item D-3 shall represent the full value of deleting the Work included under Bid Item No. 15. The deductive amount shall be equal to the Contractor's price for Bid Item No. 15 and shall include all labor, materials, equipment, overhead, profit, and incidentals associated with that Work. Deductive amounts that are not consistent with the value of Bid Item No. 15 may be considered irregular or non-responsive at the Owner's discretion.

BID SET - NOT FOR CONSTRUCTION

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 01310
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

A. General work included in this Section:
   1. Construction schedules.

1.2 CONSTRUCTION SCHEDULES: GENERAL

A. Prepare and submit to the Engineer estimated construction progress schedules for the Work, with sub-schedules of related activities that are essential to its progress.

B. Submit revised progress schedules with progress payments.

C. Owner may require Contractor to enhance construction progress by use of additional equipment, or construction forces, as well as increase the working hours if operations fall behind schedule at any time during the construction period.

1.3 FORM OF SCHEDULES

A. Prepare schedules in the form of a horizontal bar chart:
   1. Provide separate horizontal bar for each trade or operation.
   2. Horizontal time scale: Identify the first work day of each week.
   3. Scale and spacing: To allow space for notations and future revisions.
   4. Minimum sheet size: 11 IN x 17 IN.

B. Format of Listings: The Table of Contents of this Project Manual.

C. Format of Listing: The chronological order of the start of each item of work.

D. Identification of Listings: By major Specification Section numbers.

1.4 CONTENT OF SCHEDULES

A. Show on construction progress schedule:
   1. The complete sequence of construction by activity.
   2. The dates for the beginning and completion of each major element of construction.
      a. Specifically list:
         1) Site clearing.
         2) Site utilities.
         3) Trenching
            a) Provide schedule for each alignment
            b) Provide dates for each completing installation per 1,000 feet of pipe
         4) Subcontractor work.
         5) Equipment installations.
         6) Pressure testing and valve calibration.
   3. Show for submittal schedules for shop drawings and product data.
   4. The dates for Contractor's submittals.
   5. The dates submittals will be required for Owner-furnished products.
   6. The dates approved submittals will be required from Engineer.
      a. Extensions of time for delays in submittal approval shall only be allowed as provided in Section 01340.

BID SET - NOT FOR CONSTRUCTION

B. Product delivery schedules:
   1. Show the delivery dates for:
      a. Products specified under Allowances.
      b. Products furnished by Owner.
      c. All major items of equipment.

C. Prepare and submit sub-schedules for each separate stage of work.

D. Provide sub-schedules to define critical portions of prime schedules.

1.5 PROGRESS REVISIONS

A. Indicate progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule:
   1. Major changes in scope.
   2. Activities modified since previous submission.
   3. Revised projections of progress and completion.
   4. Other identifiable changes.

C. Provide a narrative report as needed to define:
   1. Problem areas, anticipated delays, and the impact on the schedule.
   2. Corrective action recommended, and its effect.
   3. The effect of changes on schedules of other prime contractors.

1.6 SUBMISSIONS

A. Submit initial schedules within 30 days after the award of Contract:
   1. Engineer will review schedules and return review copy within 10 days after receipt.
   2. If required, resubmit within 7 days after return of review copy.

B. Submit revised progress schedules with each Application for Payment.

C. For each submission, submit the number of opaque reproductions that the Contractor requires, plus three copies that will be distributed by the Engineer.
   a. Do not submit less than five copies.

D. Submit one reproducible transparency and one opaque reproduction for each initial resubmission.

1.7 DISTRIBUTION

A. Engineer will distribute copies of the accepted schedules to:
   1. One copy to Owner.
   2. Two copies to Resident Project Representative.
   3. One copy to be retained in Engineer's file.
   4. One copy to Contractor to be kept on file at job site.
   5. Remainder to Contractor for his distribution.

B. Schedule recipients will report promptly to Engineer and Contractor, in writing, any problems anticipated by the projections shown in the schedules.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 01340
SHOP DRAWINGS

PART 1 – GENERAL

1.1 SUMMARY

A. General:
   1. This Section addresses submittal requirements for shop drawings, samples, and operation and maintenance materials.

1.2 SUBMITTALS: GENERAL

A. All preliminary submittals shall be in electronic format.
B. Two hard copies of approved submittals shall be provided.
C. Transmit all submittals to Engineer.
D. All submittals shall contain a cover sheet or cover letter clearly representing the purpose and the item(s) submitted.
E. Submittal information defining equipment and materials shall be specific to the products proposed. Generalized product information that does not clearly define specific equipment or materials to be used will be rejected. Submittals shall contain the manufacturer's recommendations for installation, where applicable or required.
F. All shop drawings and material and equipment submittals shall contain an approval stamp from the Contractor.
   1. The stamp shall state that "[*Contractor name*] has examined and verified all field dimensions and measurements, field construction criteria, materials, and similar data, and that the Contractor has checked with the requirements of the Work and Contract Documents."
   2. All transmittals shall be made by the Contractor. Transmittals received from subcontractors and suppliers will receive no action.
G. The submittal of shop drawings and samples shall comply with Section 2.04 of the General Conditions.
H. Each transmittal shall contain a transmittal cover sheet clearly indicting the following:
   1. The Project Name.
   2. The Owner.
   3. The Engineer.
   4. Date transmitted.
   5. The transmittal identification number for each item.
   6. A description of each item.
   7. Action requested.

1.3 SHOP DRAWINGS SUBMITTALS

A. The requirements for shop drawing transmittals are as follows:
   1. Cover sheets shall contain the information depicted in Section 1.2F.
   2. Each item transmitted shall be numbered consecutively beginning with "1".
   3. Resubmittals shall retain the original transmittal number, but be accompanied with a suffix letter starting with letter "A".
   4. Each transmittal cover sheet shall contain items within only one Specification Section or construction detail.

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5. Submit four copies of the submittal materials for the Engineer, plus the number of copies required by the Contractor.
6. The first page of each item's submittal materials shall contain a 2" x 3" clear space for the Engineer's stamp.
7. The Contractor's marks shall be on each copy of the transmittal.
8. The contents of transmittals shall be coordinated and identified so that all items can be easily verified by the Engineer.
9. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item is in compliance with the Contract Documents.
10. Wherever possible, submit product data information on 8½ " x 11" sheets.
11. Indicate exact item or model, and all proposed items on product information sheets.
12. Submittal information shall include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls, weights, and other pertinent data.
13. If proposed products deviate from the specifications or drawings in any way, clearly note and justify the deviation, in detail, in a supplemental letter to the submittal. If an explanation is not provided, the shop drawing will be returned without action.

1.4 SAMPLE SUBMITTALS

A. Identify the sample as to manufacturer, item, use, type, project designation, tag number, specification section or drawing detail, color, texture, finish, and other pertinent data.

B. Include specific installation and application instructions.

C. Provide the Contractor's stamp of approval on samples as an indication of his checking and verification of dimensions and coordination with interrelated work.

1.5 OPERATION AND MAINTENANCE MANUALS AND EQUIPMENT MAINTENANCE SUBMITTALS

A. Operation and Maintenance Manuals are required for:
   1. Major equipment.
   2. Equipment with electric motors.
   3. Specialized equipment including control valves, instrumentation, control systems, meters, recorders, and transmitters.

B. Transmittals for Operation and Maintenance Manuals shall be identified with consecutive numbers, starting with "1". The prefix OM shall be provided for the transmittal of O&M Manuals (i.e. "OM - #").

C. Submit one copy of the Operation and Maintenance Manual until approval is received.

D. An acceptable O&M submittal will be retained by the Engineer. The transmittal cover sheet will be returned with a request for three additional copies.

E. Deficient submittals will be returned along with the transmittal sheet. The deficient areas will be noted.

F. O&M Manuals shall include, but are not necessarily limited to the following:
   1. Equipment function, normal operating characteristic, and limiting operations.

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2. Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
3. Operating instructions for start-up, routine and normal operations, regulation and control, shutdown, and emergency conditions.
4. Lubrication and maintenance instructions.
5. A guide to "troubleshooting".
6. Parts list and predicted life of parts subject to wear.
7. Outline, cross-section, and assembly drawings.
8. Engineering data.
9. Electrical diagrams, including elementary diagrams and interconnection diagrams.
10. Test data and performance curves.
11. A list of recommended spare parts.
12. Copies of installation instructions, parts lists or other documents packed with equipment when it is delivered.
13. Equipment record sheets recommended by the manufacturer.

PART 2 – EXECUTION

2.1 SUBMITTALS: APPROVAL OR REJECTION

A. The Contractor shall submit a minimum of four (4) copies of each submittal (unless additional copies are desired by the Contractor). The submittal will be reviewed for completeness and certified by the Engineer with one of the following.
   1. No Exceptions.
   2. Exceptions as Noted.
   3. Revise and Resubmit.
   4. Rejected.
   5. Information Only.

B. If the Engineer finds the submittal in substantial compliance with the specification, he will certify the submittal "No Exceptions". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

C. If the Engineer marks the submittal "Exceptions as Noted", the Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal with the noted corrections.

D. If the Engineer marks the submittal "Revise and Resubmit" it will be annotated as to why it was not approved. The Contractor must then revise his submittal to meet specifications and resubmit for approval.
   1. Resubmittal shall be identified with the original identification number and shall include a suffix in accordance with Section 1.3A

E. If the Engineer finds the submittal is not within the requirements of the specifications, it will be marked "Rejected" and annotated as to why it was rejected. The Contractor must then resubmit for approval.
   1. Resubmittal shall be identified with the original identification number and shall include a suffix in accordance with Section 1.3A

F. If the Engineer marks the submittal "Revise Information Only" it will not be reviewed and will be returned to the Contractor. The submittal is not required

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to be reviewed by the Engineer or is not within the responsibility of the Engineer for review.. The Contractor need not resubmit for approval.

G. Transmittals that are not stamped by the Contractor in accordance with Section 1.2 D will not be reviewed and will be returned with no action.

H. Transmittals that are "No Exceptions" or "Exceptions As Noted" will be distributed to the Owner's field personnel. If for any reason the Contractor resubmits an approved item, the Contractor shall assure that previously approved documents are superseded by the resubmittal. Transmittals that are "Revise and Resubmit or Rejected" will not be distributed. One copy of the transmittal will be marked up and returned to the Contractor.

END OF SECTION

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SECTION 01370
SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SUMMARY

A. General work included in this Section:
   1. Schedule of values.

1.2 SCHEDULE OF VALUES: GENERAL

A. Submit to Engineer a Schedule of Values allocated to the various portions of the Work.

B. Upon request of Engineer, support the values with data that will substantiate correctness.

C. An unbalanced Schedule of Values providing overpayment of Contractor on items of the Work that will be performed early will not be accepted.

D. Revise and resubmit the Schedule of Values until acceptable to Engineer.
   1. No Applications for Payment shall be submitted until Schedule of Values is accepted including applications for payment for mobilization.

E. The Schedule of Values, when accepted by Engineer, shall be used as the basis for the Contractor's Applications for Payment.

1.3 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Prepare schedule on 8-1/2 IN x 11 IN letter format.
   1. Contractor's standard forms and automated printout will be considered for approval by Engineer upon Contractor's request.
   2. Identify schedule with:
      a. Title of Project and location.
      b. Engineer and Project number.
      c. Name and address of Contractor.
      d. Contract designation.
      e. Date of submission.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. Follow the Table of Contents of this Project Manual as the format for listing component items.
   1. Identify each line item with the number and title of the respective major Section of the Specifications.

D. For each major line item, list subvalues of major products or operations under the item.

E. Such items as bond and insurance premiums, temporary construction facilities, job mobilization and demobilization, and may be listed separately.

F. For the various portions of the Work:
   1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

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2. For all items, break down the value into:
    a. The cost of the materials, delivered and unloaded, with taxes paid.
    b. Cost of installation.
    c. The total installed value, including Contractor's overhead and profit.

G. The sum of all values listed in the schedule shall equal the total Contract Price.

1.4 SUBSCHEDULE OF UNIT MATERIAL VALUES

A. Submit a sub-schedule of unit costs and quantities for:
    1. Products on which progress payments will be requested for stored products.

B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.

C. The unit quantity for bulk materials shall include an allowance for normal waste.

D. The unit values for the materials shall be broken down into:
    1. Cost of the material, delivered and unloaded at the site, with taxes paid.
    2. Installation costs, including Contractor's overhead and profit.

E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

END OF SECTION

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SECTION 01400
QUALITY CONTROL

PART 1 - LABORATORY TESTS

1.1 GENERAL

A. Owner will employ and pay for the services of an independent testing laboratory to perform specified laboratory and field testing of materials and equipment where The Technical Specifications specifically obligate the Owner to provide the services:
   1. Earthwork
   2. Trenching and trench backfill
   3. Paving and surfacing
   4. Concrete
   5. Bacteriological Testing

B. Contractor shall cooperate with Owner's materials testing representative to facilitate the execution of its required services.

C. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

D. The Contractor shall reimburse the Owner for retesting of earthwork and trench backfill compaction due to previously failed results.

1.2 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification," published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable.

C. Authorized to Operate in the State in Which the Project is Located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment:
   1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
      a. National Bureau of Standards.
      b. Accepted values of natural physical constants.

1.3 LABORATORY DUTIES

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:
   1. Comply with specified standards.
   2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of Work or products.

D. Promptly submit 5 copies of written report of each test and inspection to Engineer. Each report shall include:
   1. Date issued.
   2. Project title and number.
   3. Testing laboratory name, address and telephone number.

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4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and Specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by Engineer.

1.4 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory Is Not Authorized To:
   1. Release, revoke, alter or enlarge on requirements of Contract Documents.
   2. Approve or accept any portion of the Work.
   3. Owner employed laboratory shall not perform any duties of the Contractor.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with Laboratory Personnel and Provide Access to Work.
B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
D. Furnish Copies of Products Test Reports as Required.
E. Furnish Incidental Labor and Facilities:
   1. To provide access to Work to be tested.
   2. To obtain and handle samples at the Project site or at the source of the product to be tested.
   3. To facilitate inspections and tests.
   4. For storage and curing of test samples.
F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests:
   1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

PART 2 - SHOP TESTS

2.1 GENERAL

A. Contractor shall pay all costs associated with specified shop tests of materials and equipment, including retesting of items which fail original tests.
B. Related Requirements Specified Elsewhere:
   1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.
   2. Certification of products: The respective sections of Specifications.
   3. Test, adjust and balance of equipment: The respective sections of Specifications.
   4. Shop tests required, and standards for testing: Each Specification section listed.

PART 3 - MANUFACTURER'S FIELD SERVICES

3.1 GENERAL

A. Contractor shall provide and pay for the services of manufacturers' representatives to perform the

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specified services.

B. Related Requirements Specified Elsewhere:
   1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.
   2. Certification of products: The respective sections of Specifications.
   3. Test, adjust and balance of equipment: The respective sections of Specifications.
   4. Field tests required, and standards for testing: The respective Specification sections.
   5. Operating and Maintenance Data: Section 01340.

3.2 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized Representative of the Manufacturer.
B. Experienced in the Application and Installation of the Subject Equipment.

3.3 SERVICES PROVIDED BY REPRESENTATIVE

A. Visit the Site:
   1. Inspect, check and adjust equipment as required and approve installation.
   2. Be present when equipment is placed in operation.
   3. Revisit the site as often as required to correct all problems and until equipment installation and operation are acceptable to Engineer.
B. Instruct Owner's personnel in the operation and maintenance of the equipment in accordance with Section 01340.
C. Furnish 5 copies of a written report to Engineer, through Contractor, certifying that:
   1. Equipment is properly installed and lubricated.
   2. Equipment is in accurate alignment.
   3. Equipment is free from any undue stress imposed by connecting piping and anchor bolts.
   4. Equipment has operated satisfactorily under full load conditions.

PART 4 - FIELD TESTING

4.1 GENERAL

A. Contractor shall pay for field testing only for items listed under Part 5.3 (Contractor's Field Services and Testing) and for re-testing required due to failed tests/nonconforming work. Owner will provide/pay for Owner-provided testing indicated in Part 5.1.
B. Related requirements specified elsewhere:
   1. Inspection and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.
   2. Certification of products: The respective section of Specifications.
   3. Test, adjust and balance equipment: The respective sections of Specifications.
   4. Field tests required, and standards for testing: The respective Specification sections.
   5. Operating and Maintenance Data: Section 01340.

4.2 TESTING

A. Provide all required materials, labor, equipment, water, and power required for testing.
B. Perform all Tests in Presence of Engineer.
C. Prepare and submit to Engineer 5 copies of written reports detailing the results of the tests and identifying corrective action for materials and equipment which fails to pass field tests.
D. Repair with no additional compensation all materials and equipment which fail during testing.

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PART 5 - SCHEDULES

5.1 TESTING LABORATORY SERVICES

A. Owner shall pay all costs associated with laboratory services for testing of concrete, pavement, and earthwork compaction.

B. Provided testing laboratory services by Owner shall include the following:

Specification Section	Type of Equipment or System
02201	Trenching, Embedment, and Trench Backfill (Relative Density, Compaction) (Relative Density, Compaction, Asphalt)
03002	Concrete (Cylinders, Slump, Air Content)
15140	Bacteriological Sampling

5.3 CONTRACTOR'S FIELD SERVICES AND TESTING

A. Contractor supplied Field testing shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Equipment or System
09900	Painting (DFT/WFT checks)
15042	Hydrostatic Pressure Testing
16010	Electrical (electrical acceptance testing, factory testing, and commissioning)

END OF SECTION

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SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Furnish, install and maintain all temporary utilities required for the Work, and remove on completion of Work.
   2. Furnish, install and maintain all construction aids required for the Work, and remove on completion of the Work.
   3. Furnish, install and maintain fences and barriers as required for protection of the public, property, the environment and the Work.
   4. Provide storage sheds as required by the Contractor.
   5. Field offices will be located at the Project Site in locations indicated on the drawings.
   6. Provided Traffic Control and adhere to Public Convenience Requirements

B. Site Access Control:
   1. Site perimeter fencing permanent or temporary, shall be maintained at all times throughout construction.
      a. Sites and trenches shall not be accessible to the general public.
      b. Secure sites and pits with security fencing and other means necessary.
   2. Contractor shall provide list of names and respective companies to Owner for inclusion on the authorized access list.
   3. Contractor alerted that anyone not otherwise on the authorized list will be denied site access, or at the minimum delayed while access is authorized.
   4. Sites shall be safely accessible by Owner's maintenance personnel & vehicles during any weather condition throughout the project.

C. Demobilization:
   2. Final demobilization.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Comply with applicable Federal, State, and local laws, codes, regulations and ordinances.
   2. Comply with utility company requirements.

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PART 2 – PRODUCTS

2.1 GENERAL

A. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards.

2.2 TEMPORARY UTILITIES

A. Power:
   1. Contractor to make arrangements for temporary power, furnish temporary power pole and meter, temporary connection, and make arrangements and pay all costs for a temporary power supply.
   2. Equipment testing:
      a. Owner will pay for energy during start-up and testing.
      b. Contractor shall pay all costs for temporary wiring, if required.
   3. Contractor shall arrange for and pay all costs associated with temporary power service to the field offices and to Contractor's storage sheds, and pay all costs for energy used.
   4. Contractor shall pay all costs for installation and removal of temporary service, and power used.

B. Water:
   1. Provide bottled drinking water service for all drinking water required by construction personnel. **Provide refrigerated bottled water dispensers for the contractor's trailer. Pay all costs.**

C. Sanitary Facilities:
   1. Provide sanitary facilities:
      a. As required by laws and regulations.
      b. Not less than one (1) facility.
      c. Not less than one (1) facility for every 20 employees of Contractor and subcontractors at the site.
   2. Service, clean and maintain facilities and enclosures on a weekly basis.
   3. Owner's existing sanitary facilities will not be available for use by Contractor or subcontractors.

D. Temporary Heating and Ventilation:
   1. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.
   2. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
   3. Portable heaters shall be standard approved units complete with controls.
   4. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

2.3 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: Scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment.

B. Contractor may, at his own risk, use hoists and cranes installed hereunder:
   1. Coordinate with Engineer and Owner.

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2. Do not exceed rated capacity of hoists and cranes.
3. Replace or repair any damaged units.
4. Owner makes no representation as to the suitability, serviceability, or safety of new or existing hoists and cranes and assumes no responsibility for their safe use by construction personnel.

2.4 BARRIERS

A. Fencing:
   1. Provide any fencing required to protect products or to ensure public safety and the safety of Owner's employees.
   2. Provide fencing around equipment staging areas and other areas as directed or as required.

B. Barriers: Provide suitable barriers as required for public protection and protection of Owner's employees.

2.5 FIELD OFFICE AND STORAGE SHEDS

A. Construction:
   1. Structurally sound, weathertight, with floors raised above ground.
   2. Temperature transmission resistance: Compatible with occupancy and storage requirements.
   3. At Contractor's option, portable or mobile buildings modified for office use may be used.

B. Office for Contractor's superintendent and Owner Resident Field Representative:
   1. Trailer for the sole use of designated occupants, with secure entrance doors and one key per occupant.
      a. Contractor's superintendent and Owner Resident Field Representative may share one building.
   2. **There shall be separate internal office rooms each of minimum 10 feet by 10 feet dimensions.**
   3. Additional rooms shall include: one conference room (10' by 12'), file cabinet, and copy space.
   4. Area: 320 square feet minimum, with minimum dimension 10 feet.
   5. Windows:
      a. Minimum: 3, with a minimum total area of 10 percent of floor area.
      b. **Operable sash and insect screens.**
      c. **Provide and install curtains at each window rated for 100% blackout.**
   6. Furnishings:
      a. Furnishings in office:
         1) Contractors option for superintendent office.
         2) Field Representative: Provide desk, desk chair, with two legal file cabinets.
         3) 6-Tier adjustable steel wire shelving unit measuring 18x48x82 inches.
         3) Conference Room: Provide conference table and eight chairs.
   7. Services:
      a. Interior lighting.
      b. Exterior lighting at entrance door.
      c. Automatic heating and mechanical cooling equipment to maintain comfort conditions.
      d. Minimum of four 110 V duplex electric convenience outlets, at least one on each wall.
      e. Electric distribution panel: Two circuits minimum, 110 V 60 Hz service.
      f. Convenient access to drinking water and toilet facilities.
      g. Minimum one sanitary facility at Field Office location.
   8. Use by Owner's Resident Field Representative shall not be restricted.

C. Storage Shed:
   1. Per requirements of the various trades.
   2. Dimensions: Adequate for storage and handling of products.

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3. Ventilation: Comply with specified and code requirements for the products stored.
4. Heating: Adequate to maintain temperatures specified in the respective sections for the products stored.

D. Existing facilities shall not be used for Field Offices or Storage.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES

A. Maintain and operate systems to assure continuous Service.
B. Modify and extend systems as work progress requires.
C. Completely remove temporary materials and equipment when their use is no longer required.
D. Clean and repair damage caused by temporary installations or use of temporary facilities.

3.2 CONSTRUCTION AIDS

A. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner.
B. Completely remove temporary materials, equipment and services at completion of the project.
C. Clean, Repair Damage Caused by Installation or By Use of Temporary Facilities:
   1. Remove foundations and underground installations for construction aids.
   2. Grade the areas of the site affected by temporary installations to required elevations and slopes, and clean the area.

3.3 BARRIERS

A. Install Facilities of a Neat and Reasonable Uniform Appearance, Structurally Adequate for the Required Purposes.
B. Relocate Barriers as Required by Progress of Construction.
C. Completely Remove Barriers, Including Foundations, When Construction Has Progressed to the Point That They Are No Longer Needed.
D. Clean and Repair Damage Caused by Installation, Fill and Grade the Areas of the Site to Required Elevations and Slopes, and Clean the Area.

3.4 FIELD OFFICE AND STORAGE SHEDS

A. Fill and Grade Sites for Temporary Structures to Provide Surface Drainage.
B. Construct temporary field offices and storage sheds on proper foundations, provide connections for utility services:
   1. Secure portable or mobile buildings when used.
   2. Provide steps and landings at entrance door.
C. Mount Thermometer at Convenient Outside Location, Not in Direct Sunlight.
D. Provide Periodic Maintenance and Cleaning for Temporary Structures, Furnishings, Equipment and Services.
E. Remove Temporary Field Offices, Contents and Services at a Time They Are No longer needed.
F. Remove Storage Sheds When They Are No Longer Needed.
G. Remove Foundations and Debris; Grade the Site to Required Elevations and Clean the Areas.

3.5 DEMOBILIZATION

A. Upon satisfactory completion of the Work, the Contractor shall decontaminate and remove all materials and equipment brought to the Site that are not permanently installed as part of the Work. Contractor shall:
   1. Remove any temporary fencing that was installed.

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2. Repair any damage to perimeter fences, buildings, streets, curbs, landscaping, and other improvements not designated for demolition caused by Contractor's activities.
3. Furnish and install new Site perimeter fencing, equivalent to the existing Site perimeter fence, where work has created potentially less secure areas in the existing Site perimeter fencing.
4. Decontaminate all equipment, vehicles, or other items that have entered the Site.

3.6 TRAFFIC CONTROL AND PUBLIC CONVENIENCE

A. Contractor shall meet weekly with the Owner's Construction Manager and inform the Owner of the type and location of work to be performed the following week, no later than Thursday of the preceding week. The Contractor shall provide this information in writing to the Owner.

B. The Owner's working hours are 7:00am to 4:30pm. Contractor shall schedule his working hours to match the Owner's working hours.

C. Prior to performing any work in the County Right of Way, the Contractor shall submit traffic control plan (TCP) for review by the Owner and as required by San Bernardino County. Review of the TCP by the Engineer shall not relieve the Contractor for full responsibility for complying with the requirements of the Encroachment Permit.
   1. Barricades, railings, flashers, and delineators shall conform to the "State Manual of Traffic Control Devices", and Section 12, "Temporary Traffic Control" of the State Standard Specifications or as otherwise indicated herein.
   2. Install construction area warning signs as specified in Section 12-3.06, "Construction Area Signs" of the State Standard Plans.
   3. Flashing Arrow Boards shall be replaced as required on the Standard Plan or as otherwise required.
   4. Place flashers, barricades, and delineators as required by the California "Manual of Temporary Traffic Control Devices" and as directed by Engineer or as otherwise indicated herein.
   5. Signage and delineators shall conform to MUTCD standards.
   6. Flaggers shall be used when necessary for volume of traffic, line of sight, or special conditions and upon request of County or Owner.
   7. Provide light towers for any night work.

D. County Right-of-Way Permit Requirements:
   1. Contractor shall comply with the requirements of San Bernardino County Excavation Permit No. TREXC-2025-00579 and any additional requirements or field directions issued by San Bernardino County Department of Public Works.
   2. Contractor shall notify the County Road Inspector identified in the permit at least forty-eight (48) hours prior to start of permitted work. Work requiring County inspection shall not proceed without required County notification.
   3. Contractor shall maintain a copy of the County Excavation Permit, approved construction plans, approved traffic control plan, DigAlert ticket, and other permits required by agencies having jurisdiction at the Site while work is in progress.
   4. No work shall be performed within County right-of-way on weekends, County holidays, before 7:00 AM, or after 4:30 PM, unless otherwise approved by San Bernardino County Department of Public Works and the Owner.
   5. Contractor shall provide public notification at least seven (7) working days prior to start of work to affected residents, businesses, schools, and others located within a 300-foot segment of the work where such work is scheduled to last longer than one workday. Additional notifications shall be provided where required by the County Inspector.
   6. Equipment, materials, and stockpiles shall not be stored within County right-of-way when not in use or at the end of each workday unless approved by San Bernardino County Department of Public Works.

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7. Contractor shall maintain temporary traffic control in accordance with the approved traffic control plan, CA MUTCD, County permit requirements, and actual field conditions. Contractor shall adjust, relocate, supplement, or modify traffic control devices as necessary to maintain a safe work zone.
8. Contractor shall protect existing pavement, shoulders, drainage facilities, signs, striping, monuments, utilities, and other existing improvements within the County right-of-way. Damage caused by Contractor operations shall be repaired at no additional cost to the Owner and to the satisfaction of San Bernardino County Department of Public Works.

3.7 DUST AND NOISE CONTROL

A. Contractor shall meet with Owner and Construction Manager prior to mobilization to discuss Dust & Noise issues.
   1. At pre-construction meeting.
   2. Contractor to submit Dust and Noise Control Plan prior to meeting.
   3. Dust and Noise Control Plan to include:
      a. Procedures for customer complaint
      b. Use of water for dust control and street sweeping.
      c. Contractor to include Dust Control at all access paths, existing and temporary.
      d. Runoff water control.
   4. Dust control shall be performed at any time dust becomes a nuisance or visual impediment, or as directed by the local County jurisdiction.
   5. Failure to control dust and noise adequately will be cause for the County to suspend work or for the County (or local jurisdiction) to perform such activity with all costs to be borne by the contractor.
   6. Water shall be applied per the local jurisdiction County requirements. Care shall be taken to control all runoff water utilizing proper SWPPP measures in place.
   7. All work within or outside the work right-of-way must comply with County requirements.
   8. Handling of dust control spoils, hauling, storage and staging of dust control materials and equipment shall all be approved by Owner and Construction Manager prior to start of work.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 01503
STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes furnishing all labor, materials, equipment, and services necessary to prepare, implement, maintain, inspect, monitor, and document storm water and non-storm water pollution controls for the Project.

B. Project land disturbance will exceed 1 acre; therefore, the Project shall obtain and maintain coverage under the State Water Resources Control Board (SWRCB) NPDES General Permit for Storm Water Discharges Associated with Construction Activity (Construction General Permit, CGP), Order WQ 2022-0057-DWQ (NPDES No. CAS000002), as amended. The Agency shall serve as the Discharger and shall provide the Legally Responsible Person (LRP) or Duly Authorized Representative (DAR), as applicable. The Contractor, through its QSD/QSP, shall prepare and manage all documents and information necessary to obtain and maintain such coverage and shall coordinate with the Agency's LRP/DAR for required electronic certification and submittal.

C. Comply with all requirements of permits and authorizations applicable to the Work, including, but not limited to: (1) Caltrans Encroachment Permit and associated storm water requirements within Caltrans right-of-way; (2) San Bernardino County Flood Control District (or other flood control/streambed) permit requirements; and (3) other agency permits identified in the Contract Documents. Where requirements conflict, the more stringent requirement shall govern.

D. Water pollution control requirements apply to all Project-related areas of disturbance, on- and off-site, including, but not limited to staging areas, storage yards, stockpiles, access roads, and borrow/disposal areas used for the Work.

E. Unless otherwise indicated in the Contract Documents, include all costs for storm water compliance in the Contract Price, including SWPPP preparation/updates, QSD/QSP services, inspections, monitoring/sampling, reporting, BMP installation/maintenance, and permit and application fees.

F. Contractor shall retain, at its expense, a qualified storm water compliance subcontractor/consultant specializing in SWPPP preparation and implementation (QSD/QSP). Said subcontractor/consultant shall manage required SWRCB SMARTS submittals for the Project (e.g., NOI/WDID, SWPPP upload, amendments, REAPs, annual reports, and NOT), including preparation and uploading, and shall coordinate with the LRP/DAR for required electronic certification.

1.2 REFERENCES

A. SWRCB Construction General Permit (CGP), Order WQ 2022-0057-DWQ (NPDES No. CAS000002), as amended.

B. Caltrans Storm Water and Water Pollution Control manuals and handbooks, including the Water Pollution Control Program (WPCP) Preparation Manual and the Construction Site Best Management Practices (BMP) Manual, latest editions and addenda in effect at the time of advertisement.

C. Federal Clean Water Act and California Porter-Cologne Water Quality Control Act.

D. California Fish and Game Code Sections 5650 and 12015, as applicable.

E. San Bernardino County Encroachment Permit.

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F. San Bernardino County Flood Control District Permit No. FCCON-2025-00075 (Pipes Wash) including Special, Standard, and General Provisions.
G. California Department of Fish and Wildlife (CDFW) Lake or Streambed Alteration Agreement (Fish & Game Code §1602), when issued, and any associated biological mitigation measures.

1.3 DEFINITIONS

A. BMP: Best Management Practice.
B. CGP: SWRCB Construction General Permit, Order WQ 2022-0057-DWQ (NPDES No. CAS000002), as amended.
C. LRP: Legally Responsible Person as defined by the CGP and identified in the Notice of Intent (NOI).
D. NOI/NOT: Notice of Intent / Notice of Termination submitted through the SWRCB SMARTS system.
E. QPE: Qualifying Precipitation Event (per Caltrans SWSP TR-0400): forecast with a 50% or greater probability of precipitation that results in 0.5 inches or more of rain within a 24-hour period.
F. QSD/QSP: Qualified SWPPP Developer / Qualified SWPPP Practitioner as required by the CGP.
G. REAP: Rain Event Action Plan required by the CGP for applicable Risk Levels.
H. SWPPP: Storm Water Pollution Prevention Plan required by the CGP.
I. WPCP/WPCDs: Water Pollution Control Program and Water Pollution Control Drawings for work within Caltrans right-of-way, when required by Caltrans.

1.4 SUBMITTALS

A. SWPPP. Submit a project-specific SWPPP prepared and certified by a QSD. SWPPP shall include, at a minimum, site maps, BMP descriptions and locations, construction sequencing, risk level determination, REAP (when required), dewatering and discharge management measures, inspection and monitoring procedures, and corrective action procedures.
B. Permit Coverage Documentation. Prior to ground disturbance, provide evidence of CGP coverage (NOI confirmation and WDID number), and provide copies of any additional storm water-related permits required for the Work (e.g., Caltrans, Flood District, dewatering, or discharge authorizations).
C. Caltrans WPCP/WPCDs (if required). For work within Caltrans right-of-way, submit a WPCP and WPCDs consistent with Caltrans requirements.
D. Training. Submit a description of training to be provided to project personnel and subcontractors regarding SWPPP implementation and spill response, and maintain training rosters on-site.
E. Reports. Submit inspection reports, monitoring data, corrective action documentation, and other records required by the CGP and permits at the frequency required by the CGP and as directed by the Engineer.
F. SMARTS Submittals. Provide copies (PDF) of all SWRCB SMARTS submittals, receipts, and certifications for the Project (NOI/WDID, SWPPP upload, SWPPP amendments, REAPs, annual reports, and NOT) within 48 hours of submittal.

1.5 QUALITY ASSURANCE

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A. SWPPP shall be prepared and certified by a QSD. SWPPP implementation, inspections, monitoring, and reporting shall be performed by, or under the direct supervision of, a QSP, as required by the CGP.

B. Conduct a preconstruction water pollution control meeting prior to start of work. Meeting shall include, at a minimum, the Contractor's superintendent, QSP, key subcontractors, and the Engineer.

C. Contractor shall retain a qualified storm water compliance subcontractor/consultant specializing in SWPPP preparation and implementation. Provide personnel meeting CGP requirements for QSD and QSP. The QSD/QSP subcontractor/consultant shall be responsible for preparing and maintaining the SWPPP, providing QSP oversight for SWPPP implementation, and managing SMARTS submittals in accordance with Article 1.4.F.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide BMP materials suitable for the intended application and consistent with the CGP and applicable manuals and permit requirements. Materials may include, but are not limited to, stabilized construction entrance, inlet protection, fiber rolls, silt fence, gravel bag berms, erosion control blankets, plastic sheeting, temporary soil stabilization (hydromulch/seed), and concrete washout facilities.

PART 3 - EXECUTION

3.1 GENERAL

A. Temporary erosion and sediment control shall consist of, but not be limited to, constructing such facilities and taking such measures as are necessary to prevent, control, and abate water, mud, and erosion damage to public and private property as a result of construction of this Project.

B. The Contractor shall exercise every reasonable precaution to prevent the discharge of any material which is not solely stormwater (i.e., rain) to the storm drain system or receiving waters, including, but not limited to catch basins, drainage channels, and creeks. Non-allowable discharges include, but are not limited to, eroded soil from stockpiles or disturbed earth, concrete and concrete washout water, sawcut slurry, fuel, oil, and other vehicle fluids, solid wastes, and construction chemicals.

C. Storm water pollution control work shall consist of implementing BMPs shown on the plans, specified herein, required by permits, and/or directed by the Engineer.

D. Do not start ground-disturbing work until the SWPPP and required Caltrans/Flood District water pollution control documents (if applicable) have been submitted to the Engineer for review and the Project has obtained required CGP coverage. Engineer review does not relieve Contractor of responsibility to comply with the CGP and permit requirements.

E. SWPPP and related records shall be maintained on-site at all times (paper binder and/or electronic access) and be made available upon request to the Engineer, Owner, Caltrans, Flood District, and regulatory agencies.

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F. The Contractor shall monitor, maintain, and repair all water pollution control measures on a daily or more frequent basis as conditions require, including on non-work days and during storm events. Provide sufficient materials, labor, and equipment to implement REAP measures and respond to forecasted and actual rain events.

G. Minimum Actions. At a minimum, implement the following measures, as applicable:
1. Stabilize site access points to avoid tracking materials off-site.
2. Stabilize disturbed areas and stockpiles prior to the wet season and during periods of inactivity.
3. Protect adjacent properties and receiving waters from sediment-laden runoff.
4. Stabilize temporary conveyance channels and outlets.
5. Use sediment controls and filtration to remove sediment from water generated by dewatering or storm water collected in excavations, as allowed by permits.
6. Use proper materials and waste storage, handling, and disposal practices.
7. Use proper vehicle and equipment cleaning, fueling, and maintenance practices.
8. Control and prevent discharge of all potential construction-related pollutants.
9. Prepare and implement a contingency plan in the event of unexpected rain or a control measure failure.

H. During saw cutting, cover or barricade catch basins using appropriate BMPs (e.g., filter fabric, gravel bags, or manufactured inlet protection) to keep slurry out of the storm drain system. Collect and properly dispose of sawcut slurry before moving to the next location or at the end of each working day, whichever occurs first. If slurry enters a storm drain inlet, remove the slurry immediately.

I. If water pollution control measures prove inadequate, the Engineer may direct the Contractor to revise operations and/or the SWPPP. If the Contractor fails to adequately revise operations after such direction, the Engineer may cause work to be performed by others and deduct costs from monies due or to become due the Contractor.

J. The complete cleanup of all material discharged from the project in violation of the CGP, permit requirements, or applicable laws shall be the responsibility of the Contractor. Should the Contractor fail to respond promptly and effectively to the Engineer's request for cleanup, the Engineer may cause the cleanup to be performed by others and deduct costs from monies due or to become due the Contractor.

K. Nothing in the terms of the Contract nor in the provisions in this section relieves the Contractor of responsibility for compliance with applicable statutes and regulations relating to prevention or abatement of storm water pollution.

M. FLOOD CONTROL DISTRICT PERMIT REQUIREMENTS (PERMIT NO. FCCON-2025-00075)
1. Notify the District inspection office at least two (2) working days prior to commencing work within District right-of-way and coordinate inspections as required by the permit.
2. Keep a copy of the District permit on-site at all times; do not deviate from the approved plans or permit conditions without written District approval.
3. Do not maintain floatable materials or stockpiles in District right-of-way; keep equipment out of District right-of-way except when in use during work hours.

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4. Unless otherwise approved by the District, limit hours of operation to between 7:00 AM and 5:00 PM, Monday through Friday; do not start or operate equipment before 7:00 AM.
5. During the wet season (Oct 15 – Apr 15), perform installation and maintenance only when a 5-day clear weather forecast is available; maintain a flood watch when storm conditions threaten; and have personnel/equipment available on a 24-hour schedule with after-hours contacts provided to the District.
6. Obstruction limits: no more than one-third (1/3) of any flood control facility may be obstructed during Oct 15 – Apr 15; and no more than two-thirds (2/3) during the remaining period.

N. STREAMBED ALTERATION AGREEMENT (CDFW FISH & GAME CODE §1602) – PENDING

1. The Owner is pursuing a CDFW Lake or Streambed Alteration Agreement (LSAA) for work that may affect the bed, bank, or associated riparian resources at Pipes Wash. Upon issuance, the Contractor shall comply with all LSAA conditions and mitigation measures.
2. Prior to initiating work within the LSAA jurisdictional limits, revise/update the SWPPP and construction sequencing, as necessary, to incorporate LSAA requirements (e.g., work windows, exclusion fencing, isolation/dewatering methods, turbidity controls, spill prevention, and biological monitoring if required).

O. SAN BERNARDINO COUNTY ENCROACHMENT PERMIT REQUIREMENTS

1. Prepare and implement a Water Pollution Control Plan (WPCP), or incorporate equivalent measures into the SWPPP, for all work within County right-of-way in accordance with San Bernardino County Department of Public Works requirements.
2. Install and maintain perimeter sediment controls (e.g., fiber rolls, silt fence, gravel bag berms) along the downstream limits of disturbance. Protect all storm drain inlets within and immediately downstream of the work area using approved inlet protection BMPs.
3. Provide stabilized construction entrances/exits where equipment accesses paved roadways. Remove track-out daily using dry methods (e.g., sweeping or vacuuming). Do not wash sediment into gutters or storm drains.
4. During saw cutting and pavement work, prevent slurry from entering the storm drain system using berms, inlet protection, or vacuum systems. Collect and properly dispose of slurry; discharge to gutters or drainage facilities is not permitted.
5. Locate stockpiles away from gutters, inlets, and drainage paths. Protect stockpiles with covers or perimeter controls prior to forecasted rain events.
6. Dewatering discharges within County right-of-way shall not be directed to the storm drain system unless specifically permitted. Provide filtration (e.g., filter bags, sediment tanks, or approved equal) prior to discharge.
7. Prior to forecasted rain events, secure all BMPs and stabilize disturbed areas. Suspend grading and trenching activities during storm events unless adequate BMPs are in place and functioning.

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8. Stabilize disturbed areas within County right-of-way as soon as practicable using temporary or permanent measures (e.g., asphalt patch, aggregate base, or soil stabilization) to prevent sediment transport.

P. SAN BERNARDINO COUNTY SPECIAL DISTRICTS DEPARTMENT – STORM WATER REQUIREMENTS

1. Prevent the introduction of sediment, debris, or contaminated water into District-owned water, sewer, or recycled water facilities. Maintain positive drainage away from all appurtenances, including valves, vaults, blowoffs, and hydrants.
2. Install trench BMPs (e.g., trench plugs, check dams, or equivalent measures) as necessary to prevent stormwater from conveying along trench lines.
3. Backfill, cover, or otherwise secure open trenches prior to forecasted rain events where feasible to prevent accumulation and transport of sediment-laden water.
4. Prevent turbid water from entering utility structures (e.g., manholes, vaults, blowoffs). Provide filtration and sediment control measures for all dewatering activities.
5. Store fuels, lubricants, and chemicals away from drainage paths and District facilities. Provide secondary containment in accordance with applicable regulations.
6. Provide and maintain designated concrete washout areas. Do not allow concrete washout or slurry to discharge to soil, gutters, storm drains, or drainage facilities.
7. Manage chlorinated water from disinfection activities to prevent discharge to storm drains or receiving waters unless properly dechlorinated and permitted.
8. Immediately contain and clean up spills that could impact stormwater or District facilities. Notify the District and appropriate regulatory agencies as required.
9. Provide access for District inspection of BMPs during construction. Correct deficiencies immediately upon notification.

Q. Payment for preparation and implementation of storm water pollution controls, including SWPPP preparation/updates, BMP installation and maintenance, inspections, monitoring, sampling, reporting, and final cleanup, shall be considered included in the Contract item for "Storm Water Pollution Control" unless otherwise indicated.

3.2 INSPECTION, MAINTENANCE, AND REPORTING

Inspect, maintain, and repair BMPs at the frequency required by the CGP and permits. At a minimum, inspect BMPs weekly, before forecasted rain, during extended storm events as necessary, and within 48 hours after storm events. Document inspections and corrective actions in accordance with the CGP, and submit records to the Engineer upon request.

3.3 DEWATERING AND ACCUMULATED WATER

Provide controls so that rainwater does not accumulate in excavation pits or trenches. Contractor shall be responsible for the removal, treatment (if required), and proper disposal of accumulated water prior to backfilling. Dewatering and other discharges shall not be allowed to enter gutters, storm drains, or waters of the State unless permitted. Provide filtration and sediment controls as required to meet permit conditions.

3.4 CATCH BASINS AND STREETS

Remove and properly dispose of existing sediment from catch basins impacted by the Work, and keep catch basins and streets free of accumulated dirt and debris during the entire project. Perform

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final cleanup at completion of work, including cleaning impacted inlets and drainage facilities as directed by the Engineer.

3.5 FINAL STABILIZATION AND TERMINATION

Achieve final stabilization in accordance with the CGP and permit requirements. Provide documentation necessary for completion of the Notice of Termination (NOT) and other closeout requirements.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 01600
DELIVERY, STORAGE, AND HANDLING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Scheduling and coordination of product delivery.
   3. Protection of products and equipment from damage during handling, storage, and installation preparation.
   4. Protection of products and equipment from exposure to weather, moisture, and other adverse environmental conditions.
   5. Inspection of deliveries and management of nonconforming or damaged products.
   6. Storage and handling requirements for C900 PVC pipe and ductile iron pipe and fittings.

B. Payment for Stored Materials and Equipment:
   1. Progress payments for materials or equipment stored (on-site) will be made only for items that are properly stored, protected, inventoried, and insured, and only when required submittals (including shop drawings where applicable) have been approved.
   2. The Engineer may withhold payment for, or deduct previously approved payment of, stored materials or equipment if storage, protection, inventory, or insurance requirements are not continuously maintained.

C. Risk of Loss and Security:
   1. The Contractor is solely responsible for custody, care, and security of all materials and equipment, whether stored, until final acceptance of the Work.
   2. The Owner is not responsible for loss of, or damage to, materials or equipment due to theft, vandalism, weather, or other causes. Replace lost or damaged items at no additional cost to the Owner.

1.2 DELIVERY

A. Scheduling:
   1. Coordinate deliveries with the approved project schedule to allow timely installation and to minimize on-site storage time. Deliver only quantities that can be properly stored, protected, and secured.

B. Packaging:
   1. Deliver products and equipment in manufacturer's original, unopened containers or packaging suitable to protect contents from physical damage, moisture, and contamination.

C. Identification:
   1. Clearly mark products and equipment to identify manufacturer, product description, quantity, and intended installation location. Maintain identification labels and markings until installation.

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D. Protection and Handling:
1. Maintain a copy of the manufacturer's written storage and handling instructions on site and comply with such instructions at all times.
2. Handle products and equipment using methods and equipment recommended by the manufacturer. Do not drop, drag, or otherwise mishandle products or equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROTECTION, STORAGE, AND HANDLING

A. Manufacturer's and Standard Requirements:
1. Protect products and equipment in accordance with the manufacturer's written directions and applicable AWWA standards. Where manufacturer's directions conflict with the Contract Documents, notify the Engineer before proceeding.
a. Store products and equipment in a location and manner that prevents physical damage, deformation, corrosion, contamination, and loss.
b. Keep products and equipment off the ground, supported on pallets, dunnage, racks, or other approved supports, and protect from standing water and soil contact.
2. Protect products and equipment from exposure to the elements and keep thoroughly dry. Provide covers, enclosures, or temporary facilities as required. Maintain ventilation where required to prevent condensation.
3. Security:
a. Secure stored materials and equipment against theft and vandalism. Provide fencing, locks, lighting, watch, or other measures as required based on site conditions.
b. The Contractor is solely responsible for loss of, or damage to, stored materials and equipment. The Owner is not responsible for theft or vandalism of Contractor-stored materials and equipment.
4. Pipe and Fittings Storage (Minimum Requirements):
a. C900 PVC Pipe: Store and handle in accordance with AWWA C900 and manufacturer recommendations. Support pipe uniformly, limit stacking heights to prevent deformation, keep gasketed bells and spigots clean, and protect from prolonged direct sunlight/UV exposure when stored outdoors.
b. Ductile Iron Pipe and Fittings: Store and handle in accordance with applicable AWWA standards (including AWWA C151 for pipe and AWWA C110/C153 for fittings, as applicable) and manufacturer recommendations. Protect linings and coatings,

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prevent impact damage, and keep ends and gaskets clean and protected.

5. Maintain storage areas in a clean and orderly condition and segregate incompatible materials as required.

3.2 FIELD QUALITY CONTROL

A. Inspect Deliveries:

1. Inspect all products and equipment delivered to the site prior to unloading. Reject and remove from the site any products or equipment that are damaged, used, contaminated, missing identification, or otherwise unsuitable for use in the Work.

B. Provide temporary storage facilities, as required, for the protection of stored materials and equipment.

C. Monitor Storage Area:

1. Monitor storage areas to ensure suitable temperature and moisture conditions are maintained, and to ensure protection and security measures remain in place until installation.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 01611
SEISMIC DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Seismic design requirements for nonstructural components, equipment, and their supports and anchorage to structures, including but not limited to:
   1. Mechanical, electrical, and process equipment supported by structures.
   2. Tanks, vessels, and appurtenances supported by structures (excluding the tank shell design unless otherwise specified).
   3. Electrical and controls distribution systems, including but not limited to MCCs, switchgear, panels/cabinets, VFDs, PLC/control cabinets, instrumentation racks, lighting, cable tray, conduit, junction boxes, and all associated supports, braces, and attachments.
   4. Equipment anchorage, braces, frames, and supports; embedded plates; post-installed anchors; and related attachments.
   5. Coordination of clearances between adjacent systems to accommodate seismic relative displacement.

B. This Section does not modify the Engineer of Record's design of the building primary structural system unless specifically noted on the Drawings.

1.2 REFERENCED SECTIONS

A. Section 01340 - Submittals.
B. Section 05501 - Anchor Bolts and Anchoring Devices.

1.3 REFERENCES

A. 2025 California Building Code (CBC).
B. ASCE/SEI 7-22, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
C. ACI 318 (as adopted by CBC), Chapter 17 (Anchoring to Concrete) for anchors installed in concrete.
D. NV5 Geotechnical Investigation Report, Bighorn-Desert View Water Agency Water System Improvements, Landers, California, November 14, 2019.

1.4 DEFINITIONS

A. Engineer of Record (EOR): Engineer responsible for preparation of the Contract Documents and the design of the primary structural system.
B. Specialty Engineer (SE): Structural or Civil Engineer retained by the Contractor, licensed in the State of California, responsible for delegated design of nonstructural component anchorage/supports and associated calculations and drawings.
C. Nonstructural Component: Component not part of the building primary structural system, including equipment and distribution systems and their supports/attachments.

1.5 SEISMIC DESIGN CRITERIA

A. Design Codes: CBC Chapter 16 and ASCE 7-22 Chapter 13 (Nonstructural Components).
B. Site Coordinates (USGS): Latitude 34.4268°, Longitude -116.94627°.
C. Seismic Design Parameters (provided for this Project):
   1. Ss = 1.787 g
   2. S1 = 0.633 g

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3. SMS = 1.787 g
4. SM1 = 0.95 g
5. SDS = 1.191 g
6. SD1 = 0.633 g
7. Site Class = D
8. Seismic Design Category = D, unless noted otherwise
9. Risk Category = III
10. Seismic Importance Factor, Ie = 1.25

D. Component Importance Factor, Ip:
   1. Ip = 1.0 unless otherwise required by ASCE 7-22 and approved by the EOR.
   2. Ip = 1.5 for components that contain hazardous materials, and for components required to function for life safety or emergency operations after an earthquake where designated by the Owner/EOR.

E. Seismic Design Force for Nonstructural Components: Determine horizontal seismic design force, Fp, in accordance with ASCE 7-22 Section 13 including applicable minimum and maximum force limits.

F. Coordination for Relative Displacement: Coordinate layout so that adequate space is provided between adjacent items for relative motion. Provide additional supports/restraints between systems when necessary to prevent seismic interaction.

G. Design Assumptions:
   1. Do not rely on friction to resist seismic sliding unless specifically approved by the EOR and supported by calculations.
   2. For overturning resistance, use applicable CBC/ASCE load combinations (including vertical seismic effects where applicable). Do not take credit for stabilizing dead load beyond what is permitted by the governing load combinations.

1.6 DELEGATED DESIGN AND RESPONSIBILITIES

A. The Contractor is responsible for providing complete anchorage and support designs for nonstructural components and equipment included in the Work, based on the seismic design criteria in this Section.

B. Provide a Specialty Engineer to prepare signed and sealed calculations and drawings for anchorage/supports and any required structural steel frames, embeds, and attachments.

C. Coordinate anchor locations with reinforcing steel, embeds, and installed work. Repair or replacement of damaged work resulting from Contractor operations is the Contractor's responsibility.

1.7 SUBMITTALS

A. Comply with Section 01340.

B. Shop Drawings:
   1. Anchorage plans and details for each item of equipment/component requiring seismic anchorage/restraint; include dimensions, edge distances, embedment, and base material.
   2. Details of support frames, braces, welds, and attachments; identify materials, member sizes, and connection details.
   3. Manufacturer installation instructions for anchors and proprietary restraints.

C. Calculations:
   1. Signed and sealed structural calculations by the Specialty Engineer showing seismic demand (Fp) and capacity checks for anchors, base materials, and load path.
   2. For anchors in concrete, design in accordance with ACI 318 Chapter 17 (as adopted by CBC), including seismic provisions for Seismic Design Category D.
   3. For post-installed anchors (mechanical and adhesive) provide current ICC-ES

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Evaluation Reports (ESR) for each post-installed anchor proposed for use. ESR shall indicate suitability for the intended base material and installation conditions, and shall include **cracked concrete** and **seismic** qualification where anchors resist seismic design forces. Anchors without applicable ESR approval for the intended condition of use are not permitted.

D. Quality Assurance Submittals:
    1. Certification that equipment and restraint systems furnished by the Contractor are designed and installed to resist seismic forces per the criteria in this Section.
    2. Special inspection and testing plan for anchors and attachments, including inspector qualifications, hold points, and reports.

1.8 QUALITY ASSURANCE

A. Qualifications:
    1. Specialty Engineer: Licensed in the State of California.
    2. For adhesive anchors installers shall be trained/certified in accordance with the anchor manufacturer's requirements for the product used. Provide documentation upon request. Provide special inspection for adhesive anchor installation **as** required by CBC/ACI 318, including continuous special inspection when required (e.g., overhead installation or sustained tension applications).
B. Regulatory Requirements: Comply with 2019 CBC Chapter 16 (Earthquake Design) and CBC Chapter 17 (Special Inspections and Tests), plus clarifications and additions specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install anchors and restraints in accordance with the approved Shop Drawings, manufacturer instructions, and Section 05501.
B. Do not drill, cut, or damage reinforcing steel, post-tensioning tendons, embeds, or conduits. Locate anchors to maintain required edge distances and spacing.
C. For adhesive anchors, comply with required hole cleaning, installation temperature limits, and cure times. Do not torque or load anchors prior to full cure.

3.2 FIELD QUALITY CONTROL

A. Inspection and Special Inspection:
    1. Provide special inspection for post-installed anchors (including adhesive anchors) and for high-strength bolting and welding where required by CBC Chapter 17 and Section 05501.
    2. Perform proof-load testing where required by Section 05501, manufacturer requirements, or special inspector direction. At minimum, test **5 percent** of post-installed anchors of each type/diameter/installation condition, but not less than **two** anchors per day per crew. Replace and retest failed anchors. Replace and retest anchors that do not meet acceptance criteria.
B. Submit special inspection reports and test results to the EOR.

END OF SECTION

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SECTION 01650
FACILITY STARTUP

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work:

1. Procedures and actions, required of the Contractor, which are necessary to achieve and demonstrate Substantial Completion.
2. Requirements for Substantial Completion Submittals.
3. Contractor alerted that vendor site visits for operator training sessions are requested to be scheduled with prior authorization by Owner staff.
4. Equipment Manufacturer personnel to be present at startup and provide assistance as required.
5. For startup activities involving tie-ins, cutovers, or outages to existing facilities (including work at the existing R1 Booster Pump Station), the Contractor shall prepare and submit a Cutover and Outage Plan in accordance with this Section.
6. Separate startups shall be made for:
   a. Zone B Booster Pump Station (new facility).
   b. Existing R1 Booster Pump Station - Installation and Startup of New D1 Booster Pump.
7. Zone B Booster Pump Station: Permanent electrical service may not be available at time of startup. Provide temporary power for startup, testing, training, and demonstration using a portable generator and all required temporary distribution equipment, connections, grounding, protection, operators, and fuel. Generator shall be sized for the connected loads including motor starting/inrush and power quality requirements for VFDs, controls, instrumentation, and SCADA. Do not backfeed utility. Coordinate temporary power connection details with the Engineer, Owner, and Authority Having Jurisdiction.
8. Existing R1 Booster Pump Station / D1 Booster Pump: Startup includes integration of the new D1 booster pump and associated electrical, controls, instrumentation, and piping modifications at the existing R1 facility. Coordinate work sequencing, temporary operational modes, and any outages with Owner operations staff and maintain existing service to the maximum extent practicable.
9. Sequence work in accordance with Section 01015, Sequence of Construction.

1.2 DEFINITIONS

A. Substantial Completion: See General Conditions and Supplementary Conditions.

1.3 SUBMITTALS

A. Submit proposed training activities in the chronological order listed below prior to the start of the facility start-up testing period:

1. Master operation and maintenance training schedule:
   a. Submit 30 days (minimum) prior to first training session for Owner's personnel.
   b. Schedule to include:
      1) Target date and time for Owner witnessing of each system initial startup.
      2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
      3) Target date for initiation of Demonstration Period.
   c. Submit for review and approval by Owner
   d. Include holidays observed by Owner.

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e. Attend a schedule planning and coordination or progress meeting prior to first anticipated training session.
    1) Provide a status report and schedule-to-complete for requirements prerequisite to Manufacturer's training.
    2) Identify initial target dates for individual manufacturer's training sessions.
f. Owner reserves the right to insist on a minimum (7) days notice of rescheduled training session not conducted on master schedule target date for any reason.
g. Schedule to be resubmitted until approved.

2. At least eight (8) copies of instructional materials used for training to be provided at time of first training session.
3. Temporary Power Plan (Zone B Booster Pump Station):
    a. Submit a detailed Temporary Power Plan a minimum of 30 days prior to the scheduled startup where permanent utility power is not available.
    b. Plan shall include, at minimum:
        1) Generator make/model, rated kW and kVA, fuel type, and run-time/refueling plan.
        2) Load summary including motor starting/inrush considerations and power quality requirements for VFDs and controls.
        3) Temporary distribution and connection details (one-line diagram, cables/connectors, overcurrent protection, grounding/bonding, and isolation to prevent utility backfeed).
        4) Noise/emissions compliance, siting and security provisions, and staffing/monitoring plan during operation.
        5) Removal plan and transition procedure after permanent service is energized and accepted.
4. Cutover and Outage Plan (where startup affects existing systems, including the R1 Pump Station):
    a. Submit a detailed Cutover and Outage Plan a minimum of 30 days prior to any planned shutdown, cutover, or activity that affects existing facilities or customer service.
    b. Plan shall include, at minimum:
        1) Sequence of work, isolation/valving plan, temporary bypass (if required), proposed outage windows, and rollback/contingency procedures.
        2) Notification and coordination procedures with Owner operations staff, including required approvals and staffing needs.
        3) Commissioning and water quality steps required to introduce potable water or place systems into service (flushing, disinfection, bacteriological sampling/testing, dechlorination and disposal), as applicable to the Work.
        4) Controls and SCADA cutover procedures, including verification of alarms, trends, communications, and remote/local control modes.
5. Substantial Completion Submittal:
    a. File Contractor's Notice of Substantial Completion and Request for Inspection.
    b. Approved Operation and Maintenance manuals received by Engineer minimum four weeks prior to scheduled training.
    c. Written request for Owner to witness each component startup. Request to be received by Owner minimum 4 weeks before scheduled training of Owner's personnel on that system.
    d. Equipment installation and startup certifications.
    e. Letter verifying completion of all startup activities including receipt of all specified

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items from manufacturers or suppliers as final item prior to initiation of Demonstration Period.

1.4 COST OF STARTUP

A. Contractor shall pay all costs associated with facility startup. Where permanent utility power is not available at time of startup (e.g., Zone B Booster Pump Station), furnish temporary power at no additional cost, including portable generator, fuel, operators, temporary distribution, connections, grounding, and protection necessary to safely start and test the facility.

B. Contractor to pay for all return trips incurred by Manufacturer Representatives where equipment or construction was not ready for scheduled startup activities.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Completion of Construction Work:
   1. Complete the work to bring the Project to a state of substantial completion.

C. Equipment Startup:
   4. Requirements for individual items of equipment are included in Division 2 through 26 of these Specifications.
   5. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
   6. Perform Equipment Startup to extent possible without introducing product flow.
   7. Perform Equipment Startup in presence of Manufacturer's Representative and Engineer.
   8. Temporary Power: If temporary power is used for startup, provide voltage and frequency regulation within equipment manufacturer tolerances and suitable for VFDs, controls, and instrumentation. Provide surge protection and grounding as required. Any equipment damage or malfunction attributable to temporary power shall be corrected at no additional cost.
   9. Introduce product flow to complete Equipment Startup for the following equipment:
      a. Section 11800, Multi-Stage Vertical In-Line Pumps
      b. Section 11900, Vertical Turbine Pump
      c. Instrumentation and controls.
      d. SCADA
      e. Additional systems as specified.
   10. For startups involving modifications to existing facilities (including the R1 Pump Station), coordinate with Owner operations staff regarding system isolation, temporary operational modes, lockout/tagout, and return-to-service procedures.
   11. Coordinate with Owner, a logistics plan for filling pipes and systems with potable water required to facilitate startup testing of the individual equipment components and systems.
   12. Where filling, flushing, disinfection, bacteriological sampling/testing, or other water quality procedures are required for potable water systems, coordinate with the Owner and perform such work in accordance with the Contract Documents and applicable AWWA requirements. Do not place any system into service or open any connection to the active distribution system without Owner authorization.
   13. Procedures include but are not necessarily limited to the following:

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a. Test or check and correct deficiencies of:
    1) Power, control and monitoring circuits for continuity prior to connection to power source.
    2) Voltage of all circuits.
    3) Phase sequence.
    4) Cleanliness of connecting piping systems.
    5) Alignment of connected machinery.
    6) Vacuum and pressure of all closed systems.
    7) Lubrication.
    8) Valve orientation and position status for manual operating mode.
    9) Tankage for integrity using product flow.
    10) Pumping equipment using product flow.
    11) Instrumentation and control signal generation, transmission, reception and response.
    12) Tagging and identification systems.
    13) All equipment: Proper connections, alignment, calibration and adjustment.
b. Calibrate all safety equipment.
c. Manually rotate or move moving parts to assure freedom of movement.
d. "Bump" start electric motors to verify proper rotation.
e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
f. Documentation:
    1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Startup. Provide a place for the Contractor to record date and person accomplishing required work. Submit completed document before requesting inspection for Substantial Completion certification.

14. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
    a. Manufacturer's equipment installation check letters.
    b. Instrumentation Supplier's Instrumentation Installation Certificate.

C. Personnel Training:
1. See individual equipment specification sections.
2. Conduct all personnel training after completion of Equipment Startup for the equipment for which training is being conducted and after submission and approval of O&M manuals.
    a. Personnel training on both individual equipment and complete process systems will not be considered completed unless:
        1) All pretraining deliverables are received and approved before commencement of training on the individual equipment or system.
        2) No system malfunctions occur during training.
        3) All provisions of field and classroom training specifications are met.
    b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
3. Field and classroom training requirements:
    a. Hold classroom training onsite.
    b. Notify each manufacturer specified for onsite training that the Owner reserves the right to video record any or all training sessions. Organize each training session in a format compatible with video recording.
    c. Training instructor: Factory trained and familiar with giving both classroom and

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"hands-on" instructions.

d. Training instructors: Be at classes on time. Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule. Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
e. Organize training sessions into maintenance verses operation topics and identify on schedule.
f. Plan for minimum class attendance of five people at each session and provide sufficient classroom materials, samples and handouts for those in attendance.
g. Instructors to have a typed agenda and well prepared instructional material. The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs. Deliver agendas to the Engineer a minimum of 7 days prior to the classroom training. Provide equipment required for presentation of films, slides, and other visual aids.
h. In the onsite training sessions, cover the information required in the Operation and Maintenance manuals submitted according to Section 01340 and the following areas as applicable:
    1) Operation of equipment.
    2) Lubrication of equipment.
    3) Maintenance and repair of equipment.
    4) Troubleshooting of equipment.
    5) Preventive maintenance procedures.
    6) Adjustments to equipment.
    7) Inventory of spare parts.
    8) Optimizing equipment performance.
    9) Capabilities.
    10) Operational safety.
    11) Emergency situation response.
    12) Takedown procedures (disassembly and assembly).
    13) Tasks required to maintain warranty.
    14) Address questions raised by training session participants.
i. Address above paragraphs 1), 2), 8), 9), 10) and 11) in the operation sessions. Address above paragraphs 3), 4), 5), 6), 7), and 12) in the maintenance sessions.
j. Maintain a log of classroom training provided including: Instructors, topics, dates, time and attendance.

D. Complete the filing of all required submittals:
    1. Shop drawing.
    2. Operation and Maintenance Manuals.
    3. Training material.
    4. Record drawings.
E. Filing of Contractor's Notice of Substantial Completion and Request for Inspection of Project:
    1. File the notice when the following have been completed:
        a. Construction work (brought to state of Substantial Completion).
        b. Equipment startup.
        c. Personnel training.
        d. Submittal of required documents.
    2. Engineer will review required submittals for completeness within 10 calendar days of Contractor's notice. If complete, Engineer will complete inspection of the Work, within 15

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calendar days of Contractor's notice.

3. Engineer will inform Contractor in writing of the status of the Work reviewed, within 20 calendar days of Contractor's notice:
   a. Work determined not meeting state of Substantial Completion:
      1) Contractor: Correct deficiencies noted or submit plan of action for correction within five (5) days of Engineer's determination.
      2) Engineer: Reinspect work within (5) days of Contractor's notice of correction of deficiencies.
      3) All reinspection costs incurred will be deducted from final payment due Contractor.
   b. Work determined to be in state of tentative Substantial Completion: Engineer to prepare tentative "Engineer's Certificate of Substantial Completion."
   c. Engineer's Certificate of Substantial Completion:
      1) Certificate tentatively issued subject to successful demonstration of functional integrity.
      2) Issued for Project as a whole or for one or more discrete definable areas of plant.
      3) Issued subject to completion or correction of items cited in the certificate (punch list).
      4) Issued with responsibilities of Owner and Contractor cited.
      5) Executed by Engineer.
      6) Accepted by Owner.
      7) Accepted by Contractor.
   d. Upon successful completion of Demonstration Period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of beginning and ending the successful Demonstration Period of functional integrity as the effective date of Substantial Completion.

3.3 DEMONSTRATION PERIOD

A. General:
   1. Demonstrate the functional integrity of the mechanical, electrical and control interfaces of the respective equipment and components comprising the facility as evidence of Substantial Completion.
   2. Duration of Demonstration Period:
      a. Zone B Booster Pump Station: 48 consecutive hours.
      b. D1 Booster Pump Station and Existing R1 Pump Station: 48 consecutive hours.
      c. SCADA Improvements (including communications, alarms, and remote/local control at each startup facility): 48 consecutive hours (may be conducted concurrently with the applicable pump station Demonstration Period unless otherwise approved by Owner).
   3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
   4. Conduct the demonstration of functional integrity under full operational conditions.
   5. Owner will provide operational personnel to provide process decisions affecting plant performance. Owner's assistance will be available only for process decisions. Contractor will

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perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.

6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Contractor, Owner, and Engineer in advance of initiating Demonstration Period.
8. Throughout the Demonstration Period, provide qualified final field instruction on select systems and to respond to any system problems or failures which may occur:
    a. Provide final field instruction on the following systems:
        1. Multi-Stage Vertical In-Line Pump
        2. Vertical Turbine Pump
        3. Motor Control Center (MCC), VFDs, and associated motor controls
        4. Control Panels
        5. Control Valves
        6. SCADA Improvements
9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

END OF SECTION

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SECTION 01710
CLEANING

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:
   1. Intermediate and final cleaning of Work not including cleaning of systems specified elsewhere.

1.2 STORAGE AND HANDLING

A. Store cleaning products and cleaning wastes in containers specifically designed for those materials.

1.3 SCHEDULING

A. Schedule cleaning operations so that dust and other contaminants disturbed by cleaning process will not fall on newly painted surfaces.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cleaning agents:
   1. Compatible with surface being cleaned.
   2. New and uncontaminated.
   3. For manufactured surfaces use cleaning materials recommended by the manufacturer.

PART 3 – EXECUTION

3.1 CLEANING – GENERAL

A. Prevent accumulation of wastes that create hazardous conditions.
B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities.
C. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains or sewers.
D. Dispose of degradable debris and nondegradable debris at an approved solid waste disposal site.
E. On completion of work, leave area in a clean, natural looking condition. Remove all signs of temporary construction activities incidental to construction of required permanent Work.
F. Do not burn on-site.

3.2 INTERIOR CLEANING

A. Cleaning during construction:
   1. Keep work areas clean so as not to hinder health, safety or convenience of personnel at the project site.
   2. As a minimum, dispose of waste materials, debris, and rubbish on a weekly basis.

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3. Vacuum clean interior areas when ready to receive finish painting. Continue vacuum cleaning on an as-needed basis, until substantial completion.

B. Final Cleaning:
1. Remove grease, mastic, adhesives, dust, dirt, stains, labels, and other foreign materials from sight-exposed surfaces.
2. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
3. Polish glossy surfaces to a clear shine.
4. Ventilation systems:
   a. Clean permanent filters and replace disposable filters if units were operated during construction.
   b. Clean ducts, blowers and coils if units were operated without filters during construction.
5. Replace all burned out lamps.
6. Broom clean and/or mop floor areas.

3.3 EXTERIOR CLEANING

A. Cleaning during construction:
1. Construction debris:
   a. Confine in strategically located container(s).
   b. Cover containers to prevent blowing of debris.
   c. Haul containers from site a minimum of once per week.
2. Dispose debris to container(s) daily.
3. Take special precautions to dispose of loose debris under windy or adverse weather conditions.
4. Vegetation on the project site will shall be maintained and trimmed as necessary.
5. Soils, sand, and gravel shall be removed from paved and sidewalk areas, as necessary, to prevent muddy, dusty, or nuisance conditions. Materials shall not be flushed into storm sewer systems.

B. Final cleaning:
1. Remove trash and debris containers from site.
2. Clean paved roadways.

3.4 FIELD QUALITY CONTROL

A. Routine monitoring of site conditions shall be conducted by the field representative. Deviations from requirements shall be promptly rectified by the Contractor.

B. The project superintendent is expected to control conditions that may result in creating nuisance conditions for adjacent property owners.

END OF SECTION

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SECTION 01720
PROJECT CLOSEOUT

PART 1 GENERAL

1.01 PROJECT RECORD DOCUMENTS

A. Preparation of Project Record Documents: Maintain, as a minimum, on site one set of drawings, specifications, addenda, change orders, work directive changes, field orders, and other modifications to the Contract Documents.

B. Drawings: Legibly mark each item in red pencil to record actual construction. Minimum lettering size on full-size drawings shall be 1/8-inch high, block style, vertical upper case. Do not use paste-on details or mark on the back side of drawings. Include at the minimum, the following:

1. Measured depths from top of pipe to finished grade
2. Changes in the horizontal and vertical locations of new and existing underground utilities and appurtenances, referenced by measurement to permanent surface improvements
3. Measured locations of building piping and appurtenances concealed in construction, referenced to visible and accessible features of the work.
4. Identify specific details of pipe connections and final locations of piping, equipment, electrical conduits, and pull boxes.
5. Identify locations of spare conduits including beginning, ending and routing through pull boxes, and manholes. Record spare conductors, including number and size within spare conduits, and filled conduits.
6. Field changes of dimensions and details
7. Details, especially existing utilities discovered in the course of work and not on original drawings.
8. Special attention shall be applied to showing changes in the following areas:
   a. Buried or concealed (inaccessible without demolition) work
   b. Structural modifications

C. Final Submittal of Project Documents: Prior to final acceptance inspection, submit project record documents, as defined above, to Engineer. Final submittal shall include the following:

1. One complete hard copy set of full-sized project documents marked up and augmented with submittals to fully illustrate all revisions made in the course of the work.

END OF SECTION

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SECTION 01740
GUARANTEES AND WARRANTIES

PART 1 – GENERAL

1.1 SUMMARY

A. Contractor's Guarantee. The Contractor shall warrant and guarantee the entire Work and all parts thereof, including that performed and constructed by Subcontractors, Sub-subcontractors, and others employed directly or indirectly on and for the Work, against faulty or defective materials, equipment, or workmanship for a period of (2) years from formal acceptance of the Work by the Agency, unless otherwise specified or such longer period of time as may be prescribed by law or by the terms of any special guarantee or warranty required by the Contract Documents. In addition, the equipment furnished by the Contractor shall be guaranteed to be free from defects in design. Within the guarantee period and upon notification of the Contractor by the Owner, the Contractor shall promptly make all needed adjustments, repairs or replacements arising out of defects which, in the judgment of the Owner, become necessary during such period. The cost of all materials, parts, labor, transportation, supervision, special tools and supplies required for correction of abnormalities shall be paid by the Contractor. Repaired parts and replacement parts furnished under this guarantee shall be warranted for one (1) year from the date of installation by the Contractor. If, within fifteen (15) days, unless specified otherwise, after the Owner gives the Contractor notice of a defect, failure, or abnormality of the Work, the Contractor neglects to make or undertake with due diligence the necessary repair or adjustments or order the Work to be done by a third party, the Owner will direct the work to be completed by others with the cost of the Work to be paid by the Contractor. In the event of an emergency where, in the judgment of the Owner, delay would cause a spill, serious loss or damage, repairs or adjustments may be made by the Owner, or a third party chosen by the Owner, without giving notice to the Contractor, and the cost of the work shall be paid by the Contractor.

B. Guarantee of Work on Property of Others. The Contractor's guarantee shall cover and include any of the Work installed on property not owned by the Owner, whether public or private, and shall include the repair of damage to improvements and existing conditions on such other property caused by settlement or otherwise resulting from the Contractor's operations unless the owner of such other property shall in writing release the Owner from liability and responsibility for Work or damage therefrom on such other property.

C. Manufacturers' Warranties. As a precedent to final inspection, the Contractor shall deliver to the Contract Manager all the manufacturers' warranties required by the Contract Documents, with the Owner named as beneficiary. In addition, for all equipment bearing a manufacturer's warranty that extends for a longer period of time than the Contractor's guarantee, the Contractor shall secure and deliver the warranties to the Construction Manager in the same manner.

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D. Maintenance and Guarantee Bond. The obligations of the Contractor under this Section are in addition to and shall be secured by the Maintenance and Guarantee Bond required under Division 00. The Maintenance and Guarantee Bond shall serve as financial assurance for the faithful performance of all warranty and guarantee obligations described herein.

E. Coordination with Other Sections. Warranty and guarantee requirements specified in other Sections of the Specifications, including Division 16, are in addition to the requirements of this Section. Where warranty periods or obligations differ, the more stringent requirement shall apply.

F. Owner Remedies. The rights and remedies of the Owner under this Section are cumulative and are in addition to, and not in limitation of, any other rights or remedies available to the Owner under the Contract Documents or applicable law. Nothing in this Section shall be interpreted to limit the Owner's right to require correction of defective Work, perform corrective Work using the Owner's own forces or a third party and recover the associated costs from the Contractor, withhold payment where permitted by the Contract Documents, or make a claim against the Maintenance and Guarantee Bond or other applicable bond. The Contractor shall remain responsible for all warranty and guarantee obligations required by the Contract Documents regardless of whether the Owner elects to pursue one or more available remedies.

END OF SECTION

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SECTION 01950
SAFETY AND HEALTH

1.0 CONTRACTOR's RESPONSIBILITY OF SAFETY

For all requirements of Section 01950 – Safety and Health, the CONTRACTOR shall be responsible for implementation of all safety requirements while performing work at any of the OWNER's facilities and or properties.

A. Contractor Certification

1. The CONTRACTOR shall certify per Form 1950-A, SAFETY CERTIFICATION FORM, that persons for whom the CONTRACTOR is responsible or liable are experienced and qualified to anticipate and meet the safety and health requirements of this Project pursuant to California Code of Regulations (Title 8), "Industrial Relations", and Code of Federal Regulations, Sections 1900 through 1910, "Occupational Safety and Health Standards", and Section 1926 "Construction".
2. As part of this certification, the CONTRACTOR certifies that persons for whom the CONTRACTOR is responsible or liable have, at a minimum, the following written safety programs: Injury and Illness Prevention Program (IIPP), Hazard Communication Program, and New Employee Orientation Program. The CONTRACTOR certifies that persons for whom the CONTRACTOR is responsible or liable also have additional written safety programs such as: Confined Space Program, Lockout Tag Out (LOTO) Program, Excavation Safety program, Fall Protection Program, etc. to address specific safety hazards associated with the work being performed.
3. The CONTRACTOR certifies that persons for whom the CONTRACTOR is responsible or liable shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The CONTRACTOR shall be responsible for ensuring that the project is properly staffed and equipped to execute their emergency and rescue plan. This requirement will apply continuously twenty-four (24) hours a day, seven days a week until final acceptance of the Work.
4. The SAFETY CERTIFICATION FORM (Form 1950-A) must be completed by the CONTRACTOR and submitted to the OWNER as part of the Safety Submittal prior to the issuance of the Notice to Proceed.

B. Contractor's Safety Personnel

1. Safety Officer - The CONTRACTOR shall designate a fully trained and responsible member who serves as the Safety Officer for the CONTRACTOR's organization. The Safety Officer shall be experienced in administering, enforcing and overseeing the safety standards contained in the California Code of Regulations (Title 8) and 29, and the Code of Federal Regulations, Sections 1900 through 1910 and Section 1926, whose duty shall be the prevention of hazards and accidents and who shall have authority to direct work for the CONTRACTOR.
2. Safety Supervisor - The CONTRACTOR shall designate a Safety Supervisor who will be present at each project site during the course of all work performed by or under the responsibility of the CONTRACTOR. The Safety Officer may be used as a Safety Supervisor. The Safety Supervisor shall be fully trained for the type of work being performed and shall have authority to direct the CONTRACTOR's work.

C. Safety Measures

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1. The CONTRACTOR shall comply with all laws, ordinances, codes, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. It is the CONTRACTOR's responsibility that persons for whom the CONTRACTOR is responsible or liable follow the CONTRACTOR's own safety program and provide one or more designated Safety Supervisor(s) at each work site. The CONTRACTOR shall maintain copies of all documents mentioned or referenced in this Section readily available at the site until the Work is completed.

D. Accident Reporting. Any accident occurring within the premises of the OWNER's facilities shall be reported to the OWNER within 24 hours, within 8 hours if the event is deemed an Occupational Safety and Health Administration (OSHA) reportable incident, or immediately if life threatening. CONTRACTOR will provide a written report for each accident within three working days of the initial reporting.

2.0 OWNER's Responsibility for Safety

The responsibilities of the OWNER, ENGINEER and Inspector with respect to the CONTRACTOR's safety measures in, on, or about the site and vicinity will be to advise the CONTRACTOR and persons for whom the CONTRACTOR is responsible or liable of all known hazards and to apprise the CONTRACTOR of apparent safety deficiencies not meeting the requirements of the CONTRACTOR's Site Specific Safety Plan or those stated in Sections 01950. In the event of imminent danger, the OWNER, ENGINEER, and Inspector witnessing such activity will attempt to immediately inform the CONTRACTOR and persons for whom the CONTRACTOR is responsible or liable of this situation so that this activity can be halted and that persons affected are relocated to safety.

3.0 General Safety Requirements

A. Personal Hygiene
1. Persons involved in work for the OWNER may be exposed to disease-producing organisms in wastewater (sewage). The CONTRACTOR shall require persons for whom the CONTRACTOR is responsible or liable to observe proper hygienic precautions, including washing of hands and other exposed portions of the body with disinfecting soap and water before eating or smoking, and prior to leaving project site. The CONTRACTOR is required to provide portable toilets with hand washing facilities for their workforce and SUBCONTRACTORs.

B. Personal Protective Equipment
1. The CONTRACTOR shall not permit any person for whom the CONTRACTOR is responsible or liable to enter or remain on the worksite unless the person is equipped with the appropriate personal protective equipment conforming to the requirements of California General Industrial Safety Orders and shall discharge from the site all persons not so equipped. The CONTRACTOR shall post conspicuous signs at appropriate locations warning the public and persons engaged upon the Work of this requirement. At a minimum, each person must wear a safety helmet, safety glasses, steel-toed boots for general persons (EH-rated composite toe meeting ASTM F2413 for electricians) for whom the CONTRACTOR is responsible or liable, shirts with sleeves, and long pants.

C. Public Safety and Convenience

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1. The CONTRACTOR shall conduct work so as to ensure the least possible obstruction to traffic and inconvenience to the OWNER and general public at large in the vicinity of the work and to ensure the protection of persons and property. No road or street shall be closed except with the permission of the OWNER and the proper governmental authority. Fire hydrants on or adjacent to the work shall be accessible to fire-fighting equipment. Temporary provisions shall be made by the CONTRACTOR to ensure the use of sidewalks, private and public driveways and proper functioning of gutters, sewer inlets, drainage ditches and culverts, irrigation ditches and natural water courses. The CONTRACTOR is also required to mitigate any erosion as a result of the Work (through the use of silt traps at existing catch basins, etc.). A Storm Water Pollution Prevention Plan may be required as part of the Site Specific Safety Plan.

2. The CONTRACTOR shall provide and maintain barricades, guards, temporary bridges and walkways, watchmen, night lights and danger signals illuminated from sunset to sunrise, and all other necessary appliances and safeguards to protect the Work, life, property, the public, excavations, equipment, and materials. Barricades shall be of substantial construction and shall be painted and reflectorized to increase their visibility at night. Suitable warning signs shall be so placed and illuminated at night as to show in advance where construction, barricades, or detours exist. Guard rails shall be provided for bridges and walkways over or adjoining excavations, shafts, and other openings and locations where injury may occur.

D. Traffic Control and Speed Limits
   1. The OWNER's facilities is subject to traffic throughout the premises. Staff vehicles, deliveries, liquid waste manifests, vendors, construction traffic, etc. all contribute to this traffic. The CONTRACTOR shall coordinate work activities with the designated OWNER's representative to avoid blockage of major traffic lanes, and operations and to define access routes to and from the CONTRACTOR's work site. While driving on the OWNER's facilities all rules of the road apply. The maximum speed limit is 15 mph, or less, as conditions warrant. Traffic control for all work within the County ROW shall adhere to the approved encroachment permit. and the current California MUTCD

E. Communication
   1. Communication between the CONTRACTOR and the OWNER must be maintained at all times. The CONTRACTOR is responsible for providing the OWNER with a contact list for key CONTRACTOR staff, in addition to maintaining emergency procedures in their Specific Site Safety Plan. It is the CONTRACTOR's responsibility to communicate to the OWNER all hazards which they plan to introduce to the work site, whether by procedure or material, and changes, or revisions that may be needed to their Site Specific Safety Plan.

F. Hazardous Areas
   1. The CONTRACTOR shall not permit or allow any person or persons to enter any pipe, manhole, wetwell, or space containing hazardous or noxious substances or gases, or where there is an insufficient amount of oxygen to sustain life and consciousness, or any other hazardous area unless equipped with lawful and appropriate safety equipment and life supporting apparatus, and unless those entering are continually monitored and guarded by and in communication with other persons outside the space or area who are equipped in the same way, can give an alarm to others for assistance, and initiate immediate rescue operations in the event of mishap.

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4.0 EMERGENCIES

A. Work During an Emergency. The CONTRACTOR shall perform any and all operations and shall furnish any materials and equipment necessary during an emergency which will result in imminent loss of life or property. CONTRACTOR shall notify the OWNER of the emergency as soon as practicable, but shall not wait for instruction before taking necessary action. Any additional compensation or extension of Contract Time claimed by the CONTRACTOR on account of an emergency shall be applied for as provided in contract documents.

B. Representatives for Emergencies. The CONTRACTOR shall provide in the Site Specific Safety Plan a written list giving the names, addresses, and telephone numbers of the Safety Officer and Safety Supervisor(s) who can be contacted at any time in case of emergency. The representatives shall be fully authorized and equipped to correct unsafe or inconvenient conditions on short notice. The CONTRACTOR shall promptly notify the OWNER of all changes needed to keep the contact list up to date.

5.0 FIRE PROTECTION

The CONTRACTOR's Safety Officer shall inspect the entire Work and site, including storage areas, at frequent intervals to verify that fire prevention measures are constantly enforced.
A. Fire Extinguishers and Hoses. The CONTRACTOR shall furnish and maintain fully charged fire extinguishers of the appropriate type, supplemented with temporary fire hoses wherever an adequate water supply exists, at the places where burning, welding, or other operations that may cause a fire are being performed.
B. Flammable, Hazardous or Toxic Materials. Solvents, gasoline, and other hazardous materials may be in the wastewater (sewage), and therefore, the work site may be hazardous to open flame, sparks, or unventilated occupancy. The CONTRACTOR shall take measures to ensure persons, for whom the CONTRACTOR is responsible or liable, observe proper safety precautions when working in these areas. Only a working supply of flammable, hazardous or toxic materials shall be permitted in or on any of the permanent structures and improvements, and shall be removed therefrom at the end of each day's operations. The CONTRACTOR shall store flammable, hazardous or toxic materials and waste separate from the Work and stored materials for the Work in a manner that prevents spontaneous combustion or dispersion, and provides the appropriate level of secondary spill containment. None of these materials shall be placed in any sewer or drain piping nor buried on the OWNER's property. It is the CONTRACTOR's responsibility to request permission 15 days in advance, in writing, to bring hazardous, toxic, or flammable materials to the OWNER's work site. The request will specify the type and quantity of material proposed to be brought on site, where and how it will be stored, what type of secondary containment will be used, where and by whom the material will be used, and what health hazards are associated with the proposed material (Material Safety Data Sheet). The OWNER will respond to the CONTRACTOR, in writing, within seven days of the receipt of the request as to whether or not the material can be brought on site and of any special requirements the OWNER may have that are not covered in the CONTRACTOR's request. The CONTRACTOR shall maintain a current and up-to-date copy of all laws, ordinances, codes, rules, regulations and lawful orders of any regulatory authority having jurisdiction or control over flammable, hazardous or toxic materials and, at the CONTRACTOR’s expense, shall comply with said laws, ordinances, codes, rules, regulations and lawful orders. Refer to Section 8.0 Hazardous Materials

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regarding additional information relating to hazardous materials at the work site. Electronic, searchable PDF MSDS submittals are acceptable in lieu of paper binders.

6.0 OWNER's Equipment

CONTRACTOR shall not utilize any OWNER's equipment in support of their work effort, unless specifically authorized to do so per the contract. The use of OWNER equipment, tools, or staff by the CONTRACTOR is not permitted. The OWNER will not accept delivery or off load delivered material for the CONTRACTOR. The OWNER will not allow the CONTRACTOR to use any of its safety equipment (ladders, gas monitors, exhaust fans, lighting, etc.). The OWNER's equipment shall not be shut down, turned off, or otherwise handled by the CONTRACTOR, unless this is required as part of the contract and prior coordination has been made with the OWNER's staff.

7.0 Hazardous Materials

The OWNER utilizes chemicals that are classified as Hazardous Materials. If there is an OWNER related incident involving hazardous materials, you will be provided direction over the loudspeaker, or directly from the OWNER's staff. If the CONTRACTOR wishes to bring hazardous material to any location controlled by the OWNER, an MSDS for each hazardous material along with Form 1950-B must be submitted to the OWNER for review. Any hazardous materials not included within the original submittal of the Project MSDS Binder are to be submitted to the OWNER a minimum of 15 days prior to the proposed delivery date.

8.0 Submittals

A. SITE SPECIFIC SAFETY PLAN The OWNER shall only review this safety submittal for the required elements and not content. Prior to receiving Notice to Proceed, the CONTRACTOR shall submit to the OWNER three (3) sets of their Site Specific Safety Plan binders. The spine of each binder should be labeled SITE SPECIFIC SAFETY PLAN for "Project Name" in large print for easy reference. The Site Specific Safety Plan describes specific work activities to be performed and the associated hazards and corresponding safety measure(s) the CONTRACTOR is proposing to implement. The Site Specific Safety Plan shall be a stand alone document and not merely refer to portions of the CONTRACTOR's Injury and Illness Prevention Program (IIPP). Adequate descriptions of work activities, hazards, safety measures, and emergency and rescue procedures are to be provided in order to illustrate compliance with OSHA required measures. Additionally, the Site Specific Safety Plan would include at a minimum:

- a signed SAFETY CERTIFICATION FORM (Form 1950-A)
- a list showing the CONTRACTOR's Safety Officer and Safety Supervisor(s) with 24 hour contact information
- a list of safety equipment that will be maintained on site, including rescue equipment
- a list of persons for whom the CONTRACTOR is responsible or liable who are properly trained and qualified to participate in Permit Required Confined Space and Lock Out Tag Out operations
- an index shall be provided so that it references each tabbed section of the Site Specific Safety Plan.

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B. HAZARDOUS MATERIALS In addition to and separate from the Site Specific Safety Plan, the CONTRACTOR shall submit three (3) sets of Project MSDS binders to the OWNER prior to receiving the Notice to Proceed for each hazardous substance that is anticipated for use at the work site. By utilizing Form 01950-B each set is to be submitted in a binder utilizing tabbed dividers to separate the CONTRACTOR defined MSDS categories. An index is to be included on the first page in each binder showing the MSDS categories. The binder should be oversized and include dividers with extra tabs to allow room for unanticipated MSDS sheets or categories submitted during the course of the project. The spine of the binder should be labeled MSDS for "Project Name" in large print for easy reference. Subsequent MSDS sheets not provided in the original Project MSDS binder are to be provided in pre-punched sets of three with an updated index reference sheet when necessary. The CONTRACTOR shall create and maintain at least one MSDS binder for the CONTRACTOR's use at the work site.

8.1 Safety Programs

The OWNER has implemented various safety standards and programs that the CONTRACTOR and persons for whom the CONTRACTOR is responsible or liable is expected to adopt while performing all work for the OWNER. If there is a conflict with Federal, State, or local safety laws, the stricter law shall apply. If there is a conflict between the OWNER's safety standards or programs and that of the CONTRACTOR, the stricter standard or program shall apply. The CONTRACTOR shall highlight all conflicts that may exist in the CONTRACTOR's Site Specific Safety Plan and illustrate how the stricter interpretation is being utilized.

A. Confined Space Safety

The OWNER employs a "Permit Required" safety standard for all confined space entries per California General Industrial Safety Orders, Section 5157. Work performed in or about wastewater (sewage) facilities, including but not limited to manholes, wetwells, vaults, pipes, tanks, basins, structures, and excavations carries with it the high potential for exposure of persons for whom the CONTRACTOR is responsible or liable and any other persons in the vicinity of the work to hazardous conditions. These conditions may include, but are not limited to, exposure to hydrogen sulfide, carbon dioxide, methane, carbon monoxide and other gases; exposure to atmospheres containing insufficient oxygen to support human life; exposure to wastewater (sewage) which may contain bacteriological, chemical, and other constituents harmful to humans; working in conditions where engulfment or entrapment of personnel may occur (such as in excavations); and working in structures with uneven and slippery surfaces and with difficult and limited access. Many of these environments are classified as "confined spaces" in the Code of Federal Regulations, Sections 1900 through 1910 and Section 1926, the California Code of Regulations (Title 8), and the State of California's General Industry Safety Orders, Article 8, Sections 5156-59. The CONTRACTOR shall be fully familiar with, and shall strictly adhere to and comply with, the applicable sections of these documents pertaining to confined spaces. In the event of a conflict between applicable requirements, the more restrictive requirement shall apply.

1. The CONTRACTOR is required to be especially alert to these conditions and employ a "permit required" system for all confined space entries as specified in California General Industrial Safety Orders, Section 5157. The CONTRACTOR must maintain training records for all participants in confined space entries by permit only and must provide copies of these upon request of the OWNER.

2. The CONTRACTOR shall be responsible for ensuring that the project is properly staffed and equipped to execute their Confined Space Program and associated emergency and rescue plan. OWNER safety equipment and staff will not be made available to the

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CONTRACTOR, unless during the course of an emergency rescue which will result in imminent loss of life or property.

B. Lockout Tag Out (LOTO)

The OWNER employs the OSHA required Lockout Tag Out (LOTO) standards, and where permissible, a group lockout procedure per 1910.147(f)(3). While performing work on OWNER's equipment or where the OWNER's equipment or facility can potentially provide an energy source that could cause injury to the CONTRACTOR, the CONTRACTOR shall follow the OWNER's LOTO procedures. The OWNER's LOTO Program is available for review from the OWNER's Safety Officer and will be provided to the CONTRACTOR at the preconstruction meeting. The CONTRACTOR shall also be required to implement LOTO procedures that meet the requirements of Title 8, , Sections 2320.1 - 2320.7 and 3314. OWNER safety equipment and staff will not be made available to the CONTRACTOR, unless during the course of an emergency rescue which will result in imminent loss of life or property.

1. The CONTRACTOR will contact the OWNER to discuss the work to be performed and jointly identify all Lockout Tag Out points necessary to isolate energy sources.
2. The OWNER will provide and secure singularly keyed OWNER lockout lock(s) and lockout tag(s) at all lockout points. The CONTRACTOR is required to provide singularly keyed lockout lock(s) and lockout tag(s) for each affected employee at each lockout point. The CONTRACTOR and OWNER shall remove their lockout lock(s) and tag(s) when work on the OWNER's equipment or facility has been completed and deemed to be functional and ready by the OWNER to be returned back into service.
3. The CONTRACTOR may participate in group lockout whereby, the CONTRACTOR's supervisor or foreman along with the OWNER's authorized employee will participate in the coordination of affected contractor work forces and ensure continuity of protection. A group LOTO will only be permitted if the OWNER's Group LOTO procedure or a stricter procedure is followed and is approved by the OWNER's Safety Officer.
4. In addition to meeting requirements of OSHA 3120 CONTRACTOR must maintain training records for LOTO trained employees and must provide copies of these upon request of the OWNER.

END OF SECTION

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FORM 1950-A

SAFETY CERTIFICATION FORM

I hereby certify that I/we are the designated Safety Supervisor(s) for the CONTRACTOR and that I am qualified through experience, knowledge, and capability to understand and implement the requirements of all Federal and State OSHA safety standards, safety requirements provided in the project specifications, and those provided in the CONTRACTOR's Site Specific Safety Plan.

I also certify that I am aware that I have the responsibility for the safety of all persons, including CONTRACTOR, OWNER, and ENGINEER while construction work is being performed and the safety of the project site 24 hours a day, seven days a week during the course of the project.

Name: _____
CONTRACTOR's Safety Supervisor

Signature:_____ **Date:** _____

Name: _____
CONTRACTOR's Safety Supervisor

Signature:_____ **Date:** _____

Name: _____
CONTRACTOR's Safety Officer

Signature:_____ **Date:** _____

I hereby acknowledge my responsibilities for safety as described in Section 01950 and that I certify that the above individuals have the authority to direct all work effort during this project on behalf of the CONTRACTOR as necessary to comply with safety requirements, hazards, and emergencies.

Name: _____
CONTRACTOR's President/CEO

Signature:_____ **Date:** _____

Firm/Company: Name _____

Address _____

_____

Phone / Fax _____

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FORM 1950-B

REQUEST TO BRING HAZARDOUS MATERIALS ON SITE

The following form must be completed by the CONTRACTOR for each hazardous material group; i.e., paints, solvents, fuels, adhesives, etc., that the CONTRACTOR proposes to bring to the work site and or OWNER's facility. This form and the complete MSDS for each hazardous material identified on the form are to be submitted along with the Site Specific Safety Plan in accordance with Section 01950. If not included as part of the original Project MSDS submittal, these documents are to be submitted to the OWNER in the number of copies specified, no later than fifteen (15) days prior to the proposed date of delivery to any OWNER facility. The OWNER will review these documents for completeness and will discuss any concerns regarding the level of compatibility with existing hazardous materials used at the facility or degree of risk posed by the presence of these hazardous materials. The CONTRACTOR will be responsible for the training of the OWNER's staff for handling, storage, containment, clean-up, and hazard communication when extremely hazardous materials are being proposed for use.

Project Name: _____

CONTRACTOR's Name: _____

Submitted By: _____ Date: _____

Safety Officer / Supervisor

Location(s) where hazardous materials will be used: _____

Other location description: _____

Name of OWNER's Facilities where Hazardous Materials are to be Delivered:

_____

Hazardous Material Group being submitted: _____

Provide the following information: (attach additional sheets as needed)

1. List name(s) and quantity(s) in this hazardous material group proposed to be brought on site. Attach appropriate MSDS for each hazardous material listed.

_____

_____

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2. Describe how and where the hazardous material(s) will be used.

3. Describe hazardous material storage protocol.

4. Describe spill containment and clean-up procedures. (A Spill Prevention Plan may be required as part of the Site Specific Safety Plan)

5. Give the estimated time period (dates) each hazardous material will be stored on site.

6. Give a general explanation of the safety measures to be followed by the CONTRACTOR in the use of these hazardous material(s).

7. Describe any secondary or incidental hazards Owner's employees may be exposed to as a result of the CONTRACTOR's use of the material(s) including a listing of conditions that would create an extremely hazardous situation or condition; i.e., identification of chemicals, temperatures, etc., which would cause explosion or release of deadly gas.

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8. Describe plans for removal and disposal of unused materials in compliance with applicable laws.

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SECTION 02201
TRENCHING, PIPE EMBEDMENT, AND TRENCH BACKFILL

PART 1 - GENERAL

1. 1 DESCRIPTION

A. Scope:
1. Clearing, grubbing and site preparation.
2. Removal and disposal of debris, including pipes and fittings.
3. Handling, storage, transportation and disposal of excavated material.
4. Sheeting, shoring, bracing and protection Work.
5. Pumping and dewatering trenches.
6. Backfilling.
7. Pipe embedment.
8. Potholing of existing utilities at treatment facility site.
9. Appurtenant work.

1. 2 QUALITY ASSURANCE

A. Labor Code 6705 – Protection of Workers in Excavations:
As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches 5 feet or more in depth, the Contractor shall submit for acceptance by the Owner or by a registered civil or structural engineer, employed by the Owner, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for work protection from the hazard of caving ground during the excavation, of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, the plan shall be prepared by a registered civil or structural engineer employed by the Contractor, and all costs therefore shall be included in the price named in the Contract for completion of the Work as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the Owner, or any of their officers, agents, representatives, or employees.

B. Requirements of Regulatory Agencies:
1. Comply with all requirements of local, County and State agencies.

1. 3 JOB CONDITIONS

A. Protection:
1. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling.
2. Do not remove trees from outside excavation or fill areas unless authorized by the Engineer; protect from permanent damage by construction.
3. Protect Work from erosion or other similar types of damage until the Project has been completed.
4. Protect all property corners and evidence thereof.
5. Protect all existing underground utilities, except where as specified to be removed.
6. The project's property boundaries shall be clearly delineated by the use of orange temporary construction fencing. Where work is being done in an off-site easement, the property owner shall be notified 48- hours prior to beginning any work. Extreme care shall be taken to protect

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both the existing project site and all adjacent improvements from damage. The Contractor shall provide and install suitable safeguards approved by the Owner to protect objects from injury or damage. Any damage resulting from the construction shall be repaired or replaced in a timely manner at the Contractor's expense. (Refer to Cal Trans Standards Section 7-1.12 "Responsibility for Damage").

B. Weather:
   1. Do not backfill during freezing weather or during periods of heavy rainfall when soil moisture conditions will not permit achieving the required compaction.
   2. Do not use frozen materials, snow, or ice in any backfill.

1. 4 SUBMITTALS

A. Gradation Curves:
   1. Pipe embedment material
   2. Trench backfill material
   3. Aggregate base material for road restoration
   4. Asphalt Concrete for pavement restoration
   5. Contractor shall notify geotechnical representative at least one week prior to placing fill to collect samples whether from on-site or off-site borrow areas.

B. Dewatering:
   1. Proposed equipment.
   2. Well or sump location, size, and details of construction.
   3. Size and layout of discharge headers and required approvals and permits

C. Potholing Report:
   1. Do not prepare any shop drawings for, or make final order for, or design any pipe materials for any particular section of pipeline and valve vault(s) until all utilities in that section of pipeline have been exposed, 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.
   2. The number and location of the potholes to be made shall be determined by the Contractor in advance and submitted in writing to the Engineer. If such conflicts are discovered, they shall be immediately reported to the Engineer.
   3. Submit report to Engineer with potholing results for both east and west pipeline alignments:
      a. Utility location in Plan.
      b. Material type.
      c. Material size (diameter)
      d. Utility depth, IE.
   4. Submit potholing report to Engineer at least 2 weeks in advance of desired work by Contractor.

E. Submit six copies of a report from a testing laboratory verifying that backfill material conforms to the specified gradations of characteristics for granular material, imported sand, rock refill, for foundation stabilization, and water.

PART 2 – PRODUCTS

2. 1 MATERIALS

A. Classification of Excavated Materials:
   1. None.
   2. Remove and handle excavated materials regardless of its type, character, composition,

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condition, or depth.

B. Topsoil:
   1. Native material removed and stockpiled before excavation.
   2. Free from trash, debris and surface vegetation.

C. Fill materials:
   1. **Type "A" Material**: 3/8-inch minus imported screened sand with no more than 10% passing the #200 sieve and a minimum sand equivalent of 30 per CAL TEST 217. All gradations are to be approved by the Engineer prior to construction.
   2. **Type "B" Material**: 3/4-inch Class 2 Aggregate Base Rock per Caltrans specifications. Contractor may elect to use recycled aggregate following the review and approval of the material by the Owner's representative.
   3. **Type "C" Material**: 1-lnch uniform crushed or non-crushed drain rock free of organic matter. Ground water conditions require Type "C" material per approval of Engineer. Drain rock to be wrapped in geotextile fabric.
   4. **Type "D" Material**: Processed on-site soils: native soil free of organic material, with particles less than three inches in the greatest dimension with a minimum sand equivalence of 30 may be incorporated provided they are properly mixed into a matrix of friable soils. The backfill must be placed in thin layers not exceeding 8 inches in loose thickness, be well-blended and consistent texture, moisture conditioned to at least optimum moisture content.
   5. **Type "E" Material**: Imported and/or non-import mixture of crushed material, screened, non-washed with minimum sand equivalent of 30 per CAL TEST 217-G. All material free of wood, roots or other deleterious materials. Material to be 1/2-inch minus for 12-inch pipe or smaller and 3/4-inch minus for 16 inch and larger pipe. Material gradations to include some medium and fine sand (No. 8 to No. 200 Mesh Sieves). A layer of geotextile fabric shall be placed between the pipes and intermediate backfill zone for material not meeting Type "A" or "E" material specifications.
   6. **Type "F" (Controlled Density Fill) Material**: Excavatable, low-strength flowable fill for trench backfill where indicated on Drawings and in accordance with Section 3.4, O this Section. Constituents: cement, optional fly ash, fine aggregate, water, admixtures as needed to meet performance. b. Flow (ASTM D6103): 8–10 in spread; self-leveling, low bleed, non-shrink. 28-day compressive strength: 50–150 psi (target 100 psi).
   7. The use of the material Types defined above shall be allowed at the locations specified in the typical trench details of the contract drawings.

D. Thrust Blocks:
   1. Thrust blocks where indicated on drawings, 3,000 psi mix per Section 03002.

E. Tracer Wire System (non-metallic mains and services)
   1. Provide a continuous, traceable conductor along all non-metallic pressure pipelines.
   2. Wire: 12 AWG copper-clad steel (CCS) with HDPE insulation (minimum 45 mil), blue for potable water; direct-burial rated.
   3. Installation: Install wire alongside pipe with secure attachments at 10 FT intervals; splice only with waterproof, listed connectors; provide grade-accessible test/termination boxes at line ends, valves, and branches.
   4. Testing: Verify continuity after backfill and prior to acceptance; submit test report.

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PART 3 - EXECUTION

3. 1 INSPECTION

A. Field verify the location of all underground utilities, pipelines and structures. Special attention is directed to existing pipes and electrical conduits on site, which must remain in service throughout construction.
   1. Clear sites to be occupied by permanent construction of logs, trees, roots, brush, tree trimmings, and other objectionable material and debris.
   2. Grub stumps.
   3. Clean and strip subgrade for fills and embankments of surface vegetation, sod, and organic topsoil.
   4. No burning onsite is allowed.

3. 2 EXISTING UTILITIES

A. Locations of underground facilities shown on the plans are based upon record information and no guarantee is made as to the accuracy of the locations shown. The contractor shall notify Underground Service Alert (800) 642-2444 and make other investigations as may be required to determine if underground utilities might interfere with the work to be performed. If such conflicts are discovered, they shall be immediately reported to the Engineer by the Contractor. No excavations were made to verify the locations of existing underground facilities.

B. The Contractor shall excavate and locate (pothole) existing pipelines, conduits and facilities within two feet of a proposed excavation.
   1. The known existing buried utilities and pipelines are shown on the Drawings in their approximate location. The Contractor shall exercise care in avoiding damage to all utilities and will be held responsible for 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, ducts, maintenance holes, pull boxes and the like, located at the project site and adjoining construction locations. Conflicts between water and sewer pipes shall be properly protected with and will adhere to California Department of Public Health standards.
   2. Check on Locations (Potholing): Contact all affected utility owners and request them to locate their respective utilities prior to the start of "potholing" procedures (contact Underground Service Alert). 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.
   3. 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.
   4. After the utility survey is completed, commence "potholing" to determine the actual location and elevation of all utilities where crossings, interferences, or connections to new pipelines or other facilities 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 to a point 1 foot below the utility. Submit a report identifying each underground utility and its depth and location. Any variation in the actual elevations and the indicated elevations shall be brought to Engineer's attention.
   5. 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 and telephone cables.
      a. Backfill after completing potholing. In existing pavement, pave with 1 inch of cold mix asphalt concrete.

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6. Interferences: If an underground utility lies close to or will interfere with the proposed improvement, the Contractor shall immediately notify the Engineer. Contractor may be requested to submit a method to correct the interferences. The Engineer will provide the selected method for correcting said interferences to the Contractor.
7. 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. The Contractor shall also protect any utilities encountered in the work.
8. Shutdowns: Planned utility service shutdowns shall be accomplished during period of minimum use. In some instances, this may require night or weekend work. Such work shall be at no additional cost to the Owner. Program work so that service will be restored in the minimum possible time, and shall cooperate with the utility companies in reducing shutdowns of utilities to a minimum.
9. 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 hours of notice when requesting written approval. The Contractor shall program his work so that service will be restored in the minimum possible time.
10. Overhead Facilities: Overhead lines exist in the project area and must be flagged and protected by the Contractor from damage. These overhead utilities are not shown on the Drawings. Extreme caution shall be used when working in the vicinity of overhead utilities so as to prevent injury to workmen or damage to the utilities. The Contractor shall be required to comply with the applicable provisions of the California Construction Safety Orders when working anywhere on this project.

3. 3 OBSERVATION OF STAINED OR ODOROUS SOIL

A. Contractor shall notify Engineer and immediately stop work in an area if soil, debris, water or other substances at an area of the Site ("Affected Area") are observed, uncovered, or otherwise discovered because the soil, concrete or debris is discolored, oily or exhibits an odor. Promptly confirm this oral notice in writing. The owner will consider such conditions and determine a course of action. The Contractor shall continue to work in areas not affected and shall resume work in the Affected Area only after being notified by the Engineer.

3. 4 PERFORMANCE - GENERAL

A. General:
   1. Perform Work in a safe and proper manner with appropriate precautions against hazard.
   2. Provide adequate working space and clearances for Work performed within excavations and for installation and removal of concrete forms.
   3. Clean subgrades of loose material before concrete is placed thereon.
   5. Preservation of trees:
      a. Do not remove trees outside fill or excavated areas, except as authorized by Engineer.
      b. Protect trees left standing from permanent damage by construction operation.
      c. Trim standing trees as directed by Engineer.
   6. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with the concrete above.
   7. Remove soft soil materials, loose materials, wood, debris and deleterious substances encountered within excavated areas.
   8. The removal of sidewalk and/or curb and gutter requires the use of lighted barricades with construction ribbon placed in a secure manner. Wooden lath with flagging or cones shall not be allowed. Signs indicating "Sidewalk Closed" shall be installed at the ends of construction

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areas. Cut bituminous and concrete pavements regardless of the thickness and curbs and sidewalks prior to excavation of the trenches with a pavement saw or pavement cutter. Width of the pavement cut shall be at least equal to the required width of the trench at ground surface. Haul pavement and concrete material from the site. Do not use for trench backfill.

B. Blasting: Not permitted.

C. Topsoil:
   1. Remove and stockpile sufficient topsoil to surface to a minimum depth of 4 inches fill, embankment and other areas where the original topsoil will be removed or damaged.
   2. At the completion of other Work in each area, place and grade topsoil to Engineer's satisfaction.

D. Dewatering:
   1. Contractor shall remove all sediment from water pumped or otherwise removed from trenches before disposing of it in a natural stream or water course (flowing or not).
   2. All dewatering activities to be in accordance with local codes and regulations and Contractor's approved SWPPP plan.
   3. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work.
   4. Keep each excavation dry during subgrade preparation and continually thereafter until the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
   5. Where the groundwater is encountered at the depths of pipeline or structures excavations the Contractor shall over-excavate and install 9 inches of a coarse bedding material.
   6. The Contractor shall install pumps and piping and tanks as necessary to remove ground water from the excavation and contain it. The Contractor shall not discharge pumped groundwater to storm drains or creeks until the Contractor's testing indicates that it is safe to do so.
   7. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation.
   8. Divert surface water or otherwise prevent it from entering trenches to the extent practical without damaging adjacent property.
   9. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes shall be left clean and free of sediment.
   10. Obtain all required local and State permits required to discharge water pumped from the excavations.
   11. Provide stable excavation slopes, walls and bottom.
   12. Filter native soil and prevent loss of ground from dispersion and erosion.
   13. Prevent soil piping and groundwater boring through the excavation bottom.
   14. Prevent damaging settlement to nearby structures, utilities, and pipelines.
   15. Dewatering is to be installed and removed in accordance with governing agency.
   16. Allow for controlled release of groundwater to its static level in a manner that prevents disturbance of the bottom soils and prevents flotation or movement of structures, pipelines or utilities.

E. Sheeting, Shoring and Bracing:
   1. The Contractor shall submit shoring plans to the Engineer prior to performing any trench excavation over 5 feet. The Engineer's review of these plans shall not relieve the contractor of his/her responsibility for conforming to all laws concerning excavations. The Contractor shall obtain an excavation permit from Cal/OSHA for any excavations over 5 feet. The trench width shall not be more than 2 feet wider than the outside diameter of the pipeline or less than the OSHA requirements.
   2. Provide proper and substantial sheeting, shoring and bracing, as required, to prevent caving or

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sliding, to protect workmen and the Work, and to protect existing structures and facilities.

3. Design and build sheeting, shoring and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances.
4. Submit sheet pile cut-off wall design calculations, stamped by a California registered professional engineer.
5. Do not pull trench sheeting before backfilling.
6. All sheeting, shoring and bracing in accordance with OSHA and UBC requirements.
7. All sheet pile cut-off walls to be removed at the end of the Project.

F. Stabilization:
1. Thoroughly compact and consolidate subgrades for trench bottoms so they remain firm, dense and intact during required construction activities.
2. Remove all mud and muck during excavation.
3. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities, as directed by Engineer.
4. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings.
5. Scarify subgrade to a depth of 6 to 8 inches and prior to subgrade compaction.

G. Trench Excavation:
1. Do not open more trench in advance of pipe laying than is necessary to expedite the work. Open trenches and excavations be limited to accommodate the approved traffic and safety plans as approved by the San Bernardino County as properly plated.
2. Except where tunneling is indicated on the Drawings, specified, or permitted by Engineer, excavate trenches by open cut from the surface.
3. Alignment, grade and minimum cover:
   a. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings.
   b. Comply with pipe specification sections regarding vertical and horizontal alignment and maximum joint deflection.
   c. Where grades or elevations are not fixed on the Drawings, excavate trenches to provide a minimum depth of backfill cover over top of the pipe:
      1) 48 inches unless otherwise specified on drawings.
      2) Increase depth as required at vertical curves and for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades.
      3) Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation, or to future lower surface elevations where indicated on Drawings.
4. Maintain excavation spoils on uphill side of trench and provide erosion containment measures on downhill side.
5. Limiting trench widths:
   a. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and placement of embedment.
   b. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than one (1) foot above the top of the pipe.
   c. Stipulated minimum clearances are minimum clear distances, not minimum average distances.
   d. Maximum trench width six (6) inches above the top of the installed pipe: Pipe O.D. plus 24 inches, or as otherwise indicated on drawings.
   e. Minimum permissible clearances between installed pipe and trench wall:

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Pipe Size	Minimum Clearance
<=8 inches	4 inches
8 inches and Larger	12 inches

6. If the width of the lower portion of the trench exceeds the maximum permitted, provide pipe of adequate strength, special pipe embedment, or arch concrete encasement as required by loading conditions and as determined by Engineer.
7. Mechanical excavation:
   a. Do not use where its operation would damage trees, buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas.
   b. Use mechanical equipment of a type, design, and construction and operated so that:
      1) Rough trench bottom elevation can be controlled.
      2) Uniform trench widths and vertical sidewalls are obtained from one (1) foot above the top of the installed pipe to the bottom of the trench.
      3) Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls.
   c. Do not undercut trench sidewalls.
8. Excavation below pipe subgrade:
   a. Except as otherwise required, excavate trenches below the underside of pipes as indicated on Drawings, according to pipe and soil type, to provide for installation of embedment pipe foundation material.
   b. Pipe may not be laid directly on trench bottom.
9. Bell holes:
   a. Excavate to provide adequate clearance for tools and methods of pipe installation.
   b. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.
10. Open Trench: The trench shall be in a safe condition at all times. In roadway areas and locations accessible to the public, trenches shall be excavated only as far in advance of pipe laying as can be backfilled in the same day. In addition, during construction, the maximum total length of open trench should be no more than 300-feet ahead of the pipe laying operation, or 200-feet behind the pipe laying operation. A trench in an existing roadway that is not to be regraded is defined as "open" until backfilled to subgrade or the original ground line. Any portion of trench left open, with laid pipe, during non-working hours shall be completely fenced off with orange construction fencing supported by t-posts (200-feet maximum). Open trenches alone, without laid joined pipe within the trench, shall not be permitted during non-working hours.
11. Unsuitable Trench Bottom: If the bottom of the trench is soft, yielding, or otherwise unsuitable as a foundation for the pipe in the opinion of the geotechnical engineer, or Resident Engineer, the unsuitable material shall be removed to the depth necessary to provide a stable and satisfactory foundation. Three-quarter inch crushed rock shall be placed in the trench to provide a stable foundation. The rock is in addition to the required pipe bedding used in the pipe zone. All rock shall be wrapped with approved geo-fabric.

H. Pipe Embedment:
1. Embed pipes above and below the bottom of pipe as indicated on Drawings and as specified.
2. Spread and surface grade embedment to provide continuous and uniform support beneath pipe at all points between bell holes or pipe joints.
3. Slightly disturbing finished subgrade surface during withdrawal of slings and lifting tackle is permissible.

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4. After grading, aligning and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent operations.
5. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent lateral displacement.
6. Granular:
    a. Maximum un-compacted thickness of layers: eight (8) inches.
    b. Compact by slicing with shovel or vibrating.
7. Compacted embedment:
    a. Maximum un-compacted thickness of layers: eight (8) inches.
    b. Compact to 90 percent maximum density as determined by ASTM D1557 when using Type "B" material for pipe embedment, for other materials compact to 90 percent maximum density as determined by ASTM D1557.
8. Jetting and ponding not permitted.

I. Trench Backfill:
1. Compacted backfill:
    a. Provide for the full depth of trench above embedment at all locations.
    b. Where the trench for one (1) pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench.
    c. Finish the top portion beneath established sodded areas with 12 inches minimum, topsoil corresponding to, or better than, underlying adjacent sodded areas.
    d. Suitable job excavated material, or graded gravel, Contractor's option.
    e. Job excavated materials:
        1) Place in eight (8)-inch maximum un-compacted thickness, uniform layers.
        2) Increased layer thickness may be permitted for non-cohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved.
        3) Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe.
        4) Roadways and under structures: Compact to 95 percent of maximum density at optimum moisture content per ASTM D1557 or to 70 percent relative density per ASTM D4253 and D4254 when appropriate.
        5) Other locations, compact to 90 percent of maximum density at optimum moisture content per ASTM D1557 or to 70 percent of relative density per ASTM D4253 and D4254.
2. Water settled backfill: Not allowed.

J. Drainage Maintenance:
1. Do not backfill trenches across roadways, driveways, walks, or other traffic-ways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the traffic-way to prevent impounding water after pipe is laid.
2. Backfill so that water does not accumulate in unfilled or partially filled trenches.
3. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours.
4. Do not obstruct surface drainage any longer than necessary.

K. Protection of Trench Backfill:
1. Protect backfill from erosion when trenches are constructed in ditches or other water course.
2. Install ditch checks where the ditch grade exceeds one (1) percent.
3. Minimum depth: Two (2) feet below the original ditch or water course bottom for the full bottom width.

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4. Minimum width: 18 inches into the side slopes.
5. Minimum thickness: 12 inches.

L. Disposal of Excess Excavated Materials:
1. Except as otherwise permitted, dispose of excess excavated materials away from the site of the Work as approved by Engineer and areas designated by the Owner.
2. Distribute excess earth from excavations located in unimproved property directly over the pipe trench and within the pipeline right-of-way to a maximum depth of six (6) inches above the original ground surface elevation at and across the trench and sloping uniformly each way:
   a. Carefully finish material thus wasted with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point.
   b. Do not waste excess excavated material in the above manner where the trench line crosses or is within a railroad, public road, or highway right-of-way.
   c. Distribute and level to thicknesses noted on the Drawings.

M. Final Grading and Topsoil Replacement:
1. After completion of all other outside Work and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes and contours, all areas of the site to be graded.
2. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand Work.
3. Grade all surfaces for effective drainage.
4. Provide a one (1) percent minimum slope except as otherwise required.
5. Place topsoil at locations and to limits indicated on Drawings.
6. Grade and surface to Engineer's satisfaction.

N. Steel Trench Plates:
Steel trench plates shall not be used over open trench areas without the approval of the Engineer. All steel plates shall be adequately restrained to eliminate shifting. Steel plates do not eliminate the need for shoring. Temporary asphaltic plant mix ("cut-back·) at least one-foot in width shall be used for a transition on each edge of the plate. "Rough Road" or "Bump" signs shall be installed 200-feet on each side before the steel plate. The sign shall only be mounted to an operable, lighted barricade for a maximum of 24 hours. The sign shall be mounted to a 4-inch x 4-inch post if the placement exceeds 24-hours

O. Controlled Density Fill
1. Support pipe to line and grade on wide, non-abrasive bearing surfaces (precast concrete grade blocks with compressible pads or cured CLSM pedestals). Do not support on bells. Provide anti-float restraints (poly straps to deadmen) at each joint and mid-span prior to CLSM placement.
2. Place CLSM in two lifts: first to springline, allow initial set, then place to pavement subgrade. Maintain alignment throughout. Provide temporary ballast (partial water fill) if required to prevent flotation.
3. Protect pipe with pads under straps; remove temporary cribbing/straps only after the CLSM has achieved sufficient set to prevent movement.
4. Do not rely on CLSM bond for thrust resistance; provide mechanical restraints and/or thrust blocks per calculations.
5. Install detectable warning tape 12 in below finished grade (or 6 in below pavement base) continuous over the main. 1. Install #12 AWG copper-clad steel tracer wire with HMWPE jacket, continuous over CLSM segments; terminate in test stations at each end.
6. Leave-Outs at Appurtenances (No CLSM)
   a. Valve Boxes: Provide a cylindrical leave-out centered on valve stem/box from pipe crown to subgrade, 12–18 in diameter (sonotube, split HDPE, or EPS). After

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pressure testing and disinfection, remove/trim forms and backfill with compacted sand or Class II AB to 95% (ASTM D1557).

b. Flanged/MJ Fittings and Joints: Provide a 4–6 in annular leave-out around flanges, MJ glands, bolts, and accessories using removable forms. Wrap bolts/glands with polyethylene and light grease as a bond-breaker. After final acceptance testing, remove forms and backfill annulus with compacted sand to 95%.

c. Hydrants/Blow-offs/Operators: Provide local sand pockets (no CLSM) at connections and around operators; maintain access to nuts and connections.

3.5 FIELD QUALITY CONTROL

A. The Owner will pay for all laboratory and field tests to determine compliance of in-place and backfill materials and compaction with the Specifications. Contractor to coordinate field sampling schedule with Resident Inspector to provide the specified number of tests.

B. Pipe Embedment and Backfill:

1. Two initial gradation tests for each type of material plus one (1) additional test for each 500 cubic yards of each material.
2. Compaction Test Methods - The percent relative compaction of all testable trench backfill soil shall be determined by a combination of the following ASTM test methods:
   a. ASTM D1557, Modified Proctor Compaction Curve or two (2) relative density tests, ASTM D4253 and D4254, as appropriate, for each type of embedment on backfill material proposed, except granular embedment material.
   b. ASTM D1556, In-place Soil Density by The Sand Cone Replacement Method.
   c. ASTM D2216, Soil Moisture Content by The Convection Oven Method. ASTM D2922, In-place Soil Density by Nuclear Method.
   d. ASTM D3017, In-place Soil Moisture Content by Nuclear Method.
   e. ASTM D4643, Soil Moisture Content by The Microwave Oven Method ASTM D4959, Soil Moisture Content by The Direct Heating Method.
3. **Minimum of one (1) in-place compaction test, ASTM D1556 or D6938, every vertical lift of backfill, pipe envelope, and bedding material per minimum 150-foot longitudinal intervals will be required.**
4. Contractor shall, when requested, excavate to the required depth so density tests may be taken and bring such excavations to required density after testing at no additional cost to the Owner.

C. Retests of failed compaction shall be performed by the Owner, but shall be paid for by the Contractor. No backfill work can be deemed approved until such time all compaction test have been approved and accepted by the Engineer.

END OF SECTION

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SECTION 02513

ASPHALTIC CONCRETE VEHICULAR PAVING AND REPAIR

PART 1 - GENERAL

1.1 SUMMARY

A. General work included in this Section:
   1. All asphaltic concrete vehicular paving for roads, parking areas and other incidental structures as indicated in the Contract Documents.
   2. Repair existing pavements, roads, drive-ways, and curbs that are removed or damaged during construction to their original or better condition.
   3. Refer to drawings for trench paving details along with limit of paving.
   4. All work to comply with San Bernardino County Department of Public Works Road Planning and Design Standards, County Standard Plans, and General Permit Conditions/Trench Specifications (latest editions).

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Comply with all applicable requirements of State of California, DOT.
   2. Comply with all applicable requirements of the San Bernardino County Department of Public Works.

B. Reference Standard:
   1. Standard Specifications for State of California, DOT.
   2. San Bernardino County Road Planning and Design Standards; San Bernardino County Standard Plans

1.3 SUBMITTALS

A. See Section 01340.

B. The contractor shall submit asphalt concrete mix design with the submittal package.

C. The Contractor shall provide a copy of the delivery tags for all asphalt concrete incorporated into the work to both the County and Agency.

1.4 JOB CONDITIONS

A. Weather Limitations:
   1. Do not apply when underlying surface is muddy, frozen, or wet.
   2. Spreading and finishing.
      a. Do not place tack coat or asphalt when temperature is below 48 DegF and falling or at any time when temperature is below 45 DegF.
      b. Place when above 40 DegF and rising or when temperature is above 48 DegF.
   3. Do not apply pavement marking paint within 8 HRS of fog or rain or when below 45 DegF.

PART 2 - PRODUCTS

BID SET - NOT FOR CONSTRUCTION

2.1 MATERIALS

A. Asphalt Concrete Pavement shall be constructed as shown on the Plans in conformance with the provisions of Section 39, "Hot Mix Asphalt" of the State Standard Specifications.

B. Asphaltic concrete: In accord with State/County Specifications and as described below:

   a. Asphalt Concrete shall conform to the requirements for Type A, ½" Maximum, Medium Grading per Section 39 of the State Standard Specifications.

C. Thickness:

   1. As indicated on drawings.

D. Aggregate base.

   1. 3/4 IN maximum, Type A.
   2. Conform with State of California, DOT standards.

E. Seal Coat: Per State of California, DOT standards.

F. Electrical Pull Box Extension and Traffic Lid.

   1. Replacement for Existing
   2. Provide ring and lid to match new pavement final grade
   3. Per CALTRANS 2010 Standard Plans ES-8

PART 3 - EXECUTION

3.1 PAVING CONSTRUCTION

A. The Contractor shall place and compact replacement asphalt concrete paving in accordance with the State Specifications.

B. Construct to line, grade and typical section as indicated.

   1. Proof-roll subgrade prior to placing base course.
   2. Repair subgrade as required.
   3. ON properly compacted subgrade, install a compacted layer of aggregate base course in accord with State/County Specifications.
      a. Thickness as indicated on drawings
   4. Install an asphalt binder course, and an asphalt surface course, in accord with State/County Specifications.
      a. Thickness as indicated on drawings
   5. Install seal coat per State/County Specifications.

C. Construct in accord with State/County Specifications.

D. Repaired asphalt concrete pavement shall be a minimum 0.25 ft thick (or 0.10 ft thicker than existing, whichever is greater), with 95% minimum relative compaction per Caltrans methods.

E. For trenches in roadways paved within the last 3 years, full-width lane overlay may be required per County Permit Engineer direction.

F. Pavement removal shall be by saw-cut or cold planning to avoid disturbing adjacent pavement.

G. Tolerance of finished grade: 0.10 FT (30 mm) plus/minus from required elevations.

H. Correct areas where "bird baths" occur to eliminate ponding conditions.

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I. Asphalt curbs to be machine laid and homogeneous with adjacent paving.

J. Raise existing electrical pull box to final pavement elevation and replace existing lid with traffic rated lid.

END OF SECTION

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SECTION 02531
PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes precast concrete manholes, structures, vaults and hatches.
B. Precast Structures:
   1. Valve Vaults.
   2. Drain Inlets.
   3. Barrels.
   4. Other applicable structures as indicated on Drawings.
C. Vault Hatches

1.2 SUBMITTALS

A. Shop Drawings:
   1. Manholes and structures: Include plans, elevations, sections, and details.
   2. Hatch materials, fabrication details, dimensions, plans, and sections.
   3. Special coatings and sealants.
   4. Vault access door manufacturer shall provide Warranty prior to contract closeout.
   5. Reinforcement details indicating bar location, size, and length.
   6. Design calculations for non-circular vaults and structures, signed and sealed by a California Professional Engineer.
   7. Product data and installation instructions for joint sealants, gaskets, and resilient connectors (where used).

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect seals from dirt and damage.
B. Handle manholes according to manufacturer's written rigging instructions.
C. Store precast units on firm, level dunnage; protect joint surfaces and gaskets from dirt, sunlight, and damage; and do not stack units beyond manufacturer recommendations.
D. Store per Section 01600, Delivery, Storage and Handling.

1.4 PROJECT CONDITIONS

A. See Section 01015, Sequence of Construction.

1.5 QUALITY ASSURANCE

A. Manufacturer's: Jensen Precast, Oldcastle, or equal.
B. Precast manufacturer shall be NPCA Plant Certified (or approved equal) and shall have a minimum of five (5) years of experience manufacturing similar structures.
C. Design of non-circular vaults/structures shall be performed under the responsible charge of a California Professional Engineer and submitted with shop drawings.

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PART 2 - PRODUCTS

2.1 CIRCULAR PRECAST CONCRETE STRUCTURES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
B. Joints: Provide preformed flexible joint sealant or gaskets conforming to ASTM C990, installed per manufacturer recommendations to provide watertight joints.
   1. Diameter: as indicated on Drawings.

2.2 NON-CIRCULAR PRECAST CONCRETE STRUCTURES AND VAULTS

A. General: Size indicated, with provision for sealant at joints, meeting the following requirements:

1. Manufacture and construct Precast Concrete Structures: according to ASTM C 857 for AASHTO H20 traffic rating. Contractor shall provide calculations satisfying the requirements of ASTM C857 and ACI 318 with the following design assumptions:
   a. Assume buoyancy effects with the ground water level 6 inches below top of vault with a minimum 1.25 factor of safety against flotation.
   b. Walls designed for AASHTO HS-20 (H-20) heavy traffic loading surcharge pressure within a horizontal distance from the structure equal to one half the height of the structure.
2. Depth of Bury: As indicated on drawings.
3. Reinforcing steel shall comply with ASTM A615 Grade 60 or ASTM A706 Grade 60.
4. Lifting inserts for handling shall be installed per manufacturer's requirements.
5. Piping Penetrations: Locate wall penetrations horizontally to facilitate installation of piping parallel to vault walls. Locate wall penetrations vertically to facilitate installation of level piping through the vault and the pipe cover requirements outside of the vault as indicated on the typical trench detail within the Drawings.
6. Provide watertight sealing at piping penetrations using cast-in resilient connectors, modular mechanical seals (Link-Seal type), or approved equal. Grout/patch annular spaces as required.
7. Sump: Provide small sump depression in corner of vault as indicated on drawings, slope vault floor to drain to sump.

2.3 PRECAST CONCRETE MATERIALS AND MIX DESIGN

A. General: Precast concrete according to ACI 318/318R. Concrete Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

2.4 VAULT ACCESS DOOR (HATCHES)

A. Sizes as indicated on drawings.
B. Lockable, double leaf spring assisted.
C. Provide access doors and frames rated for AASHTO HS-20 (H-20) loading.
D. Cover:
   1. Opens using a lifting handle flush to the surface with smooth controlled operation throughout the entire arc of opening and closing.
   2. Frame: Trough frame shall be minimum 1/4-inch thick with a continuous anchor flange around the entire perimeter of the frame. The frame shall be designed to drain to one location in the frame featuring a drain coupling.
   3. Hinges: Shall be through bolted to the cover with tamperproof type 316 stainless steel bolts and locknuts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
   4. Lifting mechanisms: Manufacturer shall provide the proper amount of lift assistance to ensure that the cover can be opened by one person with no more than 40 lbs of force required.
   5. Hardware:
      a. Cover shall be equipped with a 316 stainless steel hold open arm with secondary latch which locks the cover in its full upright and open position.
      b. A watertight 316 stainless steel slam lock with threaded plug, removable outside key and fixed inside handle shall be mounted on the underside of the cover.
      c. Hardware shall be Type 316 stainless steel throughout.

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PART 3 – EXECUTION

3.1 INSPECTION

A. The Owner's representative shall be notified upon the arrival of all precast structures to the site and shall be allowed to inspect all products and hardware prior to installation.

3.2 EARTHWORK

A. Prepare subgrade as indicated on Drawings prior. Prior to installation of precast structures, the Owner's representative shall be notified to verify subgrade preparation. Over excavate and place drain rock wrapped in geotextile fabric as indicated on drawings. Provide nonwoven geotextile fabric conforming to AASHTO M 288, Class 2. Wrap drain rock completely to prevent migration of fines.

B. Set precast structures as required to ensure that the entire unit is installed level and square. Install and seal joints in accordance with manufacturer's recommendations. Clean joint surfaces prior to assembly and provide lubricant/sealant as required to achieve watertight joints.

C. Backfill evenly around structures and compact in lifts in accordance with Section 02201. Protect structures from flotation and displacement during backfill operations.

3.3 CLEANING

A. Clean interior after installation and remove all dirt and superfluous materials from inside the structure as well as finished grade surfaces.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 02821
CHAIN-LINK FENCES AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Chain-Link Fences.
   2. Barbed Wire
   3. Chain Link Gates.
   4. Cattle Gates.
   5. Privacy Slats

B. Related Sections include the following:
   1. Division 3 Section 03002 for concrete.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Comply with all applicable requirements of State of California, DOT.

B. Reference State Standards:
   1. Standard Specifications for State of California, DOT.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, barbed wire, reinforcements, and attachments.
   3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, braces, tension wires, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with AASHTO M181, galvanized; and requirements indicated below:
   1. Steel Wire Fabric: 9 gage (0.148 inch) wire
   2. Square 2” diamond mesh
   3. Selvage: Knuckled at both selvages
   4. Diamond count 27 Full diamonds
   5. 96 inch height

2.2 BARBED WIRE

A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121, Standard grade for the following two-strand barbed wire:
   1. Standard Size and Construction: 0.099-inch- diameter line wire with 0.080-inch-diameter, 4-point round barbs spaced not more than 5 inches o.c.

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2.3 FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
   1. Group: Schedule 40, round steel pipe, yield strength 50,000 psi.
   2. Fence Height: height of mesh as measured from grade, as indicated on drawings.
   3. Post Size and Thickness:
      a. 6’ 0” high or less
         1) Braces: 2.38 inches OD.
         2) Line Post: 2.38 inches OD.
         3) End, Corner and Pull Post: 3.5 inches OD.
         4) Swing Gate Post: 3.5-inch OD.

      b. Above 6’ 0” and less than 10’ 0”.
         1) Braces: 2.38 inches OD.
         2) Line Post: 2.875 inches OD.
         3) End, Corner and Pull Post: 3.5 inches OD.
         4) Swing Gate Post: 3.5-inch OD.

   4. Galvanized

B. Barbed Wire Arms: Pressed galvanized steel, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post, unless otherwise indicated, and as follows:
   1. Line posts with arms that accommodate top rail or tension wire.
   2. Corner arms at fence corner posts, unless extended posts are indicated.
   3. Type I, single slanted arm.
   4. Extension: 12 inches (1'-0") at 45 degrees (unless otherwise indicated).

2.4 TENSION WIRE AND TOP RAILS

A. Provide horizontal tension wire at the following locations:
   1. Location: Extended along bottom of fence fabric.

B. Metallic-Coated Steel Wire: commercial quality 7-gage coil spring steel, and the following:
   1. Metallic Coating: ASTM A 116, with the following minimum coating weight:
      a. Class 3.

C. Provide horizontal top rails at the following locations:
   1. Location: Extended along top of fence fabric.

D. 1-5/8” O.D. galvanized steel pipe, standard SS20 style top rail ASTM F1043.

2.5 INDUSTRIAL CHAIN LINK SLIDING GATE

A. General: Provide cantilever-type sliding gates complying with ASTM F1184, Type II, Class 1 or 2 for Industrial/Commercial Horizontal Slide Gates, and ASTM F2200 for automated gate construction. Gate systems shall be designed for compatibility with multiple operator brands and constructed for high-cycle commercial use.
   1. Metal Pipe and Tubing: Galvanized steel per ASTM F1043 and ASTM F1083 for structural members and protective coatings, or equivalent corrosion-resistant materials approved by the Engineer.
   2. Gate Fabric: To match fencing; galvanized steel chain link mesh, 2-inch diamond, 9-gauge minimum, or PVC-coated equivalent.

B. Frames and Bracing:
   1. Fabricate gate frames from round tubing, 1.90 inches OD minimum for vertical and bracing members and 2.375 inches OD minimum for horizontal rails. Alternative equivalent structural profiles may be used.

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2. Frame shall include counterbalance extension no less than 40% of the clear gate opening width.
3. Provide appropriate truss or wind bracing as required for structural rigidity.

C. Frame Corner Construction:
1. Welded corners or assembled with rigid corner fittings.
2. Include 3/8-inch diameter, adjustable truss rods or equivalent structural supports.

D. Hardware:
1. Provide cantilever roller assemblies with sealed bearings suitable for continuous-duty operation; minimum four roller assemblies per gate or per manufacturer's requirements.
2. Provide galvanized steel or malleable iron latch assembly, lockable, and operable from both sides.
3. Catch and locking attachments shall be non-rotating around latch post.

E. Roller Protection and Safety:
1. Provide safety covers on top and bottom rollers to comply with ASTM F2200 and UL 325 entrapment protection requirements.
2. All hardware and brackets shall be corrosion-resistant—hot-dip galvanized, powder-coated steel, or stainless steel.

F. Gate Stops and Guide:
1. Provide receiver post, positive stop, and guide assembly suitable for cantilever gate systems.

G. Extended Gate Posts:
1. Extend gate posts above the top of chain link fabric where required to accommodate barbed wire assemblies or access control hardware.

H. Gate Posts:
1. Minimum 4.0-inch OD for openings up to 20 feet; increase post size proportionally for wider gates or as recommended by gate manufacturer.
2. Posts set in concrete footings sized per manufacturer's recommendation and local soil conditions.

I. Finish:
1. All steel components shall be hot-dip galvanized after fabrication in accordance with ASTM A123. Field welds shall be touched up in accordance with ASTM A780. Powder-coated or PVC-coated finishes may be accepted if compliant with corrosion protection standards.

2.6 GATE OPERATOR (ACTUATOR)

A. General: Provide a solar-powered, UL 325 listed slide gate operator compatible with cantilever-style sliding gates, suitable for commercial or industrial applications, and rated for continuous duty. Operator shall comply with ASTM F2200 and include all safety and control features required for code compliance.

B. System Type:
1. 24V DC slide gate operator, capable of solar-powered operation with built-in battery backup.
2. Gate operator to accommodate gates up to 1,500 lbs and 40 feet in length, with adjustable opening speeds up to 1 foot per second.

C. Power and Solar Capability:
1. Operator shall include solar charge controller and be compatible with solar panel kits suitable for the specified gate usage.
2. Minimum 33Ah battery capacity; allow expansion up to 100Ah. Provide appropriate sealed deep-cycle AGM or equivalent batteries.
3. Optional AC transformer for backup charging when power is available.
4. Solar Panel Installation:
    a. Mount solar panel(s) on a dedicated support post, gate post, or adjacent structure. Do not mount solar panels to moving gate components.
    b. Locate solar panel(s) as close as practical to the gate operator.

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c. Install solar panel(s) within secured areas of the facility where possible to reduce risk of vandalism.
d. Orient solar panel(s) to face south and install to avoid shading.

D. Controls and Features:
1. Programmable logic controller with soft-start/soft-stop operation.
2. Adjustable auto-close timer, multiple access input types, and diagnostic interface.
3. Manual release mechanism for use during emergencies or power failure.
4. Access Controls: Provide gate operator with (2) handheld remote transmitters and (1) weatherproof keypad mounted on the gate (gate frame/latch post) for PIN/code entry to open the gate. Include receiver/interface modules, mounting hardware, and all wiring required for a complete, operational system.

E. Safety and Compliance:
1. Provide inherent and external entrapment protection devices, including at minimum: a. Dual monitored photoelectric sensors. b. Reversing safety edge or loop detectors (as required).
2. Audible alarm and signage per UL 325.

F. Acceptable Manufacturers:
1. HySecurity SlideSmart DC, LiftMaster CSL24UL, or approved equal that meets the criteria above.
2. Installer must verify operator compatibility with installed gate system and mounting conditions.

G. Submittals:
1. Product data, installation manual, and wiring diagrams.
2. Shop drawings indicating mounting locations, operator placement, and accessory integration.

2.7 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.
1. Line post caps with loop to receive tension wire or top rail.

C. Braces: Attach braces securely to each gate, corner, pull, and end post.

D. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

E. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

F. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

2.8 PRIVACY SLATS

A. Material: Polyethylene tubular slats, not less than 0.03 inch thick, manufactured for chain-link fences from virgin polyethylene containing UV inhibitor, sized to fit mesh specified for direction indicated.
1. Depth: not less than 0.325 inches
2. Privacy: Maximum 75%
3. Length: equal to fence height
4. Properties:
a. Melt Index: ASTM D1238, 0.24
b. Density: ASTM D1505, 0.951
c. Low temperature brittleness: ASTM D748, -76° Fahrenheit
d. Tensile Strength: ASTM D638, 3,700 psi

B. Color: Provide palette for selection by Owner.

C. Bottom Locking Channel: Manufacturer's standard locking channel and lock strip for privacy slat system; provide accessories required for a complete installation.

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D. Tie Wires: Stainless steel, 0.065 inch diameter.

2.9 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.10 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
   1. Material above Finished Grade: Copper.
   2. Material on or below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.
   1. Connectors for Below-Grade Use: Exothermic welded type.
   2. Grounding Rods: Copper-clad steel.
      a. Size: 5/8 by 96 inches.

C. Ground gates with jumpers.

D. Ground barbed wire as required to complete grounding of fencing system.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
   1. Install fencing on established boundary lines inside property line.

3.2 CHAIN-LINK FENCE INSTALLATION

A. Post Setting: Set posts in concrete as shown on drawings.
   A. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
      a. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

B. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.

C. Line Posts: Space line posts uniformly at 8 feet o.c.

D. Post Bracing: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
   A. Locate horizontal braces as indicated on drawings. Install so posts are plumb when diagonal rod is under proper tension.
   B. Brace each end, latch, and corner post to the nearest line post with either of the following:
      a. Diagonal brace used as a compression member.
      b. Horizontal brace used as a compression member and truss rods used as tension members.
   C. Equip each steel truss rod with a turnbuckle or truss tightener.

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E. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 18 inches o.c. Install tension wire in locations indicated before stretching fabric.
   A. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

G. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.
   A. Gates to also be fitted with barbed wire.

H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 12 inches o.c.

I. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
   A. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

K. Top Rail: Install top rail according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps (loop or eye tops), bending to radius for curved runs as necessary. Terminate rail into rail end fittings attached to terminal posts (end, corner, pull, and gate posts) with rail end bands or cups. Provide expansion couplings as recommended in writing by the fencing manufacturer for runs exceeding 100 feet or where thermal expansion may occur. Swedge or sleeve rail sections for secure joints between full lengths. Secure rail ends firmly to prevent movement. Attach chain-link fabric to top rail with tie wires spaced at maximum 24 inches o.c., or as required to maintain tautness.

3.3 CHAIN LINK GATE INSTALLATION

A. Install cantilever-type sliding gates in accordance with ASTM F2200, ASTM F1184, and the gate manufacturer's written instructions.
B. Align gate to slide freely without binding, ensuring level travel across full opening range.
C. Mount roller assemblies to gate posts per manufacturer’s spacing and orientation recommendations.
D. Install gate stops and receiver posts to properly retain the gate in the fully open and fully closed positions.
E. Verify gate frame is plumb, counterbalance extension is aligned, and fabric tension is consistent.
F. Provide all required hardware, including latch assemblies, guide brackets, and safety roller covers.
G. Ensure gate slides parallel to the fence line and maintains proper ground clearance per design documents.

3.4 AUTOMATED GATE OPERATOR INSTALLATION

A. Install gate operator in accordance with UL 325, ASTM F2200, and the manufacturer's written instructions.
B. Anchor operator to concrete pad or post as recommended by manufacturer; verify alignment with gate.

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C. Install solar panel and charge controller in location with adequate sunlight exposure. Orient and angle per manufacturer recommendations.
D. Connect battery bank, control panel, and safety devices. All wiring shall be installed in conduit and meet NEC requirements.
E. Install and align monitored safety devices, including at minimum:\n
    a. Dual photoelectric sensors across gate opening
    b. Reversing edge sensors or in-ground loop detectors where applicable.
F. Verify proper function of auto-reverse, stop limits, and manual release mechanism.
G. Perform field testing to confirm gate opens and closes smoothly at specified speeds. Confirm entrapment protection activates under resistance as required by UL 325.
H. Adjust settings as required for final operation and provide all keys, manuals, and codes to Owner.

3.5 GROUNDING AND BONDING

A. Grounding Method: Drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.
B. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
C. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
    A. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
    B. Make connections with clean, bare metal at points of contact.
    C. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
    D. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
    E. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
B. Lubricate hardware and other moving parts.

END OF SECTION

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SECTION 028213.19
ASBESTOS CEMENT PIPE HANDLING AND DISPOSAL

PART 1 — GENERAL

1.1 SUMMARY

A. Work includes disturbance, cutting, removal, packaging, transport, and disposal of existing asbestos-cement (AC) pipe to facilitate installation of new PVC pipe and fittings, including tie-ins and appurtenances.

B. Perform all AC pipe work as Class II asbestos work in accordance with Cal/OSHA.

C. Comply with Federal NESHAP requirements for asbestos waste handling and disposal.

D. Comply with the local air district having jurisdiction: Mojave Desert AQMD (MDAQMD).

1.2 REFERENCES

A. Cal/OSHA: Title 8 CCR §1529 (Asbestos, Construction).

B. Cal/OSHA: Title 8 CCR §341.17 (Approval of Asbestos-Cement Pipe Training for employer exemption from registration).

C. EPA NESHAP: 40 CFR Part 61, Subpart M, including §61.150 (Standard for waste disposal).

D. Local Air District: MDAQMD Asbestos Program (Demolition/Renovation Checklist & Asbestos Demolition/Renovation Notification).

E. California DTSC: Guidance on managing asbestos waste (friable vs. non-friable; hazardous waste designation).

F. San Bernardino County Solid Waste: Acceptance policies for asbestos-containing wastes and designated facilities.

1.3 DEFINITIONS

A. Asbestos-Containing Material (ACM): Material containing asbestos in an amount of ≥1.0% by area.

B. Class II Work: Cal/OSHA classification for removal of ACM that is not TSI or surfacing material, including AC pipe.

C. Friable: Material that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

D. RACM: Regulated Asbestos-Containing Material per NESHAP.

1.4 SUBMITTALS

A. AC Pipe Work Plan (Contractor's competent person): scope/limits; identification of materials; cutting/tie-in methods; wet methods; dust and visible emission controls; containment; decontamination; PPE and respiratory protection; waste packaging/labeling; transport; name/location/authorization of receiving disposal facility; emergency/stop-work procedures.

B. Regulatory Documentation:

1. Pre-renovation asbestos survey report for the affected work area.
2. Local air district notification and/or checklist as applicable; proof of filing within required lead times.
3. Copies of permits/approvals from disposal facility showing it is permitted to accept the ACM category being generated (friable or non-friable).

C. Qualifications:

1. Evidence of Cal/OSHA asbestos contractor registration or documentation of DOSH-approved AC pipe training for the employer under 8 CCR §341.17 (initial and current refresher).

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2. Competent person and worker training consistent with the scope of Class II work.

D. Waste Shipment Records/Manifests: Sample form; submit completed copies with disposal receipts at closeout.

1.5 REGULATORY COORDINATION

A. Air District Jurisdiction (Confirmed): The project is within Mojave Desert AQMD (MDAQMD); comply with MDAQMD program requirements, including survey, work-practice, and notification rules.

B. NESHAP Thresholds: When disturbing ≥260 linear feet on pipes, ≥160 square feet on other facility components, or ≥35 cubic feet of RACM, submit notifications per NESHAP and MDAQMD rules. Demolitions are generally notifiable regardless of quantity.

C. County Solid Waste: Coordinate disposal in accordance with San Bernardino County policies. County-operated landfills may not accept asbestos; Contractor shall arrange delivery to an authorized facility that accepts the generated ACM category.

1.6 QUALITY ASSURANCE

A. Competent Person: Designate a competent person knowledgeable in AC pipe work under §1529, responsible for implementation of the Work Plan, regulatory coordination, and site oversight.

B. Respiratory Protection & Exposure Assessment: Provide exposure assessments and respiratory protection per §1529(h), and medical surveillance where required.

C. Independent Monitoring (If Specified on Drawings): Provide third-party air monitoring and clearance as indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide materials (bags, wraps, containers, labels) suitable for leak-tight packaging of wetted AC debris.

B. Store packaged waste in secure areas; protect from damage and weather.

PART 2 — PRODUCTS

(Not Used.)

PART 3 — EXECUTION

3.1 GENERAL WORK PRACTICES

A. Treat all AC pipe as ACM. Implement wet methods at all times when feasible and use HEPA-filtered vacuums for collection/cleanup.

B. Prohibited practices (unless controls specified by Cal/OSHA are provided):

1. High-speed abrasive disc saws without point-of-cut ventilation and HEPA filtration.
2. Use of compressed air to remove ACM or debris unless within an enclosed, HEPA-filtered system.
3. Dry sweeping, shoveling, or brushing of ACM dust/debris.
4. Rotating employees to achieve compliance with PELs.

C. Maintain the work area free of visible emissions; immediately correct any condition causing visible emissions.

3.2 CUTTING, REMOVAL, AND TIE-IN PROCEDURES

A. Preferred Cutting Methods: Use snap/chain cutters or other low-dust methods that avoid friabilizing pipe; keep the pipe adequately wet during scoring/cutting and section handling.

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B. Mechanical Cutting: Where mechanical sawing is necessary, provide local point-of-cut capture with HEPA filtration and continuous wetting.
C. Tie-In Limits: Minimize removal length to the extent necessary to install new fittings and maintain structural integrity of existing pipe.
D. Handling: Support cut sections to prevent breakage; avoid impact, drop, or abrasive handling. Maintain wet condition until packaged.
E. Hot/Wet Taps (if performed on retained pipe): Use wet methods and emission controls; select tooling that does not generate uncontrolled dust; capture cuttings and slurry for disposal as ACM.

3.3 CONTAINMENT, HOUSEKEEPING, AND DECONTAMINATION

A. Establish controlled work zones appropriate to the task and location (open trench vs. vault vs. plant site), with barriers/signage.
B. Provide personnel and equipment **decontamination** procedures; prohibit dry tracking of debris from the work zone.
C. Perform housekeeping with **HEPA** vacuums and wet wipes; no dry cleanup.

3.4 PACKAGING, LABELING, TRANSPORT, AND DISPOSAL

A. Packaging: Place wetted AC pipe sections and debris in leak-tight containers or double-wrap in minimum 6-mil polyethylene (or equivalent), sealed to prevent leakage.
B. Labeling: Affix required danger labels (per OSHA/Cal/OSHA) and generator/location labels as required by NESHAP; ensure transport vehicles are properly placarded when required.
C. Waste Shipment Records: Prepare NESHAP waste shipment records/manifests for each load; obtain signed receipts from the receiving facility; reconcile discrepancies.
D. Disposal Facility: Dispose at a permitted landfill authorized to accept the specific ACM category (friable or non-friable). Confirm hours, appointment, packaging, and documentation requirements before hauling.
E. Hazard Classification: Manage friable ACM as hazardous waste per DTSC and applicable Title 22 requirements; non-friable ACM shall be managed per the receiving facility's conditions.

3.5 NOTIFICATIONS AND AIR-DISTRICT REQUIREMENTS

A. Air District: MDAQMD is the governing air district for this project.
B. Notification Lead Time: Submit the MDAQMD Asbestos Demolition/Renovation Notification no fewer than 10 working days prior to start of notifiable renovation/removal; all demolitions are notifiable. For work below thresholds, complete the MDAQMD Asbestos Checklist if applicable.
C. Maintain a copy of the approved notification (or checklist) on site.

3.6 PERSONNEL PROTECTION AND TRAINING

A. Provide training and supervision consistent with **Class II** work, including a **competent person** on site.
B. Where the employer uses the Cal/OSHA **AC Pipe Training** pathway in lieu of asbestos-contractor registration, ensure workers hold current training under **8 CCR §341.17** (initial and refresher).
C. Provide respiratory protection, protective clothing, and hygiene facilities in accordance with Cal/OSHA.

3.7 MEASUREMENT AND PAYMENT

A. All costs for AC pipe handling and disposal, including surveys, notifications, protective measures, packaging, transport, disposal fees, and documentation, are **incidental** to the work requiring the tie-in or removal.

END OF SECTION

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SECTION 03002

CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete and grout.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Concrete Institute (ACI):
      a. 116R, Cement and Concrete Terminology.
      b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 212.3R, Chemical Admixtures for Concrete.
      d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
      e. 304.2R, Placing Concrete by Pumping Methods.
      f. 305R, Hot Weather Concreting.
      g. 306R, Cold Weather Concreting.
      h. 318, Building Code Requirements for Structural Concrete.
      i. 347R, Recommended Practice for Concrete Formwork.
      j. 117, Specifications for Tolerances for Concrete Construction and Materials. 301, Specifications for Structural Concrete.
   2. American Society for Testing and Materials (ASTM):
      a. A1064/A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete Reinforcement.
      b. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1).
      c. A775, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
      d. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
      e. C33, Standard Specification for Concrete Aggregates.
      f. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      g. C94, Standard Specification for Ready-Mixed Concrete.
      h. C138, Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
      i. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
      j. C150, Standard Specification for Portland Cement.
      k. C157, Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
      l. C171, Standard Specification for Sheet Materials for Curing Concrete.
      m. C172, Standard Practice for Sampling Freshly Mixed Concrete.
      n. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      o. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      p. C260, Standard Specification for Air Entraining Admixtures for Concrete.

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q. C1260, Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method); and/or C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
r. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
s. C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
t. C494, Standard Specification for Chemical Admixtures for Concrete.
u. C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
v. C567, Standard Test Method for Unit Weight of Structural Lightweight Concrete.
w. C595, Standard Specification for Blended Hydraulic Cements.
x. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
y. D1056, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
z. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
aa. E329, Standard Specification for Agencies Engages in the Testing and/or Inspection of Materials Used in Construction.

3. Federal Specification (FS):
   a. CEGS 03300, Vegetable Fiber.
4. Corps of Engineers: Specification CRD-C572 Polyvinyl Waterstops.
5. State Standard Specifications: Standard Specifications for DOT State of California

B. Quality Control:
1. Concrete testing agency.
   a. Contractor shall pay for additional testing/retesting and investigation required due to nonconforming work, failed tests, or deviation from approved mix design.
      1) Perform materials evaluation.
      2) Design concrete mixes.
   b. Concrete testing agency to meet requirements of ASTM E329.
2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
   a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
   a. Do not use revised concrete mixes until submitted to and approved by Engineer.
4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.

C. Qualifications:
1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).

1.3 Formwork, shoring and reshoring for slabs and beams except where cast on ground to be

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designed by a professional engineer currently registered in the states where the project is located.

1.4 DEFINITIONS

A. Per ACI 116R except as modified herein:
   1. Concrete fill: Non-structural concrete.
   2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
   3. Exposed concrete: Exposed to view after construction is complete.
   4. Indicated: Indicated by Contract Documents.
   5. Lean concrete: Concrete with low cement content.
   6. Nonexposed concrete: Not exposed to view after construction is complete.
   7. Required: Required by Contract Documents.
   8. Specified strength: Specified compressive strength at 28 days.
   9. Submitted: Submitted to Engineer.

1.5 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340.
   2. Concrete mix designs proposed for use. Concrete mix design submittal to include the following information:
      a. Sieve analysis and source of fine and coarse aggregates.
      b. Test for aggregate organic impurities.
      c. Provide aggregate ASR testing and mitigation documentation. Use ASTM C1260 and/or ASTM C1293 (or approved equivalent per local agency) in lieu of withdrawn ASTM C289.
      d. Proportioning of all materials.
      e. Type of cement with mill certificate for cement.
      f. Type of fly ash with certificate of conformance to specification requirements.
      g. Slump.
      h. Air content.
      i. Brand, type, ASTM designation, and quantity of each admixture proposed for use.
      j. 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
      k. Shrinkage test results.
      l. Standard deviation value for concrete production facility.
      m. Contractor's proposed pour sequence. Provide 1/8 IN = 1 FT - 0 IN minimum scaled drawings indicating:
         1) Location of all construction joints.
         2) Location and type of waterstops.
         3) Any proposed deviations from Contract Drawings must be clearly indicated.
         4) Reproductions of Contract Drawings are acceptable for this purpose.
   3. Manufacturer and type of joint filler, joint sealant, curing agent and chemical floor hardener.
   4. Manufacturer and type of bonding and patching mortar and bonding adhesive used at construction joints.
   5. Manufacturer and type of nonshrink grout and the cure/seal compound required for

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the nonshrink grout.

6. Reinforcing steel: Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
   a. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
   b. Obtain approval of shop drawings by Engineer before fabrication.
   c. Mill certificates.
7. Strength test results of in place concrete including slump, air content and concrete temperature.

B. Formwork Shop Drawings
   1. Before starting concrete work, submit shop drawings of formwork showing size and thickness of members, dimensions and locations of openings and blockouts, vertical limits of concrete placements, horizontal lifts, plywood form pattern, proposed construction joints, form tie elevations and details, and any architectural features to be cast into the concrete. Incorporate the work of all trades.
   2. This review is for the purpose of assessing the Contractor's interpretation of the Contract Documents and will not include any considerations of the availability, suitability, constructability, or safety of concrete forming system.
   3. Drawings and structural calculations for all concrete other than slabs on grade shall be submitted for record purposes only and not for review or approval. Formwork drawings and structural calculations shall be signed and sealed by a Civil or Structural Engineer registered in California. Where superplasticizers are used with Engineer's approval, design formwork to resist full liquid head.
   4. The Contractor shall be solely responsible for the design, installation, use, and safe removal of all formwork. The formwork design shall comply with all governing codes, all Federal, State, and local ordinances; and generally accepted engineering principles.
   5. Submit drawings showing the installation and removal sequence and procedures to be used. Include weight of formwork, assumed construction load, proposed minimum concrete strength for stripping of formwork, size and type of reshores, reshore spacing pattern, number of levels of reshores, and assumed load per reshore at each level.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:
   1. Cement and fly ash:
      a. Store in moistureproof, weathertight enclosures.
      b. Do not use if caked or lumpy.
   2. Aggregate:
      a. Store to prevent segregation and contamination with other sizes or foreign materials.
      b. Obtain samples for testing from aggregates at point of batching.
      c. Do not use frozen or partially frozen aggregates.
      d. Do not use bottom 6 IN of stockpiles in contact with ground.
      e. Allow sand to drain until moisture content is uniform prior to use.
   3. Admixtures:
      a. Protect from contamination, evaporation, freezing, or damage.
      b. Maintain within temperature range recommended by manufacturer.
      c. Completely mix solutions and suspensions prior to use.

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4. Reinforcing steel:
    a. Support and store all rebars above ground.

B. Delivery:
1. Concrete:
    a. Prepare a delivery ticket for each load for ready-mixed concrete.
    b. Truck operator shall hand ticket to Engineer at the time of delivery.
    c. Ticket to show:
        1) Mix identification mark.
        2) Quantity delivered.
        3) Amount of each material in batch.
        4) Outdoor temp in the shade.
        5) Time at which cement was added.
        6) Numerical sequence of the delivery.
        7) Amount of water added.
2. Reinforcing steel: Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
    a. Mark numbers to match shop drawing mark number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Nonshrink grout:
    1. Sika "SikaGrout 212."
    2. Gifford Hill "Supreme Grout."
    3. Master Builders "Masterflow 713."
2. Epoxy grout:
    1. Master Builders "Brutem MPG."
    2. Euclid Chemical Company, "High Strength Grout."
    3. Fosroc, "Conbextra EPHF".
3. Expansion joint fillers:
    1. Permaglaze Co.
    2. Rubatex Corp.
    3. Williams Products, Inc.
4. Waterstops, PVC:
    1. Greenstreak Plastic Products, Inc.
    2. W.R. Meadows, Inc.
    3. Burke Company.
5. Form coating:
    1. Richmond "Rich Cote."
    2. Industrial Lubricants "Nox-Crete Form Coating."
    3. Protex "Pro-Cote."
6. Prefabricated forms:
    1. Simplex "Industrial Steel Frame Forms."
    2. Symons "Steel Ply."
    3. Universal "Uniform."
7. Chemical Floor Hardeners.
    1. L & M Construction Chemicals, Inc.

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2. Euclid Chemicals Inc.
3. Dayton Superior.

8. Bonding agents:
   1. Euclid Chemical Co.
   2. Master Builders Inc.
   3. L&M construction Chemicals Inc.

2.2 **MATERIALS**

A. Portland Cement: Conform to ASTM C150 Type II or Type V, Low Alkali (LA).

B. Fly Ash:
   1. ASTM C618, Class F or Class C.
   2. Nonstaining.
      1. Hardened concrete containing fly ash to be uniform light gray color. Specifier: May use 6 percent loss on ignition for non-air-entrained concrete.
   3. Maximum loss on ignition: 4 percent.
   4. Compatible with other concrete ingredients.
   5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.

C. Admixtures:
   1. Air entraining admixtures: ASTM C260.
   2. Water reducing, retarding, and accelerating admixtures:
      1. ASTM C494 Type A through E.
      2. Conform to provisions of ACI 212.3R.
      3. Retarding admixtures are not permitted unless specifically approved in writing by Engineer. Non-chloride accelerating admixtures are permitted for thrust block concrete only when included in an approved concrete mix design.
      4. Follow manufacturer's instructions.
      5. Use chloride free admixtures only.
   3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:
      1. 0.10 all concrete.
   4. Do not use calcium chloride.
   5. Pozzolanic admixtures: ASTM C618.
   6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.

D. Water: Potable, clean, free of oils, acids and organic matter.

E. Aggregates:
   1. Normal weight concrete: ASTM C33, except as modified below.
   2. Fine aggregate: Clean natural sand.
      1. No manufactured or artificial sand.
   3. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material.
      1. Maximum amount of clay or shale particles: 1 percent.
   4. Gradation of coarse aggregate:
      1. Lean concrete and concrete topping: Size #7.
      2. All other concrete: Size #57 or #67.

F. Concrete Grout:
   1. Nonshrink grout:

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1. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
2. Grout to produce a positive but controlled expansion.
3. Mass expansion not to be created by gas liberation.
4. Minimum compressive strength of nonshrink grout at 28 days: 6,500 psi.

2. Epoxy grout:
1. 3-component epoxy resin system.
1) Two liquid epoxy components.
2) One inert aggregate filler component.

2. Each component packaged separately for mixing at jobsite.

G. Reinforcing Steel:
1. Reinforcing bars: ASTM A615, Grade 60.
2. Welded wire reinforcement: ASTM A1064/A1064M.
1. Minimum yield strength: 60,000 psi.
3. Column spirals (wire): ASTM A1064/A1064M (or ASTM A615 if detailed as bar spirals).

H. Forms:
1. Prefabricated or job built.
2. Wood forms:
1. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
2. Built-in-place or prefabricated type panel.
3. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.
4. When approved, plywood may be reused.
3. Metal forms:
1. Metal forms excluding aluminum may be used.
2. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
4. Chamfer strips: Clear white pine, surface against concrete planed.
5. Form ties: Removable end, permanently embedded body type with cones on outer ends not requiring auxiliary spreaders.
1. Cone diameter: 3/4 IN minimum to 1 IN maximum.
2. Embedded portion 1 IN minimum back from concrete face.
3. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
4. Provide ties with built-in waterstops at all walls that will be in contact with process liquid during plant operation.
6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

I. Waterstops:
1. Plastic: Corp of Engineers Specification CRD-C572.
2. Serrated with center bulb.
3. Thickness: 3/8 IN.
4. Length (general use): 6 IN unless indicated otherwise.
5. Expansion joints:
1. Length: 9 IN.
2. Center bulb: 1 IN OD x 1/2 IN ID.
6. Provide hog rings or grommets spaced at maximum 12 IN OC along the length of the water stop.

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7. Provide factory made waterstop fabrications at all changes of direction, intersections and transitions leaving only straight butt splices for the field.

J. Chairs, Runners, Bolsters, Spacers, and Hangers:
   1. Stainless steel, epoxy coated, or plastic coated metal.
      1. Plastic coated: Rebar support tips in contact with the forms only.

K. Chemical Floor Sealer, Hardener, Densifier:
   1. Colorless, no VOC, odorless chemical solution containing alkaline siliconates.
   2. Will not support bacteria growth.
   3. 10-year manufacturers warranty.Similar to L&M construction Chemicals Inc. "Seal Hard".

L. Membrane Curing Compound: ASTM C309, Type I-D.
   1. Resin based, dissipates upon exposure to UV light.
   2. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
   3. Curing compounds used in water treatment plant construction to be nontoxic and taste and odor free.

M. Expansion Joint Filler:
   1. In contact with water or sewage:
      1. Closed cell neoprene.
      2. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).
   2. Exterior driveways, curbs and sidewalks:
      1. Asphalt expansion joint filler.
      2. ASTM D994.
   3. Other use:
      1. Fiber expansion joint filler.
      2. ASTM D1751.

N. Materials.
   1. Bonding agent:
      1. High solids acrylic latex base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
      2. Euclid Chemical Co. "Flex-Con".
      3. Master Builders Inc. "Acryl-Set".
      4. L&M construction Chemicals "Everbond".
      5. Thoro System Products "Acryl 60".

2.3 CONCRETE MIXES

A. General:
   1. All concrete to be ready mixed concrete conforming to ASTM C94.
   2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
   3. All concrete to be normal weight concrete.

B. Strength:
   1. Provide specified strength and type of concrete for each use in structure(s) as follows:

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TYPE	WEIGHT	SPECIFIED STRENGTH*
Thrust Block Concrete	Normal weight	3000 psi
All general use Concrete	Normal weight	4000 psi
Precast Concrete	Normal weight	5000 psi

*Minimum 28-day compressive strength.

C. Air Entrainment: Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5 to 7
1/2 IN	5-1/2 to 8
3/8 pea gravel	5 to 7 (lean concrete and topping only)

1. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump: 4 IN maximum, 1 IN minimum.
   1. Measured at point of discharge of the concrete into the concrete construction member.
   2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
   3. Pumped concrete:
      a. Provide additional water at batch plant to allow for slump loss due to pumping.
      b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
   4. Determine slump per ASTM C143.

E. Selection of Proportions:
   1. General - Proportion ingredients to:
      a. Produce proper workability, durability, strength, and other required properties.
      b. Prevent segregation and collection of excessive free water on surface.
   2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:
      a. 4000 psi: Max w/c (by weight) = 0.45; Min cement = 611 lb/cy (for max agg sizes 1/2 or 3/8, 3/4, or 1 in).
      b. 5000 psi: Max w/c (by weight) = 0.40; Min cement = 686 lb/cy (3/4 in max agg) and 665 lb/cy (1 in max agg). (--- shown for 1/2 or 3/8 in.)
   3. Substitution of fly ash:
      a. Maximum of 25 percent by weight of cement at rate of 1 LB fly ash for 1 LB of cement.
   4. Sand cement grout:
      a. Three parts sand.
      b. One part portland cement.
      c. Entrained air: Six percent plus or minus one percent.
      d. Sufficient water for required workability.
      e. Minimum 28-day compressive strength: 3,000 psi.
   5. Submit mix design data as required by this specification section.

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6. Normal weight concrete: Proportion mixture to provide desired characteristics using one of methods described below:
    a. Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
        1) Air content within range specified above.
        2) Record and report temperature of trial mixes.
    b. Proportion trial mixes per ACI 211.1.Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
        1) Field test records must be acceptable to Engineer to use this method.
        2) Test records shall represent materials, proportions and conditions similar to those specified.
7. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in paragraph 5.3.1 of ACI 318.

F. Allowable 21-day shrinkage for lab mixed trail batches: 0.040 percent per ASTM C157 as modified by SEAOC.

G. Thrust Block Concrete (Accelerated Curing): Provide non-chloride accelerating admixture to accelerate strength gain for thrust block concrete.
    1. Accelerating admixture: ASTM C494 Type C or Type E, non-chloride. Add at batch plant. Calcium chloride is not permitted.
    2. Early strength: Proportion mixture to achieve a minimum compressive strength of 1,500 psi at 24 HRS (when cured at approximately 70 DegF).
    3. Hold point: Do not backfill, hydrotest, or rely on thrust blocks for restraint until the minimum early strength is achieved and verified by field-cured cylinders tested in accordance with ASTM C31 and ASTM C39.

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PART 3 - EXECUTION

3.2 FORMING AND PLACING CONCRETE

A. General:
    1. Contractor is responsible for design and erection of formwork.
    2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
        a. Allowable tolerances: As recommended in ACI 347R.
    3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
        a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
        b. Do not place floor drains through beams.

B. Openings: Provide openings in formwork to accommodate work of other trades.
    1. Accurately place and securely support items built into forms.

C. Chamfer Strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.

D. Reinforcement:

1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
5. Extend reinforcement to within 2 IN of concrete perimeter edges.
    a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
6. Unless otherwise indicated, provide minimum concrete cover as follows:
    a. Concrete deposited against earth: 3 IN.
    b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
    c. Formed surfaces exposed to or located above any liquid: 2 IN.
    d. Interior surfaces: 1-1/2 IN for beams, girders and columns; 3/4 IN or bar diameter, whichever is greater, for slabs, walls and joists.
7. Do not weld reinforcing bars.

E. Construction, Expansion, and Contraction Joints:
1. Provide at locations indicated.
2. Locate wall vertical construction joints at 30 FT maximum centers and wall horizontal construction joints at 10 FT maximum centers.
3. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF.
4. Install construction joints perpendicular to the planes of their surfaces.
5. At least 48 HRS shall elapse between placing of adjoining concrete construction.
6. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
7. Before new concrete is placed, coat all construction joints with an approved bonding agent used and applied in accordance with manufacturer's instructions.

F. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
2. Use setting diagrams, templates and instructions for locating and setting.
3. Secure waterstops in correct position using hog rings or grommets spaced along the length of the waterstop and wire tie to adjacent reinforcing steel.

G. Preparation:
1. Clean and adjust forms prior to concrete placement.
2. Tighten forms to prevent mortar leakage.
3. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

H. Placing Concrete:
1. Place concrete in compliance with ACI 304R and 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Begin placement when work of other trades affecting concrete is completed.
4. Place concrete by methods which prevent aggregate segregation.
5. Do not allow concrete to free fall more than 4 FT.
6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

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I. Consolidation:
   1. Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

J. Protection:
   1. Protect concrete from physical damage or reduced strength due to weather extremes.
   2. In cold weather comply with ACI 306R except as modified herein.
      a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
      b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

      c. Do not place heated concrete that is warmer than 80 DegF.
      d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
      e. Do not allow concrete to cool suddenly.
   3. In hot weather comply with ACI 305R except as modified herein.
      a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
      b. Do not allow concrete temperature to exceed 90 DegF at placement.
      c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
      d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

K. Curing:
   1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
   2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
   3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
   4. Provide curing for minimum of 7 days.
   5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
   6. In hot weather follow curing procedures outlined in ACI 305R.
   7. In cold weather follow curing procedures outlined in ACI 306R.
   8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
   9. Curing vertical surfaces with a curing compound: Cover vertical surfaces with a minimum of two coats of the curing compound.
      a. Allow the preceding coat to completely dry prior to applying the next coat.
      b. Apply the first coat of curing compound immediately after form removal.
      c. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.

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d. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

L. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
2. Where no reshoring is planned, do not remove forms/shores supporting construction loads until concrete has attained sufficient strength to safely support its own weight and imposed construction loads, as determined by the Engineer and in accordance with ACI 347R and ACI 301.
3. Where reshoring is planned, supporting formwork may be removed when concrete has sufficient strength to safely support its own weight and loads placed thereon.
   a. While reshoring is underway, no superimposed loads shall be permitted on the new construction.
   b. Place reshores as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.
   c. Tighten reshores to carry their required loads.
   d. Leave reshores in place until concrete being supported has reached its specified 28-day compressive strength.

3.3 CONCRETE FINISHES

A. Tolerances:
1. Class A: 1/8 IN in 10 FT.
2. Class B: 1/4 IN in 10 FT.

B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
   a. To be covered with a coating or covering material applied directly to concrete.
   b. Scheduled for grout cleaned finish.
2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
3. Fill tie holes with nonshrink grout.

C. Surfaces Not Exposed to View:
1. Patch voids, air pockets and honeycomb areas with sand cement grout.
2. Fill tie holes with nonshrink grout.

D. Grout Cleaned Finish:
1. Mix a part portland cement and 1-1/2 parts fine sand with sufficient bonding agent/water mixture to produce a grout with the consistency of thick paint.
   a. White portland cement shall be substituted for gray portland cement to produce a color that matches color of surrounding concrete as determined by trial patch for areas not to be painted.
2. Wet surface of concrete to prevent absorption of water by grout and uniformly apply grout with brushes or spray gun.
3. Immediately scrub the surface with a cork float or stone to coat and fill air bubbles and holes.
4. While grout is still plastic, remove all excess grout by working surface with rubber float, sack or other approved means.
5. After the surface whitens from drying, rub vigorously with clean burlap.
6. Keep final finish damp for a minimum of 36 HRS after final rubbing.

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E. Slab Float Finish:
   1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
   2. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
   3. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
   4. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
   5. Refloat slab immediately to a uniform sandy texture.

F. Troweled Finish:
   1. Float finish surface.
   2. Next power trowel, and finally hand trowel.
   3. Produce a smooth surface which is relatively free of defects with first hand troweling.
   4. Perform additional trowelings by hand after surface has hardened sufficiently.
   5. Final trowel when a ringing sound is produced as trowel is moved over surface.
   6. Thoroughly consolidate surface by hand troweling.
   7. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
   8. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.

G. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

H. Apply chemical floor sealer, hardener, densifier to all permanently exposed interior concrete non-vertical surfaces.
   1. Apply in accordance with manufacturer's instructions.

3.4 GROUT

A. Preparation:
   1. Nonshrinking nonmetallic grout:
      a. Clean concrete surface to receive grout.
      b. Saturate concrete with water for 24 HRS prior to grouting.
   2. Rock anchors:
      a. Clean rock anchors of all loose material.
      b. Orient hook or bends in anchor bars to clear anchor bolts, reinforcements, and other embedments to be installed later.
   3. Epoxy grout: Apply only to clean, dry, sound surface.

B. Application:
   1. Nonshrink grout:
      a. Mix in a mechanical mixer.
      b. Use no more water than necessary to produce flowable grout.
      c. Place in accordance with manufacturer's instructions.
      d. Completely fill all spaces and cavities below the bottom of baseplates.
      e. Provide forms where baseplates and bedplates do not confine grout.
      f. Where exposed to view, finish grout edges smooth.
      g. Except where a slope is indicated on Drawings, finish edges flush at the

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baseplate, bedplate, member, or piece of equipment.
h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
i. Wet cure grout for 7 days, minimum.

2. Epoxy grout:
a. Mix and place in accordance with manufacturer's instructions.
b. Completely fill all cavities and spaces around dowels and anchors without voids.
c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.5 FIELD QUALITY CONTROL

A. Owner will employ and pay for services of an independent concrete testing laboratory to perform testing of concrete placed during construction. Contractor shall pay for additional testing/retesting required due to nonconforming work or failed tests.

1. Contractor to cooperate with Owner in obtaining and testing samples.

B. Tests During Construction:
1. Strength test - procedure:
a. Three cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and C31.
b. Cylinders will be tested per ASTM C39:
1) One at 7 days.
2) Two at 28 days.

2. Strength test - frequency:
a. Not less than one test each day concrete placed.
b. Not less than one test for each 50 CY or major fraction thereof placed in one day.
c. Not less than one test for each type of concrete poured.
d. Not less than one test for each concrete structure exceeding 2 CY volume.

3. Slump test: Per ASTM C143.
a. Determined for each strength test sample.
b. Additional slump tests may be taken.

4. Air content: Per ASTM C231, C173, and C138.
a. Determined for each strength test sample.

5. Temperature: Determined for each strength test sample.

C. Evaluation of Tests:
1. Strength test results: Average of 28-day strength of two cylinders from each sample.
a. If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
b. If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:
1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
b. No individual strength test falls below the required specified 28-day

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compressive strength by more than 500 psi.

2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
    a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.6 SCHEDULES

A. Form Types:
    1. Surfaces exposed to view:
        a. Prefabricated or job-built wood forms.
        b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
        c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
        d. Construct forms sufficiently tight to prevent leakage of mortar.
    2. Surfaces normally submerged or not normally exposed to view:
    3. Wood or steel forms sufficiently tight to prevent leakage of mortar.
    4. Other types of forms may be used:
        a. For surfaces not restricted to plywood or lined forms.
        b. As backing for form lining.

B. Grout:
    1. Nonshrink grout: General use.
    2. Epoxy grout:
        a. Grouting of dowels and anchor bolts into existing concrete.
        b. Other uses indicated on Drawings.
    3. Sand cement grout:
        a. Repair of surfaces not exposed to view as specified in 3.02 C.

C. Concrete:
    1. Precast concrete: Where indicated on Drawings.
    2. Normal weight concrete: All concrete unless otherwise indicated.

D. Concrete Finishes:
    1. Grout cleaned finish: Where indicated on Drawings.
    2. Slab finishes:
        a. Use following finishes as applicable, unless otherwise indicated:
            1) Floated finish: Surfaces intended to receive roofing, concrete topping, concrete fill and waterproofing.
            2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
            3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

END OF SECTION

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SECTION 03600
GROUTING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
Rapid-curing epoxy grout.
Nonshrink cementitious grout.

B. Related Requirements:
Section 03002 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures.
4. ACI 351.1R - Grouting Between Foundations and Bases for Support of Equipment and Machinery.

B. ASTM International:
1. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
2. ASTM C40/C40M - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150/C150M - Standard Specification for Portland Cement.
4. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
6. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
7. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
8. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
9. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
10. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
11. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Use for cementitious grout cubes when testing is required).

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
CRD-C621 - Non-Shrink Grout.

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1.3 SUBMITTALS

A. Section 01340 - Submittal Procedures: Requirements for submittals.
B. Product Data: Submit manufacturer information regarding grout and cure/seal compound.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Manufacturer Instructions: Submit instructions for mixing, handling, surface preparation, and placing epoxy-type and nonshrink grouts.
E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
F. Qualifications Statement:
    1. Submit qualifications for manufacturer.

1.4 QUALITY ASSURANCE

A. Perform Work according to applicable standards.
B. Maintain copy of each standard affecting Work of this Section on Site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
C. Store materials according to manufacturer instructions.
D. Protection:
    1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
    2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

A. Section 01500 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
B. Maximum Conditions: Do not perform grouting if temperatures exceed manufacturer specified limits.
C. Minimum Conditions: Maintain minimum temperature as specified by the manufacturer before, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 RAPID-CURING EPOXY GROUT

A. Manufacturers:
    1. Master Builders “MasterFlow 648”.
    2. Substitutions: Permitted, subject to compliance with requirements and acceptance by the Engineer.
B. Description:
    1. High-strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.

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2. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids, and alkalis.

C. Performance and Design Criteria:
   1. Compressive Strength:
      a. 12,000 psi at seven days.
      b. Comply with ASTM C579.
   2. Minimum Tensile Strength:
      a. 2,000 psi
      b. Comply with ASTM C307.
   3. Coefficient of Expansion:
      a. 20x10-6 inch per degree F.
      b. Comply with ASTM C531.
   4. Shrinkage:
      a. None.
      b. Comply with ASTM C827/C827M.

2.2 NONSHRINK CEMENTITIOUS GROUT

A. Manufacturers:
Sika "Sika Grout-212".
Substitutions: Permitted, subject to compliance with requirements and acceptance by the Engineer.

B. Description:
Pre-mixed and ready-for-use formulation requiring only addition of water.
Nonshrink, non-corrosive, nonmetallic, non-gas forming, and no chlorides.
Provide flowable consistency unless otherwise indicated.

C. Performance and Design Criteria:
Certified to maintain initial placement volume or expand after set, and to meet following minimum properties when tested according to CRD-C621 for Type D nonshrink grout:

a. Setting Time:
Initial: Approximately two hours.
Final: Approximately three hours.
Comply with ASTM C191.
Maximum Expansion: 0.10 to 0.40 percent.
Compressive Strength:
One-Day: 4,000 psi.
Seven-Day: 7,000 psi.
28-Day: 10,000 to 10,800 psi.
Comply with CRD-C621.

2.3 FORMWORK

A. As specified in Section 03002 - Concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01720 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify areas to receive grout.

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3.2 PREPARATION

A. Section 01720 - Execution and Closeout Requirements: Requirements for installation preparation.
B. Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by brushing, hammering, chipping, or other similar means until sound and clean concrete surface is achieved.
C. Roughen concrete lightly, but not to interfere with placement of grout.
D. Remove foreign materials from metal surfaces in contact with grout.
E. Align, level, and maintain final positioning of components to be grouted.
F. For nonshrink cementitious grout: Saturate concrete surfaces with clean water and then remove excess water to achieve saturated surface-dry (SSD) condition immediately prior to grouting.
G. For epoxy grout: Do not pre-wet substrate. Concrete surfaces shall be clean, sound, and dry, and within the epoxy grout manufacturer's moisture limitations.

3.3 INSTALLATION

A. Formwork:
    1. Construct leakproof forms anchored and shored to withstand grout pressures.
    2. Install formwork with clearances to permit proper placement of grout.
    3. As specified in Section 03002 – Concrete.
B. Mixing:
    1. Rapid-Curing Epoxy Grout:
        a. Mix and prepare according to manufacturer instructions.
    2. Nonshrink Cementitious Grout:
        a. Mix and prepare according to manufacturer instructions.
    3. Mix grout components in proximity to Work area and transport mixture quickly and in manner not permitting segregation of materials.
C. Placing of Grout:
    1. Place grout material quickly and continuously.
    2. Do not use pneumatic-pressure or dry-packing methods.
    3. Apply grout from one side only to avoid entrapping air.
    4. Do not vibrate placed grout mixture or permit placement if area is being vibrated by nearby equipment.
    5. Thoroughly compact final installation and eliminate air pockets.
    6. Do not remove leveling shims for at least 48 hours after grout has been placed.
D. Curing - Nonshrink Cementitious Grout:
    1. Cure cementitious grout in strict accordance with manufacturer's instructions. Protect from rapid moisture loss and maintain grout in a continuously moist condition for a minimum of three (3) days, unless manufacturer permits use of curing compound.
E. Curing - Rapid-Curing Epoxy Grout:
    1. Protect epoxy grout from vibration, shock, and temperature extremes. Maintain ambient and substrate temperatures within manufacturer's limits until epoxy grout has cured. Do not water cure epoxy grout.

3.4 FIELD QUALITY CONTROL

A. Section 01400 – Quality Control: Requirements for inspecting and testing.
B. Section 01720 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
C. Inspection and Testing:

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1. Comply with ACI 301, 318, 350, the applicable building code, contract drawings and as specified in Section 01400 - Quality Control.
2. When required by Engineer, perform field quality control testing for cementitious grout (flow per ASTM C939; compressive strength per ASTM C109) and submit results.
3. Submit product data, manufacturer's instructions, and recommended water content/consistency for each grout type prior to use.
4. Tests of grout components may be performed to ensure compliance with specified requirements.

END OF SECTION

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SECTION 04200
CONCRETE MASONRY UNITS (CMU)

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMUs).
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Masonry joint reinforcement.
   5. Ties and anchors.
   6. Embedded flashing.
   7. Miscellaneous masonry accessories.

B. Related Sections include the following:
   1. Section 09900 – "Painting" for interior painting and exterior CMU coating.
   2. Section 07620 – "Sheet Metal Flashing and Trim" for sheet metal flashing.
   3. Section 07900 – "Sealant and Caulking" for sealing control, expansion joints, and firestop systems in unit masonry.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement"
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
   4. Manufacturer's color selections for CMU and mortar.
C. Samples for Verification: For each type and color of the following:
   1. Concrete masonry units.
D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients. Reinforcing bars.
   5. Joint reinforcement.
   6. Anchors, ties, and metal accessories.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

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2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.4 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

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1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

F. Comply with CBC and local amendments. Provide masonry design per TMS 402 and construction per TMS 602.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:
1. Standard nominal dimensions of 8 inches wide by 16 inches long by 8 inches high.
2. Split face on exterior face
3. Smooth face on interior face
4. Colored
   a. Color and tint as selected by Engineer.

B. Concrete Masonry Units: ASTM C 90, Grade N, Type I, normal weight, medium weight, or lightweight (as required by structural design and to match specified finish). Provide unit compressive strength to achieve masonry design strength f'm indicated on the Drawings.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Mortar Cement: ASTM C 1329.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Aggregate for Mortar: ASTM C 144.

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1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water: Potable.

2.3 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A951/A951M.
1. Interior (dry locations): Provide mill-galvanized carbon-steel joint reinforcement.
2. Exterior or exposed to moisture: Provide hot-dip galvanized after fabrication or stainless-steel joint reinforcement (Type 304 minimum).
3. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.4 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M; with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304
4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
6. Stainless-Steel Sheet: ASTM A 666, Type 304.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
8. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

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2.5 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Post-installed Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Provide end dams and watertight terminations at jambs, corners, and interruptions. Lap joints minimum 6 inches and seal per flashing manufacturer. Provide weeps/vents at flashing locations (typ. 24 inches o.c. unless otherwise shown).

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

2.8 MASONRY CLEANERS

2.9 Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise

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indicated.

1. Do not use calcium chloride in mortar or grout.
2. Cementitious materials shall be portland cement and hydrated lime, mortar cement, or preblended mixes as specified. Use consistent materials for exposed work.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270. Provide the following types of mortar for applications stated unless another type is indicated.

1. Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476, minimum 2000 psi 28 day compressive strength.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

1. Comply with construction tolerances in TMS 602.

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3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in **running bond**; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.6 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do

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not allow materials to span control and expansion joints without provision to allow for in- plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.7 FLASHING

A. Install flashing as follows, unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

B. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 48 inches.
   3. Provide grout with slump of 8 to 10 inches.

3.9 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
   1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

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B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
   1. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
C. Testing Frequency: One set of tests for each 5000 sq. ft of wall area or portion thereof.
D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for compressive strength.
F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
   5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
B. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

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END OF SECTION

SECTION 05501
ANCHOR BOLTS AND EXPANSION ANCHORS

PART 1 – GENERAL

1.01 DESCRIPTION
- A. Scope:
  1. Equipment anchor bolts
  2. Structural anchor bolts
  3. Expansion anchors
  4. Epoxy set anchor bolts
- B. Additional Requirements Specified Elsewhere:
  1. Shop Drawings, Product Data and Samples: Section 01340
  2. Product Requirements: Section 01600
  3. Seismic Design Requirements: Section 01611

1.02 SUBMITTALS
- A. Product Data: Sufficient to verify compliance with Specifications
- B. American Iron and Steel certification if applicable.
- C. Provide current ESRs for all post-installed anchors (mechanical and adhesive). Installation Instructions**:** Manufacturer installation instructions for each anchor type, including drilling, hole cleaning, installation, torque, and curing (adhesive).
- D. Anchorage Design (when resisting seismic/design loads): Where anchors support equipment or systems designed for seismic loads, submit anchorage calculations and anchor schedules in accordance with Section 01611.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed. Store anchor materials in a clean, dry, secure location. Protect from corrosion and physical damage. Store adhesive products within manufacturer-recommended temperature limits and do not use expired products.

PART 2 - PRODUCTS

2.01 MATERIALS
- A. Bolts:
  1. Stainless steel: IFI-104, Grade 316
- B. Nuts:
  1. Same material as bolts
  2. Self-locking: Prevailing torque, IFI-100, grade A
- C. Washers:
  1. Same material as bolts
  2. Flat: ANSI B27.2
  3. Locking: Spring type ANSI B27.1

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D. Sleeves:
   1. Pipe: ASTM A120
   2. Bearing plates: ASTM A36
   3. Hot dip galvanize after fabrication

E. Expansion Anchors:
   Post-installed anchors shall be code-qualified products with current ICC-ES ESR for the intended use. Where anchors resist seismic forces, provide anchors with ESR indicating seismic and cracked concrete applicability as required for the application.

   1. In hardened concrete and grouted masonry
      a. Type "A": Wedge type, FS FF-S-325, Group II, Type 4, Class 1
      b. Type "B": Self-drilling, FS FF-S-325, Group III, Type 1, flush type
      c. Type "C": Non-drilling, internally threaded, FS FF-S-325, Group VIII, Type 1 Drop in
      d. Type "D": Non-drilling, externally threaded, FS FF-S-325, Group VIII, Type 2
   2. In hollow and solid masonry
      a. Type "E": Lag shield, FS FF-S-325, Group II, Type 1, Class 1
      b. Type "F": Split sleeve, FS FF-S-325, Group II, Type 3, Class 3

2.02 FABRICATION AND MANUFACTURE

A. Anchor Bolts:
   1. 3/4 inch minimum, except as indicated on the Drawings
   2. Type:
      a. General use: L-shaped hook type
      b. Where indicated on Drawings or specified:
         1) Straight bolt with square head
         2) Straight bolt with square plate welded to bolt and nut welded to plate and bolt
         3) Through-bolt with sleeve and square plate assembly
         4) Coupled bolt with sleeve welded to square plate and bolt
   3. Material:
      a. General use: Stainless steel
      b. Submerged service: Stainless steel
      c. Where indicated on Drawings: Stainless steel

B. Expansion Anchors:
   1. 3/4-inch maximum unless otherwise indicated on Drawings
   2. Do not use cinch anchors
   3. Length: As required for proper embedment
   4. Material:
      a. General use: Stainless steel
      b. Submerged service: Stainless steel
      c. Where indicated on Drawings: Stainless steel

C. Epoxy Set Anchors:
   1. Code-qualified adhesive anchors with current ICC-ES ESR for the intended use. Where anchors resist seismic forces, provide ESR indicating seismic and cracked concrete applicability as required for the application.
   2. In hardened concrete and where specifically noted on plans:
      a. Capsule-type adhesive anchors are not permitted unless specifically indicated on the Drawings, supported by applicable ESR, and approved by the Engineer.

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3. In hardened concrete and where specifically noted on plans:
    a. Parabond capsule anchors
    b. Stainless steel studs, nuts and washers
    c. Approved manufacturers:
        1) Molly Fastener Group by Emhart
        2) Hilti, Inc.
        3) Or approved equal.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that holes for anchor bolts in forms and templates match applicable equipment Shop Drawings

3.02 INSTALLATION

A. Anchor Bolts:
    1. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template
    2. Provide 3 nuts for each anchor bolt for which a lock nut is indicated, 2 for others
    3. Sleeved anchor bolts:
        a. Centered in pipe sleeve
        b. Sleeve ID: Approximately 2 1/2 times bolt OD
        c. Sleeve length: Approximately 8 times bolt OD
        d. Bearing plate minimum thickness: 1/2 times bolt OD
    4. Through bolts:
        a. Sleeved with bearing plates
        b. Bearing plates welded to bolt and plate welded to sleeve
        c. Dimensions: As specified for sleeved anchor bolts

B. Expansion Anchors:
    1. Install in conformity with the manufacturer's instructions
    2. Embedment, spacing, and edge distance: Provide embedment, spacing, and edge distance in accordance with the approved anchorage design, the anchor ESR, and the manufacturer's instructions. Do not install anchors closer to edges or with less embedment than permitted by ESR/manufacturer requirements. Install and tighten anchors using a calibrated torque wrench to the manufacturer's required installation torque (if applicable). Do not reuse expansion anchors unless specifically permitted by the manufacturer.

C. Epoxy Set Anchors:
    1. Install as per manufacturer's recommendation.
    2. Clean drilled holes and install adhesive anchors strictly in accordance with the anchor ESR and manufacturer instructions, including required hole brushing and air-blowing/cleaning steps, adhesive mixing/dispensing procedures, and curing times/temperatures.
    3. Do not install adhesive anchors in standing water, in saturated holes, or in oversize/elongated holes unless specifically permitted by the ESR and manufacturer's instructions.
    4. Hole depth and embedment: Provide hole depth and embedment in accordance with the approved anchorage design, the anchor ESR, and the manufacturer's installation instructions.
    5. Diameter of drilled holes: As per ANSI B94.12

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3.03 SPECIAL INSPECTIONS

1. Provide special inspection for post-installed anchors as required by CBC Chapter 17 and Section 01611.
2. Adhesive anchors: Install per ESR and manufacturer instructions, including strict hole cleaning and curing requirements. Do not disturb anchors during cure. Do not install adhesive anchors in oversize/elongated holes unless specifically permitted by ESR.

3.04 SCHEDULE

B. Expansion Anchors:

1. In hardened concrete and grouted masonry: Type "A," "B," "C," or "D," Contractor's option, unless type is indicated on Drawings
2. In hollow and solid masonry: Type "E," or "F," Contractor's option, unless type is indicated on Drawings
3. Epoxy set anchors where adhesive or epoxy anchor bolts specifically noted on Drawings

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 06100
ROUGH
CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION
- A. Work Included:
  1. Rough carpentry.
- B. Additional Requirements Specified Elsewhere:
  1. Shop Drawings, Production Data and Samples: Section 01340.
  2. Product Requirements: Section 01600.

1.02 QUALITY ASSURANCE
- A. Source Quality Control:
  1. Lumber grading rules and wood species: PS-20 or RIS as appropriate.
  2. Plywood grading rules: Softwood Plywood - Construction and Industrial; PS-1.
  3. Grade marks:
     a. Identify lumber and plywood by official grade mark.
     b. Lumber:
        1) Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
        2) S-Grn: Unseasoned.
        3) S-Dry: Maximum 19 percent moisture content.
        4) MC-15: Maximum of 15 percent moisture content.
        5) Dense: Density classification applies to Douglas Fir and Southern Pine, when applicable.
     c. Softwood plywood:
        1) Conforming to PS-1.
  4. Testing:
     a. ASTM E84, maximum 25 flame-spread rating.
  5. Structural glued laminated timber:
     a. Stamp: AITC.

- B. Requirements of Regulatory Agencies:
  1. Fire hazard classification: Underwriters' Laboratories, Inc., for treated lumber and plywood.
  2. Preservative-treated lumber and plywood: AWPA standards; provide third-party quality mark and treating plant certification.
  3. Pressure-treated material: Comply with AWPA U1 (Use Category System) and applicable building code requirements.
  4. Span tables: American Wood Council (AWC), Span Tables for Joists and Rafters and/or AWC WFCM as applicable.
  5. Working stresses: American Wood Council (AWC) National Design Specification (NDS) for Wood Construction and Supplement.
- C. Building code requirements.Reference Standards:
  1. American Wood Council (AWC) National Design Specification (NDS) for Wood Construction and Supplement.
  2. American Wood Council (AWC) Span Tables for Joists and Rafters.

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American Wood Council (AWC) National Design Specification (NDS) for Wood Construction (design values) and/or AWC WFCM as applicable.

3. American Wood Council (AWC) Special Design Provisions for Wind and Seismic (SDPWS) where applicable.
4. PS-1, U.S. Commerce Dept. Product Standard, Construction and Industrial Plywood.
5. PS-20, U.S. Commerce Dept. Product Standard, American Softwood Lumber Standard.
6. PS-56, U.S. Commerce Dept. Product Standard, Structural Glued Laminated Timber.
7. RIS Standard Specifications for Grades of California Redwood Lumber.
8. APA 303: American Plywood Association Siding Face Grades.
9. AITC 109: Standard for Preservation Treatment for Structural Glued Laminated Timber.
10. AITC 110: Standard Appearance Grade for Structural Glued Laminated Timber.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Framing connection details, fastener connections, and dimensions except when details are included on Drawings.
   2. Structural glued laminated timbers.
      a. Note species, sizes, and stress grades.
      b. Show pitch, span, and camber configuration.

B. Certification:
   1. Pressure-treated wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards.
   2. Preservative-treated wood: Submit certification for water-borne preservative that moisture content was reduced to 19 percent maximum, after treatment.
   3. Fire-retardant treatment: Submit certification by treating plant that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

C. Product Data
   1. Fiber Cement Siding
      a. Provide Manufacturer's product data
      b. Certifications for compliance with CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather.
B. Store materials a minimum of 6 inches aboveground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
C. Do Not Store Seasoned Materials in Wet or Damp Portions of Building.
D. Protect fire-retardant materials against high humidity and moisture during storage and erection.
E. Protect sheet materials from breaking corners and damaging surfaces while unloading.
F. Trusses: Not applicable.

BID SET - NOT FOR CONSTRUCTION

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Framing System: Not used.
B. Lumber:
   1. Dimensions:
      a. Specified lumber dimensions are nominal.
      b. Actual dimensions to conform to PS-20.
   2. Surfacing: Surface 4 sides (S4S), unless specified otherwise.
   3. Glued laminated lumber:

a. Appearance grade: Architectural, per AITC 110.

4. Framing lumber:
   a. Douglas Fir – Larch.
   b. Light framing:
      1) General framing:
         a) Standard and better or stud grade.
         b) Provide for all framing, unless otherwise indicated on Drawings.
      2) Plates, blocking, bracing, and nailers: Utility grade.
   c. Studs:
      1) Loadbearing: Stud, Standard, or No. 3 grade.
   d. Structural light framing, 2 inches to 4 inches thick, 2 inches to 6 inches wide:
      1) Grade: No. 2 or better.
      2) Where indicated on Drawings.
   e. Structural joists and planks, 2 inches to 4 inches thick, 6 inches and wider:
      1) Grade: No. 2 or better.
      2) Where indicated on Drawings.
   f. Beams and stringers, posts and timbers, 5 inches and thicker:
      1) Grade: No. 2 or better.
5. Redwood: Construction grade heartwood.

C. Plywood:
   1. Per PS-1.
   2. Exterior graded plywood where edge or surface is permanently exposed to weather.

D. Building Paper: Asphalt-saturated organic felt, ASTM D4869, Type II; or approved equal water-resistive barrier compatible with the exterior cladding system.

E. Preservative-Treated Wood Products:
   1. Water-borne salt preservatives for painted, stained, or exposed natural wood product:
      a. AWPB LP-2, aboveground application.
      b. AWPB LP-22, ground contact application.
      c. Lumber redried to maximum moisture content of 19 percent, stamped "DRY".
   2. Oil-borne preservatives for any construction:
      a. AWPB P-3, aboveground application, light petroleum solvent.
      b. AWPB LP-33, ground contact application, light petroleum solvent.
      c. AWPB LP-4, aboveground application, volatile petroleum solvent for interior application and hardwoods to be painted.
      d. AWPB LP-44, ground contact application, volatile petroleum solvent.
      e. AWPB LP-7, aboveground application, heavy petroleum solvent - penta solution for outdoor applications exposed to weather where painting is not required.
      f. AWPB LP-77, ground contact application, heavy petroleum solvent penta solution.
   3. Creosote and creosote preservatives for wood placed in ground or in water:
      a. AWPB LP-5, aboveground application, creosote or creosote coal tar solutions.
      b. AWPB LP-55, ground contact application, creosote or creosote coal tar solution.
   4. Untreated lumber: Redwood, where indicated on Drawings.

F. Rough Hardware:
   1. Bolts: ASTM A307
   2. Nuts: ASTM A563
   3. Washers: ASTM F844
   4. Lag Screws: ASME B18.2.1
   5. Wood Screws: ASME B18.6.1
   6. Nails and Staples: ASTM F1667

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7. Expansion/toggle anchors: ICC-ES evaluated product suitable for substrate and exposure galvanized or stainless steel as required
8. Metal nailing discs:
   a. Flat caps, minimum 1-inch diameter.
   b. Minimum 30 ga sheet metal.
   c. Formed to prevent dishing.
   d. Bell or cup shapes not acceptable.
9. Joist hangers: 18 ga zinc-coated steel.
10. Metal cross bridging: 16 ga zinc-coated steel:
    a. Nailable type with 2 holes in each end.
    b. Compression type with prongs at each end.
11. Bar or strap anchors: ASTM A653/A653M, zinc-coated steel sheet, 18 ga minimum (G90 minimum); provide heavier coating where required for exposure.
12. Ply-clips: Extruded 6063-T6 aluminum alloy.

G. Truss Hardware: Not applicable.

H. Fiber Cement Siding:
1. Hardie Vertical Siding "Sierra ", or equal
   a. Trim: Hardie Trim Boards "4/4 Rustic", or equal
   b. Battens: Hardie Rustic Grain Batten Boards, or equal.
2. Fiber Cement Product
3. CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.
4. Color as selected by Engineer from Manufacturer range of colors.

I. Gypsum Wallboard
1. General: Comply with ASTM C1396/C1396M as applicable to type of gypsum board indicated.
2. Regular Type:
   a. Thickness: 1/2 inch.
   b. Long Edges: Tapered
   c. Use regular type unless otherwise indicated on drawings.
3. Type X:
   a. Thickness: 5/8 inch.
   b. Long Edges: Tapered
   c. Where fire resistant gypsum wallboard indicated on drawings
4. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
   a. Core: 5/8 inch, Type X.
   b. Long Edges: Tapered
   c. Where moisture resistant gypsum wallboard indicated on drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that surfaces to receive rough carpentry materials are prepared to required grades and dimensions.

3.02 INSTALLATION

A. Metal Framing System: Not used.

B. Sills: Pressure-treated lumber or redwood:
1. Set level 1/16 inch, in 6 feet, in mortar bed, flush with exterior face of foundation.
2. Secure sills with 1/2-inch x 8 inches minimum size anchor bolts embedded in the structure

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minimum of 6 inches spaced maximum of 4-foot o.c.

3. Join solid sill members with halved joints, where not continuous and at corners, minimum of 1-foot lapped joint.
4. Lap built-up sill members minimum distance of 2 feet.
5. Termite shields:
    a. Bed termite shield in mortar bed and extend half/full distance across top of foundation wall, bend down 2 inches at angle of 45 Degrees on outside.
    b. Fit around anchor bolts and fill joints with asphaltic mastic or solder.

C. Posts or Columns:
1. Provide 2 surfaces on posts at right angles to each other for installation of interior finish materials.
2. Built-up posts: Arrange and nail together to accommodate type of construction.
3. Erect posts straight, plumb with straight edge, level, and brace with tack boards at plate and sill.

D. Joist Framing:
1. Install with crown edges up.
2. Support ends of each member minimum 1-1/2 inches of bearing on wood or metal.
3. Support ends of each member minimum 3 inches of bearing on masonry.
4. Support joists alternately at ends with solid blocking, 2 inches thick by depth of joists, between members crossing bearing points.
5. Lap members framing from opposite sides of beams, girders, or partitions, minimum 4 inches or tie opposing members together by toenailing or metal connectors.
6. Provide solid blocking between joists under door posts.
7. Notches:
    a. Do not notch in middle third of joists.
    b. Notches in top or bottom of joists: Maximum of 1/6 depth of member.
    c. Notched ends: Maximum of 1/3 depth of member.
8. Bored holes: Maximum 1/3 depth of member, 2 inches minimum distance to top or bottom of joists.
9. Bridging:
    a. Nominal depth-to-thickness ratio of joists exceeding 6, install bridging at 8-foot intervals
    b. Solid bridging.
        1) Size: 2 inches x depth of joist x length of suit.
        2) Install offset to permit toenailing or end-nailing.
        3) Space bridging maximum:
            a) Spans to 10 feet: 1 row midspan.
            b) Spans 10 feet to 20 feet: 2 rows at 1/3 span.
            c) Spans over 20 feet: Rows not over 8 feet apart.

D. Beams and Girders:
1. Install with crown edge up.
2. Provide bearing at ends of each member: Minimum 4 inches.
3. Nail built-up beams or girders with 2 rows of 20d nails spaced maximum of 2 feet 8 inches o.c., locating 1 row near top edge and other near bottom edge of member.
4. Girders not continuous: Splice together with milled wood splices for girders.
5. Beams not continuous: Splice together with steel plate splices.
6. Beams or girders framed into pockets of exterior concrete or masonry walls: Provide minimum of 1-inch air space between sides and ends of wood members and concrete or

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masonry wall.

E. Miscellaneous Framing:
   1. Firestops:
      a. Stud walls: 2 inches thick x depth of member blocking at each floor level and top story ceiling level.
      b. Floor and ceiling framing: 2 inches thick x depth of member blocking, fitted to fill openings from one space to another to prevent drafts.
   2. Framing for mechanical work:
      a. Frame members for passage of pipes and ducts to avoid cutting structural members.
      b. Do not cut, notch, or bore framing members for passage of pipes or conduits without concurrence of Engineer.
      c. Reinforce or replace framing members where damaged by cutting at engineers' discretion.

G. Siding
   1. Install per Manufacturer's recommendations.
   2. Use Manufacturer's recommended corrosion resistant fasteners.

END OF SECTION

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SECTION 06176
WOOD TRUSSES

PART 1 – GENERAL

1.1 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. TPI: Truss Plate Institute, Inc.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. WWPA: Western Wood Products Association.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated on drawings and in accordance with the California Building Code (CBC) as adopted by the Authority Having Jurisdiction, including referenced standards (e.g., ASCE 7), for the project location.
2. Maximum Deflection Under Design Loads:
   a. Roof Trusses: Vertical deflection of 1/240 of span.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.

D. Comply with applicable requirements and recommendations of the following publications:

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1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
4. SBCA, "BCSI-B1: Summary Sheet - Building Component Safety Information (BCSI) for Truss Handling, Installing & Bracing," latest edition.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
   1. Handle, install, and brace trusses in accordance with SBCA BCSI and the truss design drawings, including all temporary and permanent bracing required by the truss engineer.
   2. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   3. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   4. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.5 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 – PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Provide dressed lumber, S4S.
   3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to the American Wood Council (AWC) "National Design Specification (NDS) for Wood Construction" and its Supplement.

C. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of not less than the following grade for the following species:
   1. Grade for Chord Members: No. 1.
   2. Grade for Web Members: No. 2
   3. Species: Douglas fir-larch; WWPA.

D. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal.

2.2 METAL CONNECTOR PLATES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alpine Engineered Products, Inc.

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2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
9. Truswal Systems Corporation.
10. ~~Or equal~~

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
1. Use for interior locations where stainless steel is not indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.
1. Use for exterior locations and where indicated.

2.3 FASTENERS

1. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Provide fasteners suitable for the substrate with current ICC-ES evaluation report (ESR) or other code-recognized approval, installed per manufacturer written instructions.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E488/E488M conducted by a qualified independent testing and inspecting agency; provide anchors with current ICC-ES ESR for the intended substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 .

2.4 METAL TRUSS ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Products: Subject to compliance with requirements, provide comparable products by one of the following:
1. Cleveland Steel Specialty Co.

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2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.
7. Or equal.

D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those required

E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
1. Use for interior locations where stainless steel is not indicated.

F. Stainless-Steel Sheet: ASTM A 666, Type 304.
1. Use for exterior locations and where indicated.

G. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, minimum 1-1/2 inches wide by 0.050 inch thick.

H. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, minimum 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.

I. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with minimum 1-3/4-inch- long seat; formed from metal strap 0.062-inch-thick with tabs bent to extend over and be fastened to supporting member.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses maximum 24 inches o.c. unless otherwise indicated on drawings; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to

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manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

I. Install wood trusses within installation tolerances in TPI 1.

J. Do not cut or remove truss members.

K. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

A. Protect trusses from weather and moisture. If trusses become wet, provide ventilation and allow to dry; replace trusses and/or members that are damaged, distorted, or show evidence of deterioration.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Do not field coat truss connector plates. Provide galvanized or stainless-steel connector plates as specified. Repair damaged galvanized coatings on exposed accessories in accordance with ASTM A780 and manufacturer written instructions.

1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION

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SECTION 07210
BUILDING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Foil faced fiberglass batt insulation installed above ceiling (concealed) for Harvey Pump Building and where shown on Drawings.

B. Related Sections:

1. Submittal Procedures: Section 01340
2. Metal Roofing: Section 07411

1.02 REFERENCES:

A. ASTM E84: Surface Burning Characteristics of Building Materials.

B. ASTM C665: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

D. D.ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. E.ASTM E96/E96M: Standard Test Methods for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Product Data: Submit Product Data for each type of required insulation, clearly identified with:

1. Manufacturer's name
2. Brand name
3. R-Value
4. Composition

B. Certificates:

1. Compliance with applicable reference standards.
2. ~~Loose insulation water repellency.~~

C. Manufacturer's Recommendations:

1. Adhesive for application of fibrous insulation to metal studs or joist construction.
2. Procedures for use of adhesive.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver materials to project site in manufacturer's original packing.
2. Clearly identify manufacturer, contents, brand name, applicable standard, and R- value.

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B. Storage:
   1. Store materials off ground and under protective covering.
   2. Protect against weather, direct sunlight, condensation, and damage.
   3. Immediately remove damaged material from site

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:
   1. Owens Corning
   2. Johns Manville
   3. CertainTeed
   4. Knauf Insulation
   5. Or approved equal per Division 01.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. Wall Insulation:
   1. Where shown as 2 x 4 wall construction: R-11

B. Roof/Ceiling Insulation: R-38

2.03 FIRE RESISTANCE

A. Surface Burning Characteristics: Provide insulation and facings with flame spread index 25 max and smoke developed index 50 max when tested per ASTM E84 (UL 723).

   1. Unfaced insulation shall be noncombustible when tested per ASTM E136.
   2. Faced insulation is not required to be noncombustible; facings shall be suitable for the intended location and comply with code requirements.

2.04 MATERIALS

A. Faced fiberglass batt insulation:
   1. Federal Specifications: Not required.
   2. ASTM C665
   3. Faced:
      a. FSK (foil-scrim-kraft) faced, factory laminated. Vapor retarder: 0.02 perms maximum when tested per ASTM E96/E96M.

B. Fasteners: Corrosion-resistant staples for wood framing; adhesive for metal framing as recommended by insulation manufacturer; provide non-corrosive supports/retainage as required to prevent sagging.

2.05 SOURCE QUALITY CONTROL

A. Verification of Performance
   1. Provide manufacturer's written certification that products intended for use meet specified requirements.
   2. Installer shall provide written certification that insulation was installed in accordance with manufacturer's printed installation instructions.

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B. Testing

1. Provide test reports verifying compliance with specified surface burning characteristics per ASTM E84 (UL 723).

PART 3 EXECUTION

3.01 EXAMINATION

1. Fiberglass Batt Insulation: Examine areas scheduled to receive insulation to ensure protection against inclement weather and other hazards, and verify work of preceding trades is completed.
2. Verify conditions affecting the Work of this Section and obtain accurate dimensions of all openings, levels, and location and arrangements of embedded items.
3. Examine space allocated for insulation for proper depth to receive material.
4. Clean substrates from substances harmful to insulation or vapor retarder, including removing projections capable of puncturing vapor retarder or of interfering with insulation attachment.
5. Remove or protect against construction framing projections which damage or prevent proper installation.
6. Proceed with installation when conditions are satisfactory.

3.02 INSTALLATION

A. General:

1. Install insulation systems in accordance with the manufacturers' printed installation instructions. Extend insulation in the thickness indicated to envelop the entire area to be insulated. Apply single layer of insulation to produce thickness and R-Value indicated, unless multiple layers are required to make up total system.
2. Fit insulation snugly between framing.
3. Maintain integrity of insulation over entire area to be insulated.
4. Insulate small areas between closely-spaced framing members.
5. Carefully cut and fit insulation around pipes, conduits, and other obstructions.
6. Where pipes or conduit are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation where necessary.
7. Do not install insulation requiring compression in excess of 10 percent.
8. Install insulation to attain minimum R-Value as indicated.

B. Faced insulation:

1. Wall cavities: Staple facing flanges to sides of wood framing at 8-inch centers, or closer, as necessary to hold flanges tightly to framing members.
2. Roof/Ceiling (above ceiling): Install batts continuously above ceiling, full loft, without gaps or voids. Provide supports/retainage (wire, strapping, netting, spring wires, or manufacturer-approved method) as required to prevent sagging or displacement.
3. Do not leave faced insulation exposed to occupied spaces; conceal insulation behind/above ceiling or other finish as indicated.
4. Where above-ceiling space is used as an air plenum, provide insulation/facing listed for plenum use and complying with ASTM E84 (UL 723) flame spread index 25 max and

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smoke developed index 50 max; do not use kraft facing in plenums.

5. Exercise care to ensure the integral vapor retarder is continuous over the entire surface.
6. Patch and seal punctures, tears, or voids in integral vapor barrier. Seal facing laps and joints with foil tape compatible with the facing, where required to maintain vapor retarder continuity.
7. Install faced insulation with integral vapor barrier toward warm-in-winter side of assembly.

C. Metal studs or joists: Install insulation with adhesive and in manner recommended by insulation manufacturer.

3.03 CLEAN-UP

A. Remove accumulations of waste materials, rubbish, excess insulation, and containers.

B. Dispose of waste materials off-site.

END OF SECTION

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SECTION 07411
METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY
- A. Section Includes:
  1. Standing-seam metal roof panels.
  2. Metal soffit panels.
  3. Eave, rake, gable trim and Pipe Flashing where indicated on drawings.
- B. Related Sections:
  1. 07900 – "Sealant and Caulking" for field-applied sealants not otherwise specified in this Section.

1.2 DEFINITIONS
- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.3 PERFORMANCE REQUIREMENTS
- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Design Basis: Determine wind loads in accordance with the 2025 California Building Code and ASCE/SEI 7-22, Risk Category III, for the Project site. Exposure Category shall be as indicated on the Structural Drawings. Design wind pressures indicated on the Structural Drawings shall govern. Where pressures are not indicated, submit signed and sealed calculations based on the applicable project-site wind criteria.
  1. Roof Snow Loads: 25 lbf/sq. ft.
  2. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.
  3. Water Penetration: Provide metal roof panel system tested in accordance with ASTM E1646 with no uncontrolled water leakage at test pressure differential recommended by manufacturer for the specified wind design.
  4. Air Infiltration: Provide metal roof panel system tested in accordance with ASTM E1680 or ASTM E2140.
- D. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change (Range): 120 deg F, ambient; material surfaces.

1.4 SUBMITTALS
- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings,

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closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Delegated-Design Calculations: Submit roof panel system engineering (panel/clip/fastener capacities and spacing, edge/corner conditions, and roof zone diagram), signed and sealed by a California-licensed Professional Engineer, demonstrating compliance with design wind pressures indicated on Structural Drawings and applicable codes.
2. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
   a. Flashing and trim.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
D. Field quality-control reports.
E. Maintenance Data: For metal roof panels to include in maintenance manuals.
F. Warranties: Samples of special warranties.
   1. Wildfire (WUI) Documentation: Submit vent listing/labeling documentation demonstrating compliance with CBC Chapter 7A and ASTM E2886 (and CSFM listing where required).
G. American Iron and Steel Certification.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: Not applicable to standing-seam metal roof panels. Where roof insulation, underlayment, or other combustible components are provided as part of the roof panel assembly, provide materials and assemblies meeting code requirements and required listings.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.
B. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Roof Covering Fire Rating: Where required by code or indicated on Drawings, provide roof panel assembly rated Class A in accordance with ASTM E108 or UL 790.
   2. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
   3. Combustion Characteristics: ASTM E 136.
      a. Non-combustible
   4. Provide roofing panels, trims, closures, and vents complying with CBC Chapter 7A (WUI) requirements where project is within a designated Wildland-Urban Interface / Very High Fire Hazard Severity Zone.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high

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humidity, except to extent necessary for period of metal roof panel installation.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

C. When the Project is within a designated California Wildland-Urban Interface (WUI) / wildfire hazard area provide WUI-rated venting and exterior components as required by CBC Chapter 7A.

1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, purlins and rafters, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Fading or discoloration.
   d. Leakage.
2. Warranty Period: Ten years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, finish.
   a. 2-Coat Fluoropolymer Finish: AAMA 621 or AAMA 2605 (with coil coating appendix), minimum 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces in accordance with coating and resin manufacturers' written instructions.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch-wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

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2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D4869 Type II (No. 30) asphalt-saturated organic felt underlayment; or approved synthetic underlayment recommended in writing by roof panel manufacturer.

2.3 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Hat-Shaped, Rigid Furring Channels:
   1. Nominal Thickness: 0.040 inch.
   2. Depth: 1-1/2 inches.

C. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.4 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.
   1. Material: Zinc-coated (galvanized) steel sheet, minimum 24-gauge thickness.
      a. Exterior Finish: 2-coat fluoropolymer
      b. Color: As selected by Engineer from manufacturer's full range.

2.6 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Match profile and material of metal roof panels.
   1. Finish: as selected by Engineer from Manufacturer’s standard colors.
   2. Sealant: Factory applied within interlocking joint.

C. Flush-Profile Metal Soffit Panels Solid panels and flat pan between panel edges; with flush joint between panels.
   1. Material: Same material, finish, and color as metal roof panels.

2.7 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as

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required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Soffit Vents: Longitudinal vents formed between soffit panels

1. Provide soffit/eave ventilation openings covered with WUI (ember and flame resistant) vents in accordance with CBC Chapter 7A (as adopted by AHJ).
2. Provide vents listed to ASTM E2886 and labeled/approved as required by the California State Fire Marshal (CSFM) for WUI applications.
3. Minimum 1/16 inch and Maximum 1/8-inch openings.

C. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

2.8 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. End Seams: Form nonmoving seams in accordance with SMACNA recommendations. Do not solder painted/galvanized sheet steel. Provide sealed joints using butyl tape and/or sealant as recommended by manufacturer for a watertight assembly.
3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.9 FINISHES

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A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
B. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
C. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
D. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to roofing/underlayment installation, including removing projections capable of interfering with attachment.
B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.
   1. Soffit Framing: Clip furring channels to supports.

3.3 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Apply in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
B. Install flashings to cover underlayment to comply with requirements specified in Division 7 Section 07620 - "Sheet Metal Flashing and Trim."

3.4 METAL ROOF PANEL INSTALLATION, GENERAL

A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
C. Point of Fixity: Fasten each panel along a single line of fixing.
   1. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
D. Install metal roof panels as follows:

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1. Field cutting of metal panels by torch is not permitted.
2. Install panels perpendicular to purlins.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Provide metal closures at rake edges and each side of ridge caps.
5. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
6. Install ridge caps as metal roof panel work proceeds.
7. End Splices: Locate panel end splices over, but not attached to, structural supports. Stagger panel end splices to avoid a four-panel splice condition.
8. Install metal flashing to allow moisture to run over and off metal roof panels.

E. Fasteners:
1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.

F. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

G. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

H. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section 07900 - "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.6 METAL SOFFIT PANEL INSTALLATION

A. In addition to complying with requirements in "Metal Roof Panel Installation, General" Article, install metal soffit panels to comply with requirements in this article.

B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

C. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping

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screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07620
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured Products:
      a. Manufactured reglets and counterflashing.
   2. Specials
      a. Field fabricated items

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Design and fabricate copings, edge metal, flashings, and trim to resist design wind pressures (positive and negative) indicated on the Structural Drawings and required by the 2025 California Building Code and ASCE/SEI 7-22, Risk Category III. Where Structural Drawings indicate design pressures or more stringent criteria, comply with the Structural Drawings.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Wind Design Data: Provide design pressures and attachment details for copings/edge metal and other perimeter flashings, including cleat/fastener spacing to resist wind uplift pressures indicated on Structural Drawings. Where delegated design is provided, submit calculations sealed by a California-licensed Professional Engineer.

C. Warranty: Sample of special warranty.

D. American Iron and Steel certification if required.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

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A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.6 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Factory Prime Coating: Where painting after installation is indicated, pretreat with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil.
2. Color: As selected by Engineer from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
C. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and preainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Surface: Embossed and mill phosphatized for field painting.
3. Color: As selected by Engineer from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
D. Zinc Sheet: Zinc, 99 percent pure, alloyed with a maximum of 1 percent copper and titanium; with manufacturer's standard factory-applied, flexible, protective back coating.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

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a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
4. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
1. Solder: ASTM B32, lead-free grade (e.g., Sn95 or Sn97) as recommended by the manufacturer for the base metal. Do not use lead-bearing solder.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated [with interlocking counterflashing on exterior face, of same metal as reglet.
1. Manufacturers: Subject to compliance with requirements,
a. Cheney Flashing Company.
b. Fry Reglet Corporation.
c. Heckmann Building Products Inc.
d. Hickman, W. P. Company.
e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
f. Keystone Flashing Company, Inc.
g. National Sheet Metal Systems, Inc.
h. Sandell Manufacturing Company, Inc.
i. Or approved equal per Division 01 substitution requirements.
2. Material: Galvanized steel, 0.022 inch thick
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Accessories:
a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before

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counterflashing to prevent wind uplift of counterflashing lower edge.

5. Finish: Paint exposed galvanized surfaces after installation.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength

H. Soldering shall not be used on factory-finished/precoated sheet metal unless specifically recommended by the manufacturer and approved by Engineer.

I. Retain first paragraph below only for aluminum sheet without painted or coated finish. If required, retain rivet option.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

K. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. General

Provide sheet metal roof drainage systems, including gutters, downspouts, leaders, outlets, and accessories, as indicated on the Drawings. Fabricate and install in accordance with SMACNA Architectural Sheet Metal Manual.

B. Materials

1. Aluminum Sheet: ASTM B209, minimum 0.032-inch thickness for gutters and 0.040-inch thickness for downspouts, unless noted otherwise.
2. Finish: Factory-applied coating, color as selected by Engineer.
3. Fasteners: Stainless steel for exterior exposed applications.

C. Gutters

1. Fabricate gutters to profiles and dimensions indicated on the Drawings.
2. Provide end caps, outlet tubes, and expansion provisions.

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3. Slope gutters minimum 1/16 inch per foot toward outlets.
4. Provide hangers or brackets spaced not more than 36 inches on center.

D. Downspouts
1. Fabricate downspouts of shapes and sizes indicated.
2. Provide elbows, offsets, and transitions as required.
3. Secure downspouts to wall with straps at maximum 8 feet on center.
4. Provide discharge to grade, splash block, or piping system as indicated.

E. Accessories
1. Provide gutter outlets, strainers, and leaf guards where indicated.
2. Provide sealant and soldered or sealed joints to ensure watertight system.

F. Coordination
1. Size gutters and downspouts as indicated on Drawings. If not indicated, size system to accommodate roof drainage without overflow under design storm conditions.
2. Coordinate outlet locations with roof panel layout and structural framing.

G. Eave Flashing.
1. Fabricate from the following materials: Galvanized Steel: 0.028 inch .

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.
1. Joint Style: Butt, with 12-inch- wide, concealed backup plate.
2. Fabricate from the following materials:
a. Aluminum: 0.050 inch thick.

B. Counterflashing: Fabricate from the following materials:
1. Galvanized Steel: 0.022 inch

C. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.
2. Zinc: 0.032 inch thick.

D. Roof-Drain Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 **EXAMINATION**

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in

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place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section 07900 - "Joint Sealants."

F. Rivets: Rivet joints in uncoated aluminum and zinc where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

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B. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
   2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. Reglets: Installation of reglets is specified in Division 4 Section 04200 - "Concrete Masonry Units "

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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END OF SECTION

SECTION 07900
SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Provide caulking and sealing.
B. Additional Requirements Specified Elsewhere:
   1. Shop Drawings, Product Data and Samples: Section 01340.
C. Definitions: The terms "caulking" and "sealing" are used on the Drawings and in the Specifications synonymously. Either or both terms indicate the materials specified herein.
D. Minimum Sealant Locations: At a minimum, provide sealant per Section 07900 at: (1) exterior wall penetrations, (2) perimeter of doors/frames/louvers, (3) dissimilar material transitions exposed to weather, (4) interior wet areas at fixtures/equipment pads, and (5) floor/control joints where indicated by this section.
E. Fire-Rated Construction: Do not use standard sealant or foam where a rated fire-resistance-rated joint or penetration firestop system is required. Provide listed and labeled systems tested for the specific condition. Through-penetrations: ASTM E814 (UL 1479). Joints (head-of-wall, floor-to-floor, etc.): ASTM E1966 (UL 2079). Provide F and T ratings not less than the required rating of the assembly.

1.02 QUALITY ASSURANCE

A. Reference Standards:
   1. ASTM C920, Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193, Standard Guide for Use of Joint Sealants.
   3. ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
   4. ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops (UL 1479).
   5. ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems (UL 2079).

1.03 SUBMITTALS

A. Firestop Submittals:
   1. Submit UL system number(s) (or other recognized listing) for each firestop condition, including substrates, penetrant type/size, annular space, and required rating. For conditions without a published system, submit a manufacturer’s Engineering Judgment (EJ) issued for this project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Polyurethane Sealant:
   1. One or two part components.
   2. Paintable.
   3. Meet ASTM C920 Type S or Type M, Grade NS or P, Class 25, Use NT, T, M, A and O.
      1. Pecora Dynatrol-IXL, Dynatrol 11, Urcxpan NR-200, NR-20 1.
      2. Sika Chemical Corporation Sikaflex-1 a, Sikaflex-2C NS/SL.
      3. Sonneborn Sonolastic NP-1, NP-11 , SL-1 SL-2.
      4. Tremco Dymonic or Dymeric, Vulkem 116,227,45,245.

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B. Silicone Sealant:
   a. One (1) component.
   b. Meet ASTM C920, Type S, Grade NS, Class 25, Use NT, G, A, 0.
      a. General Electric: Silpruf, Silglaze II.
      b. General Electric: Sanitary 1700 sealant for sealing around plumbing fixtures.
      c. Dow Corning: 786 for sealing around plumbing fixtures.
      d. Dow Corning: 790, 795.
      2. Tremco: Spectrem I, Spectrem 3, Tremsil 600.

C. Compressible Sealant:
   1. Size so that width of material is twice joint width.
   2. Fire-Rated Joints and Penetrations: Do not use standard sealants or expanding foam in lieu of a listed firestop system. Provide listed and labeled through-penetration firestop systems (ASTM E814/UL 1479) and fire-resistive joint systems (ASTM E1966/UL 2079) as required.

D. Joint Cleaner, Primer, Bond Breaker: As recommended by sealant manufacturer .

E. Sealant Backer Rod and/or Compressible Filler:
   1. Closed cell polyethylene, polyethylene jacketed polyurethane foam, or other flexible, nonabsorbent, non-bituminous material recommended by sealant manufacturer to:
      a. Control joint depth.
      b. Break bond of sealant at bottom of joint.
      c. Provide proper shape of sealant bead.
      d. Serve as expansion joint filler.

F. Adhesive, Compressible Sealant: As recommended by sealant manufacturer.

G. Expanding Foam Sealant:
   1. One (1) or two (2) component moisture-cured expanding urethane for non-rated air sealing only.
   2. Shall not contain formaldehyde.
   3. Density: Minimum 1.5 pcf.
   4. Use expanding foam sealant only for non-rated air sealing where concealed from UV/weather, unless otherwise approved. Where fire-resistance rated assemblies are required, provide listed firestop systems (ASTM E814/UL 1479; ASTM E1966/UL 2079) as specified herein.

   5. R-value minimum 5.0/JN.
   6. Flame spread: Less than 25.
   7. Smoke developed: Less than 25.

H. **Firestop Systems and Sealants:**
   1. Provide listed and labeled firestop systems for fire-resistance rated construction, including through-penetrations and joints, and furnish all components required by the listed system (sealant, mineral wool, collars, wrap strips, putty, etc.).
   2. Through-penetration firestop systems: tested/listed to ASTM E814 (UL 1479).
   3. Fire-resistive joint systems (head-of-wall, floor-to-floor, wall-to-wall, etc.): tested/listed to ASTM E1966 (UL 2079).
   4. Systems shall have F and T ratings not less than the required rating of the assembly.
   5. Acceptable manufacturers: Hilti; Specified Technologies (STI); 3M; RectorSeal; Tremco; or approved equal.

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I. Polysulfide Rubber Sealant:
   1. One (I) or two (2) component.
   2. Meet ASTM C920.
      a. Pecora Synthacalk GC2+.
      b. Sonneborn- Sonolastic- two-part polysulfide sealant
      c. Morton Polymer Systems - Thiokol Sealants.

J. Polyurea Joint Filler:
   1. Two (2) component, semi-rigid material for filling control, sawcut and construction joints in interior concrete floors.
      a. Dayton Superior Specialty Chemical Corp. "Joint Fill, Joint Seal, Joint Saver II" as required for condition and recommended by manufacturer.
      b. Euclid Chemical Co. "EUCO QWIK" joint.
      c. L & M Construction Chemicals, Inc. "Joint Tite 750".
      d. Sonneborn "TF-100" control joint filler.
   2. Comply with ACI 302.1 R performance recommendations regarding control and construction joints.
   3. Color: Gray.

2.02 MANUFACTURE

A. Colors: Manufacturer's standard colors to best blend in with location.

PART 3 – EXECUTION

3.01 PREPARATION

A. Cleaning:
   1. Clean surfaces to receive sealant of all dust, grease, oil, or wax.
   2. Wipe surfaces with clean rag soaked in xylol or suitable solvent.

B. Backup Material:
   1. Where required to control depth of sealant, install backup material.
   2. When compressed 25 percent to 50 percent fills the joint space.
   3. Rolled or pressed into place avoiding lengthwise stretching.

3.02 INSTALLATION

A. Install Sealants Before Painting.
B. Install Sealants Only When the Air and Surface Temperatures are Above 50 Degrees F.
C. Tool Each Joint to a Smooth, Even Finish, Flush with the Edges of the Sealing Recess.
D. Keep Adjacent Surfaces Clean and Free of Overlapping Sealant.
E. Apply to a Depth Equal to Joint Width, But Not Less Than 1/2 Inch.
F. Remove Sealant and Reseal Joints at Which:
   1. Excess sealant is outside the joint and feathered onto surfaces.
   2. It is not possible to paint adjacent surfaces to a clean line.

G. **FIRESTOPPING (RATED JOINTS AND PENETRATIONS)**
   1. Fire-Resistance Rated Joints and Penetrations: Listed firestop systems per this section (ASTM E814/UL 1479; ASTM E1966/UL 2079).
   2. Provide firestop systems only where required by code, rated assemblies, or as indicated on drawings.
   3. Install firestop materials in strict accordance with the listed system and manufacturer’s instructions; do not deviate from tested/approved annular spaces, backing materials, or depths.
   4. Provide permanent identification/labeling at concealed locations prior to closure (system

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number, installer, date), and provide a firestop log in closeout documentation.

3.03 SEALING SCHEDULE

A. Exterior Areas:
   1. Polyurethane.
B. Interior Wet Areas:
   1. Silicone.
C. Interior Corrosive Areas:
   1. Polyurethane.
D. Submerged or prolonged contact with wastewater:
   1. Polysulfide.
E. Around plumbing fixtures and casework:
   1. Silicone
F. Penetrations through exterior wall above grade
   1. Expanding Urethane foam with polyurethane sealant
   2. In corrosive areas finish with polysulfide sealant.
G. Interior floor joints or sawed joints:
   1. Polyurea joint filler
H. Silicone:
   1. Where type not otherwise specified.

END OF SECTION

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SECTION 08110
METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL
A. Section Includes:
1. 20 Minute Metal doors and frames.
2. Grouting of door frames.

B. Related Sections include but are not necessarily limited to:
1. Section 08700 - Finish Hardware.
2. Section 09900 - Painting and Protective Coatings.

1.2 REFERENCED STANDARDS:
A. American National Standards Institute (ANSI):
1. A250.5, Accelerated Physical Endurance Test Procedure for Steel Doors, Frames and Frame Anchors.
2. A250.6, Hardware on Standard Steel Doors (Reinforcement - Application).
3. A250.7, Nomenclature: Standard Steel Doors and Steel Frames.
4. A250.8, Recommended Specifications for Standard Steel Doors and Frames.
5. A250.10, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

B. ASTM International (ASTM):
1. A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy- Coated (Galvannealed) by the Hot-Dip Process.

C. National Association of Architectural Metal Manufacturers (NAAMM):
1. Hollow Metal Manufacturers Association (HMMA).

D. National Fire Protection Association (NFPA)
1. 80, Standard for Fire Doors and Fire Windows.

E. Steel Door Institute (SDI):
1. 105, Erection Instructions for Steel Frames.
2. 117, Manufacturing Tolerances Standard Doors and Frames.
3. All SDI publications.

F. International Building Code (IBC):
1. IBC 7-2, Fire Tests of Door Assemblies.

G. Underwriters Laboratories, Inc. (UL):
1. Building Materials Directory.
2. UL 10 B, Standard for Safety Fire Tests of Door Assemblies.
3. UL 10 C, Standard for Safety Positive Pressure Fire Tests of Door Assemblies.
Building code: 2025 California State Building Code.

1.3 QUALIFICATIONS:
A. Manufacturer must be current member of SDI, and NAAMM (HMMA).
B. Wipe coat galvanized steel is not acceptable as substitute for galvanizing finish specified.

1.4 DEFINITIONS

BID SET - NOT FOR CONSTRUCTION

A. As identified in ANSI A250.7

1.5 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   3. Schedule of doors and frames using same reference numbers as used on Drawings.
   4. SDI certification.
   5. UL certification.

B. American Iron and Steel certification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store doors and frames in accordance with SDI 105.

1.7 JOB CONDITIONS

A. Job located within California Wildfire Hazard Area
   1. Manufacture to comply with Chapter 7A "Materials and Construction Methods for Exterior Wildfire Exposure" of 2025 CA Building Code.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Metal doors and frames and metal borrowed light frames:
      a. CECO Corporation.
      b. Steelcraft Manufacturing Co.
      c. Curries Company.
      d. Or equal

2.2 MATERIALS

A. Sheet Steel: Hot-dipped galvannealed steel, ASTM A653, A60 coating.
B. Frames: Hot-dipped galvannealed steel, ASTM A653, A60 coating.
C. Supports and Reinforcing: Hot-dipped galvannealed steel, ASTM A653, A60 coating.
D. Inserts, Bolts and Fasteners: Manufacturer's standard.
E. Primer: Manufacturer's standard coating meeting ANSI A250.10.
F. Galvannealed Coating Repair: See Section 09900.
G. Thermal Insulation: Polyurethane, CFC free.
H. Sound Insulation: Fiberglass/ batt insulation or impregnated Kraft honeycomb.

2.3 ACCESSORIES

A. Frame Anchors:
   1. ANSI A250.5.
   2. Jamb anchors:
      a. Masonry wire anchors: Minimum 0.187 5 IN wire, galvanized.
      b. Existing wall anchor: Minimum 18 GA, galvanized.

BID SET - NOT FOR CONSTRUCTION

c. Stud partition and base anchors: Minimum 18 GA, galvanized.

2.4 FABRICATION

A. General:
1. ANSI A250.8.
2. Fabricate rigid, neat in appearance and free from defects.
3. Form to sizes and profiles indicated on Drawings.
   a. Beveled edge.
4. Fit and assemble in shop wherever practical.
5. Mark work that cannot be fully assembled in shop to assure proper assembly at site.
6. Continuously wire weld all joints, dress exposed joints smooth and flush.
7. Fabricate doors and frames to tolerance requirements of SDI 117.
8. Fit doors to SDI and NFPA 80 clearances.
9. Provide doors which are approved and labeled by UL where indicated.
10. All doors shall be handed.
11. Hinge cut-out depth and size on doors and frames shall match hinge specified in Section 08700.
12. Design and fabricate doors to requirements of the Building Code.

B. Hollow Metal Doors:
1. General:
   a. 1-3/4 IN thick.
   b. Fabricate with flush top caps.
      i. Thickness and material to match door face.
   c. Continuously wire weld all joints and dress, smooth and flush.
   d. Galvannealed per ASTM A653, A60 coating.
2. Exterior:
   a. ANSI A250.8 Level 3, and physical performance level A, Model 2.
      i. Face sheet minimum thickness: 16 GA.
      ii. Insulated: Minimum R 10.
3. Fire rated:
   a. 20 minutes minimum (as required for Wildfire Zone)
   b. ANSI A250.8 Level 3, and physical performance level A, Model 2.
   c. Comply with ASTM El52 and UBC 7-2.
   d. UL fire labeled.
   e. Comply with UL 10 B and UL 10 C.
   f. Maximum transmitted temperature:
      i. Fire doors shall have a maximum transmitted temperature end point of not more than 250 Deg F above ambient at the end of 30 minutes of standard fire test exposure.
   g. Pairs UL fire labeled without astragal.
   h. Comply with NFPA 80.

C. Hollow Metal Frames
1. Door frames:
   a. Provide 2 IN face at all heads, jambs and mullions for frames in stud walls.
   b. Provide 4 IN face at head where noted on Drawings or required by wall construction.
   c. 26 GA galvannealed steel boxes welded to frame at back of all hardware cutouts.

BID SET - NOT FOR CONSTRUCTION

d. Steel plate reinforcement welded to frame for hinge, strikes, closers and surface- mounted hardware reinforcing.
    i. All plate reinforcement shall meet size and thickness requirements of ANSI A250.8
    ii. Galvannealed per ASTM A653, minimum M60.
e. Split type frames not acceptable.
    i. All horizontal and vertical mullions and transom bars shall be welded to adjacent members.
f. Conceal all fasteners.
g. Frames shall be set up; all face joints continuously wire welded and dressed smooth.
h. Exterior (up to 4 FT wide): 16 GA steel galvannealed per AS A653, A60.
i. Exterior (over 4 FT wide): 14 GA steel galvannealed per AS A653, A60.
j. Interior: 16 GA steel galvannealed per ASTM A653, A60.
k. Provide removable spreaders at bottom of frame.

D. Prepare for finish hardware in accordance with hardware schedule, templates provided by hardware supplier, and ANSI A250.6.
    1. Locate finish hardware in accordance with ANSI A250.8.
    2. See Section 08700 for hardware.
    3. Prepare doors for swing direction indicated. Preparing doors for non-handed hinges is not acceptable.
E. After fabrication, clean off mill scale and foreign materials, repair damaged galvannealed surfaces, and treat and prime with rust inhibiting primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors and frames in accordance with SDI 105, the Building Code and manufacturer's instructions.
B. Where applicable, place frames prior to construction of enclosing walls and ceilings.
C. Plumb, align, and brace securely until permanently anchored.
D. After completion of walls, remove temporary braces and spreaders.
E. Install fire-rated frames in accordance with NFPA 80 and manufacturer's instructions.
F. Use plastic plugs to keep silencer holes clear during construction.
G. In steel stud partitions, attach wall anchors with self-tapping screws.
H. Grout fill all door frames.
I. Grout fill frames prior to installation for all frames mounted in stud wall and in concrete wall construction.
J. Immediately after erection, sand smooth rusted or damaged areas of prime and galvannealed coating.
K. Touch-up prime and galvannealed coating in accordance with Section 09900.
L. Where indicated to be painted leave finish smooth for finish painting.
M. Install three silencers on strike jamb of single door frame and two on head of double door.

BID SET - NOT FOR CONSTRUCTION

N. Number and location of anchors shall be in accordance with frame manufacturer's recommendation with minimum of three anchors per jamb.
O. Protect doors and frames during construction.

END SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 08700
FINISH HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finish hardware.

B. Related Sections include but are not necessarily limited to:

1. Section 08110 - Metal Doors and Frames and Borrowed Light Frames.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Americans with Disabilities Act (ADA): a. Accessibility Guidelines for Buildings and Facilities.
2. American National Standards Institute (ANSI): a. A156.1, Butts and Hinges. b. A156.3, Exit Devices. c. A156.4, Door Controls (Closers). d. A156.6, Architectural Door Trim. e. A156.8, Door Controls - Overhead Holders. f. A156.13, Mortise Locks and Latches. g. A156.16, Auxiliary Hardware. h. A156.18, Materials and Finishes. i. A156.21, Thresholds.
3. Builders Hardware Manufacturers Association (BHMA).
4. National Fire Protection Association (NFPA): a. 80, Standard for Fire Doors and Fire Windows.
5. Steel Door Institute (SDI): a. 107, Hardware on Steel Doors (Reinforcement-Application). b. 109, Hardware for Standard Steel Doors and Frames. c. 112, Galvanized Standard Steel Doors and Frames.
6. Underwriters Laboratories, Inc. (UL): a. Building Materials Directory.
7. Building code: 2025 California Building Code.

B. Qualifications:

1. Installation shall be performed or inspected by an Architectural Hardware Consultant (AHC).

1.3 DEFINITIONS

A. AHC: Architectural Hardware Consultant

B. Installer or Applicator: Installer or applicator is the person actually installing or applying the product in the field at the Project site.

1. Installer and applicator are synonymous. C. All weather: Capable of operation from -50 to +120°F. D. Active Leaf: Right-hand leaf when facing door from keyed side unless noted otherwise on Drawings.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Section 01340.
2. Product technical data including: a. Acknowledgement that products submitted meet requirements of standards referenced. b. Manufacturer's installation instructions.
3. Schedule of all hardware being used on each door: Number hardware sets and door references same as those indicated on Drawings.
4. Technical data sheets on each hardware item proposed for use. B. Miscellaneous Submittals.

BID SET - NOT FOR CONSTRUCTION

5. See Section 01340 – “Shop Drawings” for requirements for the mechanics and administration of the submittal process.
6. Architectural Hardware Consultant qualifications. C. American Iron and Steel Certification if required.

PART 2 – PRODUCTS

1.5 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers, or equal, are acceptable:

1. Locksets and latchsets: a. Best Access Systems. b. Sargent c. Schlage d. Yale
2. Closers: a. LCN. b. Norton. c. Corbin/Russwin.
3. Hinges: a. Stanley Works. b. Hager Hinge Co. c. McKinney Manufacturing Co.
4. Door stops and holders: a. Trimco/BBW/Quality. b. Rockwood. c. Glynn-Johnson Corp.
5. Overhead stops: a. Glynn-Johnson Corp. b. Rixson. c. DORMA.
6. Door trim: a. Trimco/BBW/Quality b. Rockwood. c. Hiawatha, Inc.
7. Weatherstripping and thresholds a. Pemko Manufacturing Co b. Reese Enterprises, Inc. c. Zero Weatherstripping, Inc. d. National Guard Products, Inc.
8. Exit devices: a. Von Duprin, Inc. b. Corbin/Russwin. c. Precision.
9. Door bolts, coordinators and strikes: a. Ives Division/Leigh Products Inc. b. Trimco/BBW/Quality/Glynn-Johnson Corp. c. Rockwood. d. Stanley.
10. Other materials: As noted.

1.6 MATERIALS

A. Fasteners: Stainless steel. B. Locking, Latching and Retracting Mechanism and Lock Case: Corrosion resistant.

1. Match existing colors and finishes. C. Closers:
2. Shell: Aluminum or cast iron.
3. Arms and piston: Forged steel.
4. Corrosion resistant closer. a. Shell: Aluminum. b. Shaft, arm and fasteners: Stainless steel. c. Pinion bushing: Bronze. D. Kickplates: Stainless steel. E. Thresholds: Aluminum. F. Keys: Brass or bronze. G. Weatherstripping and Smoke Seals: Polypropylene, neoprene, or EPDM.

1.7 ACCESSORIES

A. Closer Mechanism Covers:

1. Match finish of adjacent hardware.
2. Full cover. B. Arms, Brackets, and Plates: As required for complete installation of closers. C. Strikes:
3. Stainless steel.
4. Provide with curved lips.
5. Extended lips when required.
6. Furnish strike boxes.
7. Appropriate for function and hardware listed.

1.8 FABRICATION

A. Hardware - General:

1. Generally, prepare for Phillips head machine screw installation.

BID SET - NOT FOR CONSTRUCTION

2. Exposed screws to match hardware finish or, if exposed in surfaces of other work, to match finish of other work as closely as possible.
3. For mineral core doors use screws which thread to head to apply butts.
4. Provide concealed fasteners unless through-bolted.
5. Through-bolt closers on all doors.
6. Furnish items of hardware for proper door swing.
7. Furnish lock devices which allow door to be opened from inside room without a key or any special knowledge. B. Hardware:
8. Fabricate hardware for fire rated openings in compliance with UL and NFPA 80. a. This requirement takes precedence over other requirements for such hardware. b. Provide only hardware which has been tested and listed by UL for types and sizes of doors.
9. Provide stainless steel dustproof strikes for all doors with automatic or manual flush bolts or other bolts into floor.
10. Provide following ANSI A156.18 finishes: a. Locks: 630. b. Door pulls, push bars, push plates: 630. c. Kickplates: 630. d. Exit devices: 630. e. Butts: 630. f. Door stops, dead locks, mortise bolts, and miscellaneous hardware: 630. g. Door overhead stops: 630.
11. All parts of closers (other than corrosion resistant closers): Provide special rust inhibiting pretreatment. C. Mortise Locks and Latches:
12. ANSI A156.13, Series 1000, Grade 1. a. Meet requirements of ADA.
13. Antifriction 2-piece mechanical latchbolt with stainless steel anti-friction insert. a. One-piece stainless steel deadbolt, minimum 1-1/4 IN x 9/16 IN thick with 1 IN throw. b. 2-3/4 IN backset. c. Cylinder: i. Interchangeable cores. d. ADA compliant thumb turn lever. e. Lever handles. f. Functions as indicated in following table in accordance with ANSI A156.13. g. All exterior doors. D. Heavy Duty Locksets:
14. ANSI A156.2.
15. Lever handles.
16. Interchangeable cores.
17. Interior doors. (etc. – rest of product specs unchanged as they were solid)

1.9 KEYING

1. Establish keying with Owner.
   a. Provide and set up complete visible card indexed system with key tags and control slips.
   b. Tag and identify keys.
   c. Provide at least three keys for each lock or cylinder.
   d. Master key and key in groups as directed.
   e. Key to existing master key system.
   f. Provide temporary construction cores if required by Owner; return to permanent cores at completion.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's installation instructions, supervised or inspected by an AHC.

B. Fit hardware before final door finishing.

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C. Permanently install hardware after door finishing operations are complete.
D. Use SDI mounting heights for hardware.
E. Mount closers on push side of doors unless noted otherwise.

1. Provide extended arms and brackets as required.
2. Provide full cover for each closer. F. Install closers with integral stop at all doors scheduled to receive closer unless noted otherwise.
3. Do not install integral stop on closers mounted on pull side of door. G. Provide concealed overhead stop when corrosion resistant closer is specified. H. Where interior doors swing more than 105 degrees without encountering a wall and which do not have a closer scheduled, provide overhead stop.
4. Provide concealed overhead stop on doors scheduled to receive closer mounted on pull side of door. (etc. – rest of installation and field quality control unchanged)

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 09900
PAINTING

PART 1 - GENERAL

1. 1 DESCRIPTION

A. Work Included: Field painting of all new non-prefinished items provided in Contract including surface preparation and surface protection:
   1. Repair of shop-painted surfaces damaged during shipment, handling, or installation.
   2. Field priming of all new surfaces that are not shop-primed.
   3. Field finishing of all shop-primed surfaces.
   4. Field finishing of all field-primed surfaces.
   5. Field finish of all above grade process piping, yard piping and pumping equipment.

B. Additional Requirements Specified Elsewhere:
   1. Shop Drawings, Product Data and Samples: Section 01340.
   2. Delivery Storage and Handling: Section 01600.

1.2 QUALITY ASSURANCE

A. Acceptable Paint System Manufacturers:
   1. Products specified are manufactured by Tnemec Company and Carboline as the basis of minimum acceptable material specification and quality.
   2. Subject to compliance with Contract Documents, the following manufacturers are approved as acceptable equivalents, and the appropriate paint type equivalent to that originally specified may be submitted:
      a. Ameron
      b. Pittsburgh Paints
      c. DeVoe
      d. Tnemec
      e. Or approved equal

B. Referenced Standards:
   1. American National Standards Institute (ANSI):
      a. A224.1, Test Procedures and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
      b. Z53.1, Safety Color Code for Marking Physical Hazards.
   2. American Society for Testing and Materials (ASTM):
      a. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. National Bureau of Standards (NBS):
      a. Certified Coating Thickness Calibration Standards.
   4. National Fire Protection Association (NFPA):
      a. 101, Life Safety Code.
   5 Steel Structures Painting Council (SSPC):
      a. SP-1, Solvent Cleaning.
      b. SP-2, Hand Tool Cleaning.
      c. SP-3, Power Tool Cleaning.
      d. SP-6, Commercial Blast Cleaning.
      e. SP-10, Near-White Blast Cleaning.
      f. TR-3/NACE 6A192 - Dehumidification and temperature control during surface preparation, application and curing for coatings/linings of steel tank.

BID SET - NOT FOR CONSTRUCTION

C. Include on Label of Containers:
   1. Manufacturer's name.
   2. Type of paint.
   3. Manufacturer's stock number.
   4. Color.
   5. Instructions for reducing, where applicable.
   6. Label analysis.
   7. Federal specification number.

D. Sampling of Material:
   1. Provide test samples at random from sealed containers stored on-site.

E. Paint Used in Successive Field Coats by Same Manufacturer.

F. Field Coats Should Not Damage Shop Applied Undercoats.

G. Water Reducible Alkyd Primers are not Permitted.

H. Film Thickness Gauges:
   1. Painter to maintain onsite one wet film thickness gauge for use by Owner during all painting activities.
   2. Painter to maintain one magnetic style dry film thickness gauge onsite for use by Owner during all painting activities.
   3. Painter to maintain onsite for use by Owner calibration plates for the dry film thickness gauge.

1.3 SUBMITTALS

A. Manufacturer's Approval of Applicator.

B. Applicator Experience Qualifications.

C. Shop Drawings:
   1. See Section 01340.
   2. Provide VOC (g/l) emittance concentrations for all paint types submitted, and certification of compliance with the local County Air Quality requirements.
   3. Complete Manufacturer's Product Data, Certificates, and Test Data.
   4. Label each paint submittal with paint type and the intended use for that specific paint type.
   5. Manufacturer's surface preparation instructions.

D. Color Samples:
   1. Furnish color chips for color selection by Owner.
   2. Prepare stained wood samples on type and quality of wood specified for use on Project.
   3. Engineer will prepare color schedule after submittals. Contractor will provide colors in accordance with Schedule. Selections by Owner may exceed manufacturer's standard range of colors.

E. Maintenance Data: Include in Materials and Finishes Manual; see Section 01340.

F. For any given structure or piping system, all coats shall be from a single manufacturer’s compatible coating system.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver Materials in Original, Sealed Containers, Labeled as Follows:
   1. Name or type of material.
   2. Manufacturer's name and item stock number.
   3. Contents, by volume, of major constituents.
   4. Warning labels.
   5. VOC content.
   6. All labels legible and intact.

BID SET - NOT FOR CONSTRUCTION

B. Storage of Materials:
   1. Store only acceptable Project materials on Project site.
   2. Store in a suitable location inside and protect from freezing.
   3. Restrict storage to paint materials and related equipment.
   4. Comply with health and fire regulations.
   5. Provide necessary ventilation of entire storage area.

1.5 JOB CONDITIONS

A. Environmental Requirements:
   1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
   2. Do not apply finish in areas where dust is being generated.
   3. Air and surface temperature within those recommended by manufacturer for coating being applied.

PART 2 – PRODUCTS

2.1 GENERAL

A. Use Product of Single Manufacturer for Coating Systems for Each Type of Surface.
B. Use Paint Compatible with Shop Coating or Primer for Field Coating of Shop-Painted or Primed Surfaces.
C. Use Only Mercury-Free, Fume-Proof Paint for Intermediate and Finish Coats.
D. Use Only Lead-Free Paint or Paint That Does Not Cause Discoloration.
E. Provide Tie Coats Where Recommended by Manufacturer.
F. Use Only Paint Which Complies with VOC Limits Defined by the Local Air Quality Regulations.
G. Provide Surface Preparation for Each Paint Type and Surface Type in Accordance with Manufacturer's Recommendations.
H. Paint of same type and color to be from the same manufacturing ‘lot’ or ‘run’ number to ensure color continuity.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and that cannot be put into acceptable condition through preparatory work as included in Preparation of Surfaces.
B. Do Not Proceed with Surface Preparation or Coating Application Until Conditions Are Suitable.
C. Engineer to Inspect and Approve Surface Preparation of all Areas Prior to Painting.
D. Engineer will confirm paint film thickness using thickness gauge provided by contractor.

3.2 PREPARATION OF SURFACES

A. Ferrous Metal Surfaces: Unless otherwise indicated, per Steel Structures Painting Manual, Vol. 2, "Systems and Specifications:"
   1. Complete fabrication, welding or burning prior to beginning surface preparation:
      a. Chip or grind off flux, spatter, slag or other laminations left from welding.
      b. Remove mill scale.
      c. Grind smooth rough welds and other sharp projections.
   2. Steel: Structural, tanks, pipe, and equipment:
      a. Nonsubmerged: SSPC-SP-6.
      b. Submerged or partially submerged: SSPC-SP10.

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c. High temperature surfaces subject to heat in excess of 600 Degrees F: SSPC-SP10.

3. Mill-coated steel pipe:
   a. Exterior nonsubmerged: Clean and dry.
   b. Exterior submerged: SSPC-SP10.
4. Galvanized steel: SSPC-SP1 for dry surfaces; SSPC-SP7 for damp surfaces.
5. Steel pipe receiving fusion bonded epoxy: SSPC-SP10.
6. Stainless steel: Solvent clean.
7. Sandblast exterior bituminous coating off of DIP sections scheduled to receive epoxy paint coating:
   a. All above grade sections of DIP.

B. Aluminum:
1. Clean surface with mineral spirits.
2. Where in contact with concrete: Apply coal tar epoxy after cleaning.

C. Copper:
1. Buff or polish to bright color.
2. Remove flux residue from joints in copper tubing.
3. Clean surface with mild phosphoric acid cleaner.
4. Apply finish while surface is clean and bright.

D. PVC Plastic:
1. Remove all wax and oil with solvent in accordance with recommendations of primer manufacturer.

E. Hardware:
1. Remove any visible dirt, corrosion, or foreign material.

F. Sandblasting Procedures:
1. Per OSHA.
2. Do not allow surfaces to become wet after blasting and before painting.
3. Apply primer same day as blasting.
4. Depth of sandblasted surface: Not less than 1 mil or greater than 2 mils.
5. Air free of water and oil.
6. Confine sandblast sand to area being prepared.
7. Protect nameplates, valve stems, rotating equipment, motors, and other damageable items.
8. Do not reuse sand.
9. Plug pipe, holes, or openings before sandblasting. Keep covered until sand removed.

G. Surface Preparation of Previously Painted Surfaces:
1. Remove existing paint that has tendency to powder, peel, or shatter when scraped with a knife.
2. Remove all paint from entire surface that is less than 75 percent intact.
3. The modular treatment units (Unit #6) exterior will be factory primed prior to shipment. Remove all chalked or hazed primer and prepare to accept finish coat in accordance with Manufacturer's recommendations.

H. Protection of Surfaces:
1. Use drop cloths, masking tape, and other measures to protect all surfaces from accidental spraying, spattering, or spilling of paint.
2. Contractor to repair all damage caused by painting to other items of Work.
3. Immediately remove paint deposited on surfaces not being painted.
4. Surface clean bituminous paints spilled or dropped and spot paint with aluminum paint prior to specified paint.
5. Remove and rebuild concrete surfaces damaged by paint, or where authorized by Engineer, paint with 2 coats masonry paint.

BID SET - NOT FOR CONSTRUCTION

3.3 MIXING AND TINTING

A. Deliver Paints and Enamels Ready-Mixed to Job Site.
B. Mix Only in Mixing Pails, Suitably Sized, Nonferrous or Oxide Metal Pans.
C. Use Tinting Colors Recommended by Manufacturer for Specific Type of Finish.
D. Do Not Add Any Adulterants or Unauthorized Thinners.
E. Thoroughly Mix Each Time Paint Withdrawn From Container.
F. Keep Containers Closed Tightly, Except While Paint is Withdrawn.
G. All Paint Factory Mixed.
H. Thinning Only Permitted to Obtain Recommended Coverage at Lower Application Temperatures.
I. Do Not Thin Paint Below Recommended Coverage Rate.
J. Two Part Epoxy Paint Systems:
    1. Painter shall notify Engineers/Owner's onsite inspector prior to mixing of each batch of two-part epoxy paint.
    2. Contractor shall verify for inspector that appropriate "sweat in" time has been provided for each batch in accordance with paint manufacturer's specifications.

3.4 APPLICATION

A. General Requirements:
    1. Do not apply initial coating until moisture content of surface is within moisture limitations of paint manufacturer.
    3. Apply paint with suitable brushes, rollers, or spraying equipment:
        a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved.
        b. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminants and suitable for the finish required.
    4. Comply with recommendation of product manufacturer for drying time between succeeding coats.
    5. Vary slightly the color of successive coats. Final coat color to be uniform.
    6. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
    7. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas.
    8. Inspection:
        a. Do not apply additional coats until completed coat has been inspected by the Engineer.
        b. Only inspected coats of paint will be considered in determining number of coats applied.
    9. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
    10. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners or depressions.
    11. Apply primer on all work before glazing.
    12. Refinish whole wall where portion of finish color is not uniform or has been damaged or is not acceptable.
    13. Surfaces to be painted with water-thinned paint: Spot prime exposed nails and other ferrous metals with aluminum paint.
    14. Application temperatures:
        a. 60 Degrees F to 100 Degrees F for epoxy based coatings.
        b. 45 Degrees F to 100 Degrees F for all other paint.
    15. Relative humidity: Provide dehumidification control in accordance with 3.04 A 2 above.
B. Painted Work:
    1. Back prime all exterior woodwork with oil-base primer.
    2. Back prime all interior trim.

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3. Runs on face not permitted.

C. Stained and Natural Finish:
   1. Adjust natural finishes as necessary to obtain identical appearance on all woodwork of a similar type.

D. Rate of Application:
   1. Coverage not greater than value recommended by manufacturer.
   2. Use of paint thinner not to be used as means of extending coverage of paint.

F. Touch-up:
   1. Touch-up paint to be applied with roller or spray to provide similar texture to original primer or finish coat. Brush apply touch-up only for small areas approved by Engineer, or where original prime or finish coats approved to be brush applied.

3.5 CLEANING

A. Touch-Up and Restore Finish Where Damaged.
B. Remove Spilled, Splashed, Splattered or Overspray Paint from All Surfaces.
C. Do Not Mar Surface Finish of Item Being Cleaned.
D. Leave Storage Space Clean and in Condition Required for Equivalent Spaces in Project.

3.6 PAINTING SCHEDULE

A. Metal Surfaces:
   1. All non-submerged surfaces of structural and miscellaneous steel in exterior locations, handrails (unless galvanized), structural steel and miscellaneous steel supports for piping and walkways, exterior of fusion bonded epoxy steel process piping (per Section 15061), and pumps and motors except as specified elsewhere:
      a. Primer: Tnemec Series 69 Epoxoline or Carboguard 890 at 5.0 mils.
      b. Finish: Tnemec Series 1075 Urethane or Carboline Carbothane 134 VOC at 5.0 mils."
      c. Total dry film thickness: 10.0 mils.
   2. All non-submerged surfaces of structural and miscellaneous steel inside buildings except as specified elsewhere.
      a. Primer: Tnemec Series 69 Epoxoline or Carboguard 890 at 5.0 mils.
      b. Finish: Tnemec Series 69 Epoxoline or Carboguard 890 at 5.0 mils.
      c. Total dry-film thickness: 10.0 mils.
   3. All submerged or partially submerged and buried surfaces, not in contact with potable water and unless otherwise specified, including valves, valve boxes, cast iron and steel pipe, supports, fittings, flanges and bolts, excluding piping laid in the ground:
      a. Primer: Series 69 at 6.0 mils or Bitumastic "Superservice Black" at 10 mils."
      b. Finish: Series 69 at 6.0 mils or Bitumastic Superservice Black at 10 mils.
      c. Total dry film thickness: 20.0 mils.
   4. All exposed surfaces of ductile iron piping and steel piping inside buildings and above-grade outdoors, including valves, fittings, flanges, bolts, supports, and accessories therefor, including galvanized surfaces:
      a. Primer: High-build epoxy, 5.0 mils DFT; Tnemec Series 135 Chembuild or Carboguard 890, or equal.
      b. Intermediate/Finish (interior and exterior): High-build epoxy, 6.0 mils DFT;
      b. Tnemec Series 69 Epoxoline or Carboguard 890, or equal.
      c. Exterior Finish Coat (above-grade outdoors only): Aliphatic polyurethane, 2.0 to 3.0 mils DFT;
      d. Tnemec Endura-Shield series or Carbothane series, or equal.
      e. Total dry film thickness:
         1) Interior/indoor service: 11.0 mils minimum.

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2) Exterior above-grade service: 13.0 mils minimum.

5. All exposed surfaces of electrical conduit inside buildings, except banks of conduits in multiple layers hung from ceilings, including fittings, boxes, supports, and accessories therefore:
   a. Finish: Two coats Series 135-1243 Chembuild or Carboguard 890 at 3.0-4.0 mils each.
   b. Total dry film thickness: 6.0-8.0 mils.
6. All metal harness anchorage for buried piping:
   a. Primer: None.
   b. Finish: Tnemec 46H413 Fibertar or Carboline Bitumastic 300M at 16 - 20 mils.
   c. Total dry-film thickness: 16 – 20 mils.
7. Miscellaneous castings, including manhole rings, covers and steps:
   a. Primer: None.
   b. Finish: Tnemec 46H413 Fibertar or Carboline Bitumastic 300M at 16 – 20 mils.
   c. Total dry-film thickness: 16 – 20 mils."
8. Surfaces of aluminum or galvanized sheet metal ductwork exposed inside buildings:
   a. Primer: Tnemec Series 69 Epoxoline or Rustbond PS/FC at 2.0-2.5 mils.
   b. Finish: Tnemec Series 69 Epoxoline or Carboguard 890 at 3.0-4.0 mils.
   c. Total dry-film thickness: 5.0-6.5 mils.
9. Copper tubing: Not painted.
10. Polished brass or bronze: Minimum of 2 coats clear satin varnish, 2 mils dry film.

B. CMU Surfaces
   1. Interior plain face surfaces CMU:
      a. Primer: Series 130 Envirofill or 1254 EpoxoBlock, DFT, 60-80 sq ft/gal
      b. Intermediate: Series 113 or 114 H.B. Tneme-Tufcoat, DFT 4.0 to 6.0 mils
      c. Finish: Series 113 or 114 H.B. Tneme-Tufcoat, DFT 4.0 to 6.0 mils
      d. Total dry film thickness: 8.0 to 12.0 mils
   2. Exterior Surfaces, including split face and plain face CMU
      a. Clear Waterproof Sealer: Sikagard Natural Look Clear Sealer, or equal
         1) Not less than 40% silane.
         2) Apply in two coats, applying second coat while first is still wet in top to bottom fashion.

C. Wood:
   1. Interior wood trim and interior wood doors for opaque finish:
      a. Primer: Series 10-99W Tnemec Primer, DFT 2.0 to 3.5 mils
      b. Finish: Two coats Series 6 Tneme-Cryl at 2.0-3.0 mils each.
      c. Total dry-film thickness: 6.0-9.5 mils.
         1. Interior wood trim and interior wood doors for transparent finish:
      d. Primer: Wood stain - color selection by OWNER.
      e. Finish: Two coats clear satin varnish.
      f. Total dry-film thickness: 2.0 mils minimum.
   2. Interior wood casework for transparent finish:
      a. Primer: Wood stain - color selection by OWNER.
      b. Finish: Two coats clear satin varnish.
      c. Total dry-film thickness: 2.0 mils minimum.
   3. Exterior trim, exterior side of wood doors:
      a. Primer: Exterior wood stain.
      b. Finish: Exterior wood stain, or two coats Series 6 Tneme-Cryl at 2.0-3.0 mils each.
      c. Total dry-film thickness: 4.0-6.0 mils.

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4. Exterior siding:
    a. Primer: Not used.
    b. Finish: Not used.
5. Interior wood casework for opaque finish:
    a. Finish: Two coats Series 6 Tneme-Cryl at 2.0-3.0 mils each.
    b. Total dry-film thickness: 4.0-6.0 mils.

D. Miscellaneous Surfaces:
1. Gypsum wallboard in dry locations:
    a. Primer: Tnemec Series 6 Tneme-Cryl.
    b. Finish: Tnemec Series 6 Tneme-Cryl.
    c. Total dry-film thickness: 4.0-6.0 mils.
2. Gypsum wallboard in restrooms and process buildings:
    a. Primer: Tnemec 201 Epoxoprime at 4.0-5.0 mils.
    b. Finish: Tnemec 280 Tneme-Glaze at 4.0-5.0 mils.
    c. Total dry-film thickness: Minimum 8.0-10.0 mils.
3. PVC piping and PVC jackets on insulated pipe in interior locations:
    a. Finish: Two coats Tnemec Series 69 Epoxoline at 4.0-6.0 mils each.
    b. Total dry film thickness: Minimum 8.0-12.0 mils.
4. PVC piping and PVC jackets on insulated pipe in exterior locations including exterior pipe of secondary containment piping:
    a. Primer: Latex primer sealer
    b. Finish: Two coats water based exterior latex per pipe manufacturer

3.7 SURFACES NOT TO BE PAINTED

A. Except As Otherwise Required or Directed, Do Not Paint the Following Surfaces:
1. Exposed surfaces of aluminum, except ductwork and conduit.
2. Polished or finished stainless steel. Unfinished stainless steel shall be painted.
3. Nickel or chromium.
4. Galvanized surfaces, except piping, conduit, duct work, and other items specifically noted.
5. Piping concealed in inaccessible plumbing chases and above suspended ceilings.
6. Rubber and plastics, including fiberglass-reinforced plastics.
7. Exterior concrete.
8. Surfaces specified to be factory finished.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 10400
IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION
A. Work Included:
1. Signs and Tags:
   a. Safety, caution, danger and hazard signs.
   b. Stamped metal tags for field equipment and instruments.
   c. Tagging of valves, pumps, motors, conduit, instrumentation and process equipment.
2. Pipeline marking tape to identify buried pipe:
   a. All pressure lines.
   b. All drain lines 4 inches or larger.
3. Locating wire:
   a. All non-metallic buried pipe.
4. Color coding, labeling, stenciling, and tagging of all exposed process, water and air piping.
5. Identification and tagging of electrical and instrumentation equipment.
6. Wire numbering standards: See Division 16 specifications.

B. Additional Requirements Specified Elsewhere:
1. Shop Drawings, Product Data, and Samples: Section 01340.
2. Painting: Section 09900.
3. Piping: Section 15060 – PVC and Ductile Iron Piping Systems.

1.2 SUBMITTALS
A. See Section 01340.
B. Product Technical Data Including:
1. Acknowledgment that products submitted meet requirements of standards referenced.
2. Identification register listing all items to be identified, type of identification system to be used, lettering, location and color.
3. Catalog information for all tagging systems.
4. Updated, complete, identification register with non-conflicting numerical assignments submitted prior to project acceptance.

C. Drawings and Data:
1. Signs: Submit schedule of all signs, including data describing size, colors, materials, letter sizes, mounting and schedule of signage.
2. Tape: Material, size, color, detectability.

1.3 JOB CONDITIONS
A. Signs:
1. Indoor installation; wall, bracket or pipe mount as directed by Engineer.
2. Outdoor installation; wall mount, direct sunlight, locate as directed by Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Paint: As specified in Painting Section 09900.
B. Metal Tags and Attachment Wire:
1. Tags: Aluminum or stainless steel.

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2. Stamped-in identifying letters.
3. Colors: Two colors, lettering on separate background color. Colors as selected by Owner.
4. Size: 3 inch diameter, minimum, or larger as required.
5. Wire: 32 mil, nylon coated, stainless steel, no substitution.
6. Tag numbers in accordance with valve and equipment schedules in respective sections and numbering shown on P&ID's.
7. WH Brady Company, Carlton Industries, or equal.

C. Snap-on Markers: Plastic sleeves, Seton Name Plate "Setmark," WH Brady Company, Carlton Industries, or equal.

D. Fiberglass Reinforced Plastic Signs:
1. Approved manufacturers and catalog numbers:
   a. W H Brady Co., Catalog S-10, #B-120, Carlton Industries, or equal.
2. Material: Fiberglass reinforced plastic.
3. Size:
   a. Surface: As scheduled.
   b. Thickness: 0.10 inch.
4. Fabrication:
   a. Rounded corners.
   b. Drilled holes in corners with grommets.
5. Legend: Preprinted and permanently embedded.

E. Phenolic Nameplates:
1. Approved manufacturers and catalog numbers:
   a. W H Brady Co., Catalog S-10, #B-1, Carlton Industries, or equal.
2. Materials: Phenolic.
3. Size:
   a. Surface: As required for text.
   b. Thickness: 1/16 inch.
4. Fabrication:
   a. Three layers laminated.
   b. Legend engraved through top lamination into center lamination.
   c. Drilled holes with grommets for mounting.

2.2 SAFETY SIGNS

A. General:
1. Material: Fiberglass reinforced resin/glass.
2. Construction:
   a. Graphics laminated between resin glass shields.
   b. Thickness: 1/16 inch.
   c. Grommeted corner holes.
3. Abrasion and impact resistant.

2.3 PIPELINE AND ELECTRICAL CONDUIT MARKING TAPE

A. Material: Mylar Encased Aluminum.
B. Width: 2 inches.
C. Color: Orange or Yellow.
D. Printed Identification:
1. Pressure lines: "Caution: Buried Water Line Below".
2. Drain lines: "Caution: Buried Drain Line Below".
3. Electrical: "Caution: Electrical Below".

E. Capable of Being Located From Above Ground With Metal Locator.

2.4 LOCATING WIRE

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A. No. 10 AWG, Continuous, Solid Copper, with UF Coating.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Location of Identification:
   1. Lettering and flow direction arrows:
      a. Near equipment served.
      b. Adjacent to valves.
      c. At each branch or tee.
      d. At intervals of not more than 50 feet on straight runs, unless otherwise indicated by the Engineer.
   2. "Caution," "Danger," and identification signs located at direction of Engineer.

B. Metal Tags:
   1. Provide tags in lieu of stenciling/lettering on pipe 5/8 inch or smaller outside diameter (including covering).
   2. Color code as specified.
   3. Attach with stainless wire and stainless crimps.

C. Lettering:
   1. Self adhesive or snap-on style markers.
   2. Letter size as follows:

Outside Diameter of Pipe or Covering	Minimum Height of Letters
5/8 inch or smaller	Metal tags – 1/4 inch
3/4 inch through 4 inches	3/4 inch
5 inches or larger	2 inches

D. Scheduled Color Coding:
   1. All 12 inch pipe and smaller.
   2. Bands where scheduled: 6 inches wide, at 5 foot intervals.
   3. Provide only bands of color on uninsulated stainless steel, CPVC, and PVC, elsewhere natural finish.

E. Piping Not Scheduled:
   1. Paint to match wall or ceiling, unless otherwise directed by Engineer.
   2. Appropriately identify and place flow arrows
   3. Uninsulated stainless steel and PVC:
      a. Natural finish.

F. Pipeline Marking Tape:
   1. Install continuously above all buried pipe.
   2. Depth: 4 inches, 6 inches.
   3. Terra Tape, or equal

G. Pipeline Locating Wire:
   1. Install continuously, tape to all non-metallic buried pipe.
   2. See details on plans for continuation at valve boxes.

H. Piping Not Scheduled:
   1. Paint to match wall or ceiling, unless otherwise directed by Engineer.
   2. Appropriately identify and place flow arrows.
   3. Uninsulated stainless steel, CPVC and PVC:
      a. Natural finish.

3.2 SCHEDULES

A. Exposed Piping Color Schedule:

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Pipe	Color of Pipe	Lettering
Potable Water	Light Blue	Black
Non-potable Water	Purple	White

B. PVC Piping (Chemical Feed Systems) to be labeled and banded only.
C. Paint Vent Lines to Match Surfaces They Adjoin.
D. Specially Paint the Following Items:

Item	Color
Valve handwheels and levers	Red

E. Danger Signs:
   1. Size: 10 inches wide by 7 inches high.
   2. Standard OSHA header, "Danger," white letters on red background in upper half of sign.
   3. Baked enamel on 0.063 inch aluminum.
   4. Custom lettering, "Equipment Starts Automatically", black letters on white background, Quantity: 1.
   5. Custom lettering, “High Voltage”, quantity 1.
   8. Mount in location directed by Engineer.

F. Pipeline Labeling Markers:
   1. Label all process piping as listed below.
   2. Peel and press self-adhesive style labels.
   3. White lettering on green background.
   4. Size markers for pipe size per label manufacturer=s recommendations.
   5. Secure each pipeline label marker with self-adhesive flow arrow tape, one full wrap minimum at each end of label. White arrows on colored background, same color as pipeline label.
   6. Legend:

Label	Quantity
Potable Water	3

G. Metal Tags:
   1. Schedule:
      a. All field instrumentation in accordance with the P&ID plan sheets.
      b. All motors in accordance with the P&ID plan sheets.
      c. All pumps in accordance with the P&ID plan sheets.

O. Valve Tags:
   1. Valves, provide tags in accordance with schedule in Section 15100 - Valves.

P. Conduit Tags:
   1. Conduit tags in accordance with conduit schedules on contract electrical plan sheet.

Q. Instrumentation Tags:
   1. Instrumentation tags in accordance with instrumentation schedules in Division 13, and as shown on P&ID plan sheets.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 10442
BATTERY POWERED MAGNETIC
FLOWMETERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Battery powered magnetic flowmeters for potable water service.
   2. Flowmeter transmitter/converter, local display, batteries, grounding rings, cables, connectors, and accessories required for a complete operating installation.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American National Standards Institute (ANSI).
   2. C715, Electromagnetic Water Meters.
   3. American Water Works Association (AWWA):
   4. American Society of Mechanical Engineers (ASME):
      a. B16.5, Pipe Flanges and Flanged Fittings.
   5. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment.
      b. NSF International / American National Standards Institute / Standards Council of Canada:
      c. NSF/ANSI/CAN 61, Drinking Water System Components - Health Effects.
      d. NSF/ANSI 372, Drinking Water System Components - Lead Content.
      e. National Electrical Code (NEC), as applicable for hazardous location installations indicated on the Drawings.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product data and catalog information for the furnished flowmeter, converter/transmitter, local display, batteries, grounding rings, cables, connectors, and accessories.
   3. Dimensional drawings include meter laying length, flange dimensions, transmitter/converter mounting arrangement, display orientation, vault clearances, and battery access requirements.
   4. Flow range, accuracy, pressure rating, materials of construction, liner/coating information, electrode material, and grounding requirements.
   5. Wiring diagrams and output information for all signal outputs required by the Drawings or control system, including pulse output and other communications or analog outputs where provided.
   6. Documentation confirming battery-powered operation, expected battery life, battery replacement procedure, and that solar backup or solar charging equipment is not included.
   7. Documentation confirming enclosure rating and suitability of the furnished converter/transmitter, battery compartment, cable connections, and connectors for the proposed below-grade vault installation.
   8. Manufacturer installation requirements, including grounding, upstream and

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downstream straight pipe requirements, flow direction, minimum full-pipe requirements, and requirements for buried or vault installations.

9. Hazardous location listing documentation.
10. See Section 01340 for requirements for the mechanics and administration of the submittal process and the content of Operation and Maintenance Manuals.
    a. Include calibration information, programming instructions, battery replacement instructions, troubleshooting guide, and recommended spare parts.

B. Certifications:
1. Submit NSF/ANSI/CAN 61 listing documentation for all wetted materials including liner/coating, electrodes, gaskets, and coatings.
   Submit NSF/ANSI 372 listing documentation.

PART 2 - PRODUCTS

2.1 FLOWMETER

A. Flowmeter:
1. Acceptable manufacturers:
   a. McCrometer Ultra Mag 3000, 6-inch, with ProComm GO converter, Part No. PG-MB---1, battery-powered configuration.
   b. The furnished meter shall be the battery-only configuration with five-year expected battery life. Solar backup, solar charging equipment, AC power, and DC power are not required and shall not be provided unless specifically authorized by the Owner.
2. General Requirements:
   a. Flowmeter shall be a full-bore, flanged, microprocessor-based electromagnetic flowmeter for potable water service in full pipes.
   b. Flowmeter shall indicate, totalize, and transmit flow as required.
   c. Size shall be as indicated on the Drawings.
   d. Flowmeter shall be suitable for installation inside below-grade precast concrete vaults.
   e. Flowmeter shall be furnished as a complete system including sensor body, ProComm GO converter/transmitter, local rate and total display, battery pack, grounding rings, cables, connectors, mounting hardware, and all accessories required for a complete operating installation.
3. Materials and Ratings:
   a. Meter body and flanges shall be manufacturer's standard construction suitable for potable water service and the pressure class shown on the Drawings.
   b. Flanges shall be ASME B16.5 Class 150 unless otherwise indicated on the Drawings.
   c. Liner/coating and wetted materials shall be suitable for potable water service and certified to NSF/ANSI/CAN 61.
   d. Electrodes shall be 316 stainless steel unless otherwise recommended by the manufacturer for the application.
   e. Grounding rings shall be 316 stainless steel and furnished where required by the manufacturer.
   f. Converter/transmitter and connections shall have the manufacturer's published enclosure rating for the specified PG-MB---1 configuration. Contractor shall submit manufacturer documentation confirming the rating and installation limitations. Do not install equipment in a manner exceeding the manufacturer's enclosure rating.
   g. Size as indicated on drawings

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h. Flowmeter shall be certified to NSF/ANSI/CAN 61 and NSF/ANSI 372.
i. Power and Signals:
j. Power shall be internal battery power only with five-year expected battery life under the furnished output and operating configuration.
k. Field splices within the vault are not permitted unless specifically approved by the Engineer and made with watertight, manufacturer-approved splice kits or connectors rated for the installed environment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with the manufacturer's instructions and approved shop drawings.
B. Install flowmeter in the orientation and with the upstream and downstream straight pipe lengths required by the manufacturer.
C. Install grounding rings, grounding conductors, and grounding connections in accordance with the manufacturer's instructions.
D. Install transmitter/converter and local display so that display is readable and batteries are accessible from the vault hatch or normal maintenance access location.
E. Protect flowmeter, transmitter/converter, cables, connectors, and accessories from construction debris, impact, vibration, and moisture intrusion during installation.
F. Keep foreign matter out of the system.
G. Plug all open ends and connections to keep out contaminants.
H. Threaded Connection Seals:
    1. Use Tite-Seal or acceptable alternate.
    2. Use of lead base pipe dope or Teflon tape is not acceptable.
    3. Do not apply Tite-Seal to tubing threads of compression fittings.
I. Instrument Mounting and Access:
    1. Mount all instruments where they will be accessible from fixed ladders, platforms, grade, or the vault hatch/access opening.
    2. Mount local display facing the normal maintenance access location, within reading distance, and in the line of sight.
    3. Mount instruments level, plumb, and support rigidly by use of factory-furnished stainless steel mounting plate and anchors.
    4. Mount to provide:
        a. Clearance above high water levels, mount as high as practical.
        b. Protection from heat, shock, and vibrations.
        c. Accessibility for maintenance.
        d. Freedom from interference with piping, conduit and equipment.
        e. FIELD TESTING AND STARTUP
        f. Prior to startup, verify that the meter is installed in the correct flow direction, the pipe is full, grounding is complete, batteries are installed, and all required outputs are wired and functional.
        g. Manufacturer's representative or qualified supplier shall assist with startup and programming when required by the Engineer or Owner.
        h. Demonstrate local display, totalization, flow indication, and required signal outputs to the Engineer and Owner.
        i. Record initial totalizer reading, meter serial number, programmed units, output configuration, and battery installation date in the startup documentation.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 11005
EQUIPMENT REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY
A. Section Includes
   1. Motors for all equipment
   2. Equipment accessories
   3. Seismic requirements for all equipment

1.2 QUALITY ASSURANCE
A. Reference Standards: see Part 2 - Products

1.3 SUBMITTALS
A. Shop Drawings
   1. See Section 01340 for submittal requirements..
   2. Product technical data showing compliance with specifications.
      a. Motors
      b. Seismic calculations
B. Operation and Maintenance Manuals
   1. See Section 01340 for:
      a. The submittal process
      b. The submittal contents

1.4 SEISMIC REQUIREMENTS

A. All equipment, piping, ductwork, supports, and anchorage shall comply with Section 01611 – Seismic Design Requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following manufactures are acceptable subject to compliance with the specifications:
   1. Motors
      a. U. S Motors, or equal

2.2 MOTORS
A. Less than 1/3 HP
   1. Single phase, 60 HZ
   2. Voltage as shown on drawings
   3. TENV or TEFC, unless otherwise stated.
   4. Permanently lubricated, sealed bearings
   5. Built-in manual thermal reset
B. 1/3 to 1 HP
   1. Single phase, 60 HZ
   2. Voltage as shown on drawings
   3. TENV or TEFC unless otherwise stated.

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4. Permanently lubricated, sealed bearings
5. Specially insulation for damp areas.
6. Premium efficiency motor

C. 1-1/2 through 10 HP
1. 230/460 V, 60 HZ, 3 PH
2. TEFC, unless otherwise stated.
3. Permanently lubricated, sealed bearings
4. Specially insulation for damp areas
5. Vertical motors: 15 year thrust bearing life.
6. Premium efficiency motor.

2.3 EQUIPMENT ACCESSORIES

A. Anchorage
1. Type 316 stainless steel anchorage
2. Number and configuration of anchor bolts per manufacturer
3. Epoxy grout drilled anchorage or cast-in place anchorage.

B. Data Plate
1. Stainless steel data plate attached to equipment
2. Equipment number, performance, serial number

C. Guards
1. OSHA guards for exposed moving parts
2. Galvanized steel for interior applications
3. Stainless steel for exterior applications

D. Lifting eye bolts
1. Provide for equipment over 50 LBS.

PART 3 – EXECUTION

3.1 INSTALLATION CHECKS

A. Authorized representative of equipment manufacturer to visit site and approve equipment installation.

B. Provide written report that equipment is properly installed, aligned, and operated under full load conditions satisfactorily.

3.2 FIELD PAINTING

A. Comply with Section 09900.

END OF SECTION

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SECTION 11800
MULTI-STAGE VERTICAL IN-LINE PUMPS

PART 1 – GENERAL

1.01 SUMMARY

A. Furnish and install two (2) vertical multistage inline booster pumps complete with motors, accessories, testing, startup, training, and appurtenances.

B. Both pumps shall be suitable for variable speed operation on to provide controlled acceleration/deceleration and minimize surge.

C. Variable Frequency Drives:

1. Pump speed shall be controlled by VFDs.
2. Contractor shall coordinate motor/VFD compatibility requirements and provide manufacturer-recommended operating limits and ramp rates.

1.02 REFERENCES

A. ANSI/HI 14.6 – Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.

B. ISO 9906:2012 – Rotodynamic Pumps, Hydraulic Performance Acceptance Tests (Grade 3B tolerance minimum).

C. NSF/ANSI 61 – Drinking Water System Components – Health Effects.

D. NSF/ANSI 372 – Lead Content.

E. NEMA MG 1 – Motors and Generators (including inverter-duty requirements where VFD-driven).

1.03 SUBMITTALS

A. Submit per Division 01 and this Section.

B. Product Data (each pump):

1. Certified pump curves showing head, efficiency, brake horsepower, and NPSHr over the expected operating range.
2. Materials of construction (wetted and non-wetted), coatings/linings, and certifications for NSF/ANSI 61 and 372.
3. Dimensional drawings, weights, connection sizes, flange ratings, and recommended installation clearances.
4. Motor data: HP, voltage, phase, efficiency, enclosure, service factor, insulation class, and nameplate data.
5. Mechanical seal data (seal type and materials) and manufacturer recommendations for flush plan (if any).
6. VFD Operation Data (each pump/motor):
    a. Confirmation motor is inverter-duty suitable for VFD service.
    b. Manufacturer recommended minimum and maximum continuous operating speed/frequency.
    c. Manufacturer recommended acceleration/deceleration (ramp) rates and any limitations required to protect the pump/motor and minimize hydraulic transients.

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d. Any manufacturer-required accessories for VFD operation (if any), identified for Electrical coordination.

C. Test Reports:
1. Factory performance test report for each pump per ANSI/HI 14.6 (or ISO 9906) demonstrating compliance with duty point(s).

D. O&M Manuals and Training:
1. O&M manuals including recommended spare parts list and maintenance schedule.
2. Startup and training documentation.

E. Seismic Submittals:
1. Foundation and anchor bolt requirements and anchor bolt templates for each pump.
2. Anchor bolt setting plan confirming cast-in-place anchor bolts for each pump; identify bolt sizes, spacing, projection, and template details. Post-installed anchors for pumps are not permitted.
3. Structural calculations including seismic anchorage calculations (and required equipment seismic loads) demonstrating compliance with Section 01611, Seismic Requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of five (5) years documented experience supplying pumps of similar type and service.

B. Wetted materials shall be certified for potable water service per NSF/ANSI 61 and NSF/ANSI 372.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Cap and protect all openings. Provide manufacturer's storage instructions and maintain until startup.

1.06 WARRANTY

A. Provide a minimum one (1) year warranty from Date of Final Acceptance for pump, motor, and furnished accessories.

1.07 SEISMIC REQUIREMENTS

A. Anchorage design shall conform to the requirements of Section 01611 - Seismic Requirements, and the Contract Documents.

B. Provide cast-in-place anchor bolts for pump anchorage. Anchor bolt materials, templates, sleeves, plates, and installation shall conform to Section 05501, Anchor Bolts and Expansion Anchors.

C. Post-installed anchors (mechanical/expansion or adhesive) are not permitted for anchorage of the pumps unless specifically approved in writing by the Engineer of Record.

D. Provide foundation and anchor bolt requirements and anchor bolt templates for each pump.

E. Provide seismic design loads and anchorage requirements for the pumps; submit anchorage calculations where required by the Contract Documents.

BID SET - NOT FOR CONSTRUCTION

PART 2 – PRODUCTS

2.01 MANUFACTURERS / BASIS OF DESIGN

A. Basis of Design: Grundfos vertical multistage inline pumps, CR-series (or approved equal).

B. Substitutions: per Division 01. “Equal” pumps shall match all performance, flange ratings, pressure ratings, and materials herein and shall be suitable for VFD operation.

C. Integral (on-motor) drives are not permitted. Provide VFD controls installed remotely in the motor control panel as shown in the Electrical Drawings.

2.02 PUMP SCHEDULE / PERFORMANCE REQUIREMENTS

A. General:

1. Pumps shall meet duty point(s) indicated below within ISO 9906:2012 Grade 3B tolerance minimum.
2. Pumps shall operate within the manufacturer’s recommended operating region.
3. Pumps and motors shall be suitable for variable speed operation on VFDs.

B. Pump No. 1 (High Head):

1. Type: Vertical multistage inline pump assembly (standard motor; no integral VFD).
2. Rated Motor Power (P2): 30 HP.
3. Duty Point 1 – Zone D to Zone B Conveyance:
   a. 200 gpm at 397.5 ft TDH (variable speed operation).
4. NPSHr at duty point: approximately 10.45 ft.
5. Connections: 3-inch inlet and 3-inch outlet, ANSI 300 lb flanges.
6. Maximum operating pressure: not less than 435 psi.

C. Pump No. 2 (Lower Head):

1. Type: Vertical multistage inline pump assembly (standard motor; no integral VFD).
2. Rated Motor Power (P2): 20 HP.
3. Duty Point 1 - HDWD to Zone B Conveyance:
   a. 200 gpm at 252 ft TDH (variable speed operation).
4. Duty Point 2 – Zone D to HDWD Conveyance
   a. 200 gpm at 145 ft TDH (variable speed operation).
5. NPSHr at 252-ft duty point: approximately 10.06 ft.
6. Connections: 3-inch inlet and 3-inch outlet, ANSI 150 lb flanges.
7. Maximum operating pressure: not less than 232 psi.

D. Potable Water Certification:

1. Pumps shall be listed/certified for potable water service per NSF/ANSI 61 and NSF/ANSI 372.

2.03 CONSTRUCTION / MATERIALS

A. General:

1. Pump shall be vertical multistage type suitable for indoor booster station service.

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2. Provide stainless steel shaft suitable for continuous duty and potable water service.

B. Wetted Materials (minimum):
1. Impellers: Stainless steel (AISI 304 minimum).
2. Casing/base: Cast iron (or better).

C. Flanges:
1. Pump No. 1: ANSI 300 lb, 3-inch.
2. Pump No. 2: ANSI 150 lb, 3-inch.

D. Curve Tolerance:
1. ISO 9906:2012 Grade 3B minimum.

2.04 SHAFT SEAL

A. Provide single mechanical seal, suitable for potable water service.
B. Seal materials shall be compatible with potable water.

2.05 MOTORS (BOTH PUMPS)

A. Provide NEMA premium efficiency, inverter-duty motors suitable for VFD service per NEMA MG 1 requirements.
B. Enclosure: TEFC or IP55 (or better) suitable for indoor pump station service.
C. Insulation: Class F minimum.
D. Service factor: 1.15 minimum unless manufacturer requires otherwise for VFD service.
E. Coordinate with Electrical for any manufacturer-recommended VFD-related provisions (e.g., shaft grounding, insulated bearing, filters) and identify such requirements in submittals.

2.06 VARIABLE FREQUENCY DRIVES

A. VFD installed remotely in the motor control panel / MCC per electrical drawings and specifications.

2.07 ACCESSORIES

A. Provide:
1. Lifting provisions and identification tags.
2. Vent and drain connections as furnished by manufacturer.
3. Anchor/foot mounting provisions compatible with the concrete housekeeping pad and seismic anchorage requirements.
4. Anchor bolt templates and anchor bolt requirements.

2.08 COATINGS

A. Exterior coating suitable for indoor pump station environment.
B. Any interior coatings/linings, if provided, shall be NSF/ANSI 61 compliant.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify housekeeping pads/foundations are level and anchors are located per approved shop drawings.
B. Verify piping is properly supported and aligned to prevent strain on pump nozzles.

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C. Provide cast-in-place anchor bolts for pump anchorage; set bolts using templates in accordance with Section 05501 and approved shop drawings. Post-installed anchors are not permitted for pump anchorage unless specifically approved in writing by the Engineer of Record. Torque anchor bolt nuts per manufacturer recommendations.

3.02 INSTALLATION

A. Install pumps per manufacturer's written instructions and approved submittals.

B. Install and torque anchors per Section 01611 - Seismic Requirements and approved shop drawings.

C. Confirm correct rotation and verify VFD minimum/maximum speed limits and ramp settings (Electrical coordination) prior to startup.

3.03 FIELD QUALITY CONTROL

A. Perform field startup by manufacturer's authorized representative.

B. Demonstrate stable operation at required duty point(s).

C. Demonstrate controlled acceleration/deceleration via VFD settings (Electrical coordination) to minimize hydraulic transients.

3.04 STARTUP AND TRAINING

A. Provide onsite training for Owner's staff covering operation, routine maintenance, and troubleshooting.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 11900
VERTICAL TURBINE PUMP

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:
   1. Vertical turbine pumps for high service pump station.

B. Related Requirements:
   1. Section 09900 – Painting
   2. Section 16010 – Electrical

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.

C. ASTM International:

1. ASTM A29 - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM A744 - Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service.

D. ANSI/HI Standards

1. ANSI/HI 2.1-2.2 - Rotodynamic Vertical Pumps of Radial, Mixed, & Axial Flow Types for Nomenclature & Definitions
2. ANSI/HI 2.3 – Rotodynamic Vertical Pumps of Radial, Mixed, & Axial Flow Types for Design and Application
3. ANSI/HI 2.4 – Rotodynamic Vertical Pumps for Manuals Describing Installation, Operation and Maintenance
4. ANSI/HI 9 – Rotodynamic Pumps
5. ANSI/HI 14.6 – Rotodynamic Pumps for Hydraulic Acceptance Tests
6. ANSI/HI 20.3 – Rotodynamic (Centrifugal and Vertical) Pump Efficiency Prediction

1.3 COORDINATION

A. Coordinate installation and startup of Work of this Section with Owner and plant operations.

1.4 SCHEDULING

A. Section 01310 Construction Schedules
B. Section 01650 Facility Startup
C. Schedule Work of this Section to install pumps prior to connecting piping work.

1.5 QUALITY ASSURANCE

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A. All materials and appurtenances in contact with potable water shall be NSF 61 listed and certified.
B. Equipment specified in the section shall be the product of a single manufacturer.
C. The manufacturer shall be solely and fully responsible for the warranty and mechanical design adequacy of all the provided components under this section.
D. The pump manufacturer shall be certified to the ISO 9001 standard for the design and manufacturer of vertical turbine pumps.
E. Pressure containing fabrications shall be welded only by those whom are qualified on ASME code Section IX.

1.6 SUBMITTALS

A. Submit equipment data per Section 01340 – Shop Drawings.
B. Product Data: Submit manufacturer information for materials of construction and fabrication.
C. Shop Drawings:
    1. Submit detailed dimensions for materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
    2. Include manufacturer's specified displacement tolerances for vibration at operational speed specified for pumps.
    3. Manufacturers pump curves showing duty point, efficiency, and other performance parameters.
D. Critical speed calculations and analysis.
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout. Manufacturer shall provide anchor bolt calculations as indicated on drawings.
G. Source Quality-Control Submittals: Indicate results of shop/factory tests and inspections.
H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
I. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions.

1.7 CLOSEOUT SUBMITTALS

A. Section 017020 – Project Closeout: Requirements for submittals.
B. Project Record Documents: Record actual locations and final orientation of equipment and accessories.

1.8 WARRANTY

A. Section 01740 – Guaranties and Warranties: Requirements for warranties.
B. The Manufacturer and Contractor shall furnish a warranty extending twelve (12) months after the product is put into operation.

PART 2 - PRODUCTS

2.1 VERTICAL TURBINE PUMPS

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A. Manufacturers:
   1. The vertical turbine pumps shall be manufactured by:
      a. Xylem-Goulds Water Technology
      b. Peerless
      c. Or approved equal.

B. Description: Vertical multi-stage type, consisting of a fabricated steel discharge head, vertical hollow shaft motor, discharge column and shafting, bowl assembly and electric motor.

C. Pump Designation:

D. Performance and Design Criteria:
   1. Design Flow Rate: 190 gpm.
   2. Design Flow Total Dynamic Head: 290 feet.
   3. Minimum Efficiency at Design Flow Rate: 78%.
   4. Maximum Pump Speed: 1800 rpm.
   5. Maximum Motor Horsepower: 20 HP
   6. Minimum Column Diameter: 6 inches
   7. Pump Discharge Diameter: 4 inches
   8. Minimum lineshaft diameter: 1 inch

E. Bowl Assembly:
   1. Suction Bell: Shall be constructed of cast iron and machined for bolting to the bowls. The suction bell shall be a smooth bell-shaped entrance as a waterway to the impellers, and shall incorporate an integrally cast suction manifold bearing housing. The housing shall have an ASTM B584 lead-free bronze bearing and a cast iron suction manifold plug. Bowl inlet shall include a Type 316L stainless steel inlet strainer.
   2. Pump Bowls: Shall be constructed of ASTM A48 Class 30 close grained cast iron with integrally cast diffusion vanes. The bottom bowl shall be machined to bolt to the suction bell. Each bowl shall be equipped with an ASTM B584 lead-free bronze bearing. Each bowl interior shall be enameled to provide smooth passage of water and increase efficiency.
   3. Impellers: Shall be enclosed type, constructed of Type 316 stainless steel, dynamically and statically balanced. The impeller vanes shall be machined to match the contours of the suction bell, and also the contour of the series case. Impeller shall be secured by means of ASTM A582 Type 416 stainless steel taper lock collet to the bowl shaft. The impeller shaft shall be of 416 stainless steel. The total hydraulic down-thrust for pump shall be minimized. Up-thrust developed upon starting shall be acceptable, but pumps that operate in continuous up thrust shall not be acceptable. Verification of thrust values shall be provided and documented with standard manufacturers published information. Failure to verify thrust calculations shall be basis for rejection of equipment.

F. Column Assembly:
   1. The Column Assembly: The pump shall be of open lineshaft construction designed for lubrication by the pumped media. Column pipe shall be flanged or threaded and shall be fabricated of ASTM A53 Grade B, carbon steel. Column assembly shall

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have stainless steel bearing retainers that are clamped between registers machined into adjoining column pipe flanges. Each guide shall contain a water lubricated cutless bearing designed for open line shaft, vertical turbine service. Maximum length of one column section shall be 10 feet. Column sections located directly below the discharge head and directly above the pump bowl assembly shall not generally exceed 5'-0" in length. Column sections shall be secured by means of ASTM F593-Gr. CW1 stainless bolts and ASTM F594-Gr.CW1 stainless steel nuts.

2. Line Shafting: Shall be of ASTM A582-88a Type 416 stainless steel, ground and polished. Shafting shall be connected by means of stainless steel couplings. All shaft journals shall be provided with ASTM A269 304 S.S. sleeves at the location of each shaft bearing. Shafting size shall be determined from the thrust characteristics of the particular pump bowl under consideration, and shall be adequate size to transmit the full motor horsepower without failure. Undersized shafting shall be basis for rejection of the pump. Pump supplier shall submit manufacturer's published data to verify shafting selection. Failure to verify shaft sizing shall be basis for rejection of the equipment.

3. A flanged non-spacer coupling shall be furnished to facilitate removal of the motor. The flanged coupling shall be a Type CPAT design with flanged ends and a threaded pump coupling to facilitate field adjustment. The coupling shall be dynamically balanced for smooth operation. Threaded and coupled shafting is not acceptable. The top shaft and the line shaft shall be of ASTM A582-95b Type 416 stainless steel and of adequate size for the HP to be transmitted.

G. Discharge Head

1. The pump discharge head shall be fabricated steel type. The head shall be suitable for floor mounting and shall be furnished with a steel sole plate to facilitate future removal. Sole plate mounting surface shall be fully machined to provide a perfectly flat base for accurate leveling of the discharge head, and the sole plate shall be accurately leveled to the tolerances specified by the manufacturer prior to installation of the pump. The discharge head base shall be machined to accept the sole plate and shall include a Class 150 integral discharge flange. The head shall have provisions for the mounting and securing of a vertical hollow-shaft motor. The motor mounting flange shall be machined for a perfect fit and angular misalignment shall not be allowed.

2. Lifting lugs shall be integrally cast on the discharge head and shall be capable of supporting the entire weight of the pump. A 1-inch NPT drain connection, 1/2-inch NPT pre-lube connection, and a 1/4-inch NPT gauge connection shall be provided. The pump discharge flange shall be provided. The pump discharge flange shall conform to CL 150 ANSI standard drilling for pipe flanges. The pump shall be sealed at the discharge head by means of graphited packing. An ASTM B584-00 C90300 bronze bushing, an ASTM A744-00 Type 316 stainless steel packing washer, and an ASTM A744 Type 316 stainless steel two-piece packing gland shall secure the packing and allow for adjustment for lubrication. A removable coupling guard fabricated from stainless steel shall be provided to protect operating personnel from accidental contact with the shaft or flanged coupling during operation.

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3. Discharge head shall include a tap on the packing gland for connection to external water lubrication source.
4. The pump discharge head shall be provided with shaft critical speed calculations, and a structural dynamics analysis shall be performed on the pump assembly to ensure low- vibration operation.

H. Motor

1. Each turbine pump shall be driven by a vertical hollow shaft motor suitable for 460 volts, 3 phase, 60 hertz. The motor shall be an integral part of the pumping unit, and shall be suitable for mounting as shown on the plans. All motors shall be sized so that they will not be overloaded at their rated capacity at any point on the pump performance curves. Motors shall be TEFC with Class F insulation and shall have a minimum service factor of 1.15.
2. Motors shall be U.S. Motors or equal.
3. Each motor shall have thrust bearing(s) capable of carrying the dead weight of all rotating parts of the pump plus the hydraulic thrust incurred during operation.
4. Motor shall be vertical hollow shaft, squirrel cage induction type and shall conform to AIEE standards. Each motor shall be equipped with a non-reverse coupling. A coupling at the top of the motor shall facilitate vertical adjustment of the impellers of the pump. The motor shall also be furnished with a protective cap. All bearings shall be oil or grease lubricated, with proper provisions made to guard against the escape of lubricant.
5. Motors shall be “inverter duty rated” and shall conform to the NEMA “High” standard for premium efficiency. The nameplate on the motor shall also indicate the motor is “inverter duty rated” to the NEMA “High” standard for premium efficiency. A 120v space heater shall be supplied with the motor.
6. Not used.
7. Thermostats shall be provided in the windings of each phase to afford protection of the motor against excessive operating temperature. Thermostats shall be normally closed, suitable for operations on 120 VAC, with leads from the same routed to an accessory conduit box for connections separate from the power wiring. One thermostat shall be provided for each phase of the motor windings.
8. Space heaters and thermostat leads shall be directed to a separate junction box, for field wiring by the contractor. These leads shall not be routed through the primary junction box.
9. Shaft grounding rings shall be provided for each motor.
10. Motor bearings shall be oil lubricated and shall be rated for a minimum AMBA 9, L-10 life of 10,000 hours.

I. Miscellaneous

1. Data Plates: Each pump shall be equipped with a data plate securely fastened to the pump that contains the manufacturer's name, pump size and type, serial number, pump speed, impeller data, capacity and head rating, and any other pertinent information.
2. A fabricated steel sole plate shall be provided with each pump to facilitate installation and future removal. The plate shall be provided with min. 1" diameter holes for anchor bolts and tapped holes corresponding to drilling of the pump discharge head base

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bolting. A suitably-sized hole shall be accurately cut in the center of the plate to allow passage of the pump, and the top surface shall be accurately machined to provide a perfectly flat surface for mounting the discharge head. Raw or mill finished steel plate is not considered acceptable. The base plate shall be grouted in place by the Contractor, in the position as indicated on the Plans. Anchor bolts shall be provided by the Contractor, and shall be fabricated of 304 stainless steel. Sole plate shall be minimum of 25" square x 1" thick.

3. Testing: The pump shall be performance tested prior to shipment to confirm pump performance. Test shall comply with ANSI/HI 14.6 Grade 1U requirements, and shall include, but not be limited to, checking the unit at its rated speed, capacity, head, efficiency, and brake horsepower at such conditions of head and capacity so as to properly establish the actual performance curve. Certified copies of the test reports shall be submitted for review prior to shipment. The Standards of the Hydraulic Institute shall govern the procedures and calculations for the prescribed testing.
4. Painting: All equipment comprising each pumping unit shall be painted with a potable epoxy finish by the pump manufacturer prior to shipment. Epoxy shall be Tnemec Series 21, and shall be applied to the discharge head ID/OD, column pipe ID/OD, and bowl OD. Coatings shall be minimum 10 mils DFT. All finish coating shall be provided as specified in Section 09900 - Painting. Coatings shall be NSF 61 certified.
5. All pumps shall be completely assembled, less motors, at the manufacturer's facility prior to shipment, and shall be shipped in one (1) piece. Onsite assembly of pumps will not be permitted.

J. Operation:
1. Electrical Characteristics: As specified in Division 26 – Electrical and the following:
   a. Voltage: 460/480V, 3 Phase, 60 Hz.
2. Constant-speed, across-the line/full-voltage starter

K. Fabrication:
1. Shaft Guard: Enclose shaft and universal joint with enclosed-type metal shaft guard complying with OSHA standards. Also, install a reverse ratchet to prevent the impeller from loosening if the motor turns in reverse.
2. Pump and Drive Mating Surfaces: Machine finished.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install pumps where indicated on Drawings and according to manufacturer instructions.
B. Provide and connect piping, power and control conduit, and wiring to make system operational and ready for startup.
C. Flush piping with clean water.

3.2 FIELD QUALITY CONTROL
A. Section 01400 - Quality Control: Requirements for inspecting and testing.
B. Section 01650 – Facility Startup: Requirements for testing, adjusting, and balancing.
C. Preoperational Check: Before operating system or components, perform following:
1. Check pump and motor alignment.

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2. Check for proper motor rotation.
3. Check pump and drive units for proper lubrication.

D. Startup and Performance Testing:
1. Operate each pump on clear water at design point for continuous period of two (2) hours, under supervision of manufacturer's representative and in presence of Engineer.

E. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than two (2) eight (8)-hour days on site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment

F. Verify pump performance by performing time-fill test.

G. Check pump and motor for excessive vibration according to manufacturer instructions. Check for motor overload by taking ampere readings.

H. Equipment Acceptance:
1. Adjust, repair, modify, or replace system components that fail to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

I. Provide Operations & Maintenance Manuals per Section 01 78 23.

J. Provide Training per Section 01650 – Facility Startup.

END OF SECTION

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SECTION 13100

ZONE B BOOSTER PUMP STATION CONTROL STRATEGIES

PART 1 GENERAL

1.1 SUMMARY

A. The Zone B Booster Pump Station primarily consists of the following equipment: two booster pumps, two flow control valves, and three motor operated valves. The booster pump station shall be capable of conveying flows between the following three pressure zones: Zone D, HDWD, and Zone B. The pump station shall be configured to perform five conveyance modes as defined:

1. Mode 1 conveyance of flow from Zone D to Zone B by Booster Pump 1.
2. Mode 2 conveyance of flow from Zone D to HDWD by Booster Pump 2.
3. Mode 3 conveyance of flow from HDWD to Zone B by Booster Pump 2.
4. Mode 4 conveyance of flow from Zone B to HDWD by Flow Control Valve 1.
5. Mode 5 conveyance of flow from HDWD to Zone D by Flow Control Valve 2.

1.2 DEFINITIONS

A. Hardwired Control – Control circuitry that does not utilize software to initiate functionality.

B. Hardwired Interlocks – A safety or protective feature that will interrupt operation of the equipment in all operating modes with no required operator intervention.

C. PLC Interlocks – A safety or protective feature that will interrupt operation of the equipment when the PLC has control.

1.3 SUBMITTALS

A. Refer to Section 01340.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EQUIPMENT AND INSTRUMENTATION OVERVIEW

A. The Zone B Booster Pump Station PLC Panel (PLC-CP)

The PLC-CP shall provide corresponding operator interface capabilities at both the existing plant SCADA Operator Interface Computer (OI) as well as an HMI locally at the panel. The PLC-CP shall be configured to monitor and control the following equipment and instrumentation in Table 1.0 below:

1. Table 1.0 Zone B Pump Station Equipment and Instrumentation

Equipment and Instrumentation	Label referenced herein and on Mechanical Drawings	Corresponding Tag on P&ID Drawings

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Booster Pump No. 1	BP 1	P211
Booster Pump No. 2	BP 2	P212
Flow Control Valve No. 1	FCV 1	FCV221
Flow Control Valve No. 2	FCV 2	FCV222
Motor Operated Valve No. 1	MOV 1	MOV231
Motor Operated Valve No. 2	MOV 2	MOV232
Motor Operated Valve No. 3	MOV 3	MOV233
Flow Meter No. 1	FM 1	FIT 271
Flow Meter No. 2	FM 2	FIT 071
Flow Meter No. 3	FM 3	FIT 472
Pressure Transducer No. 1	PT 1	PIT 261
Pressure Transducer No. 2	PT 2	PIT 061
Pressure Transducer No. 3	PT 3	PIT 461

2. The PLC-CP shall also monitor/display PT 1, 2, and 3 (in psi) and FM 1, 2, and 3 (in gpm). The PLC-CP shall also control the BP 1 and BP 2 Motor Control.
3. OI Display shall match P&ID. Mode direction of flow shall be highlighted on P&ID.

B. Zone B Booster Pump Station Motor Control Center

The pump station shall be furnished with a MCC featuring variable frequency drives for each booster pump. The MCC shall feature a Hand-Off-Auto switches for BP 1 and BP 2.

3.2 COMMON REQUIREMENTS

A. Setpoints and Units:
1. Flow setpoints shall be displayed and entered as Flow Rate Setpoint (gpm).
2. Batch/transfer targets shall be displayed and entered as Batch Volume Setpoint (gal). Batch transfers are manually initiated by the Operator and do not automatically start independent of the Operator.
3. Pressure values shall be displayed in psi.

B. Flowmeter Totalization:
1. Each flowmeter flow 4-20mA input shall be totalized by the PLC for totalized volume (gal).
2. Provide separate “forward” and “reverse” flow totals.
3. Clearly indicate flow direction in text and symbols on the graphics.

C. Pressure Transducer Functional Roles:
1. The PLC shall assign PT 1, PT 2, and PT 3 functional roles (Suction, Discharge, Upstream, Downstream) by conveyance mode as shown in Table 2.0 below.

Table 2.0 Pressure Transducer Function Schedule

Conveyance Mode	Functional Pressure Transducer (Suction / Upstream)	Functional Pressure Transducer (Discharge / Downstream)
1	PT 3 = Suction	PT 1 =Discharge
2	PT 3 = Suction	PT 2* = Discharge

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3	PT 2* = Suction	PT 1 = Discharge
4	PT 1 = Upstream	PT 2* = Downstream
5	PT 2* = Upstream	PT 3 = Downstream

*Note PT 2 serves as either suction or discharge pressure feedback depending on the active conveyance mode.

2. Pressure transmitters shall transmit a 4-20mA signal to the PLC for pressure indication, alarms and shutdowns as applicable.
3. Pressure-based permissives, alarms, and shutdowns shall reference the transmitter assigned to the applicable role for the active conveyance mode.

D. Pump Permissives / Shutdowns (Modes 1 through 3):
1. Prior to starting any booster pump, the PLC shall verify required permissives including (as applicable) HOA-AUTO, VFD/MCP healthy/ready, no fault, and required valve lineup/proof.
2. Protective shutdowns shall include (as applicable) low suction pressure and high discharge pressure using the pressure transmitters assigned to the active mode per Table 2.0.

E. Valve Proof / Timeouts:
1. Where MOVs and FCVs are commanded to open/close, the PLC shall require proof of position within an adjustable timeout (default 60 seconds).
2. Failure to prove position shall generate an alarm and the PLC shall execute the applicable Safe State Actions (Mode Abort) in part G below.

F. Loss of Signal:
1. Loss/bad signal for required PTs (analog) and required flowmeter inputs shall generate alarms.
2. If a failed instrument is required for the active mode's protection or control, the PLC shall execute the applicable Safe State Actions (Mode Abort) in part G below.

G. Safe State Actions (Mode Abort):
1. When a shutdown, interlock trip, valve fail-to-position, or required instrument failure occurs while a mode is active, the PLC shall annunciate Mode Abort and execute the applicable actions below:
   a. Mode 1 (Zone D to Zone B / BP-1): Command BP-1 to STOP. No MOV action is required for Mode 1.
   b. Mode 2 (Zone D to HDWD / BP-2): Command BP-2 to STOP. After BP-2 stop is confirmed (or adjustable delay, default 10 seconds), Maintain MOV lineup as last commanded for the mode.
   c. Mode 3 (HDWD to Zone B / BP-2): Command BP-2 to STOP. After BP-2 stop is confirmed (or adjustable delay, default 10 seconds), Maintain MOV lineup as last commanded for the mode.

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d. Mode 4 (Zone B to HDWD / FCV-1): Command FCV-1 CLOSED by de-energizing the solenoid. Maintain MOV lineup as last commanded for the mode.

e. Mode 5 (HDWD to Zone D / FCV-2): Command FCV-2 CLOSED by de-energizing the solenoid. Maintain MOV lineup as last commanded for the mode.

H. Totals Reset and Setpoint Changes:

1. For batch transfers (Modes 2 through 5), the PLC shall maintain a Batch Total (gal) and reset Batch Total to zero at the start of each batch.
2. Changes to Flow Rate Setpoint (gpm) shall take effect immediately.
3. Changes to Batch Volume Setpoint (gal) shall take effect immediately; if the new setpoint is less than or equal to the accumulated Batch Total, the batch shall complete immediately.

I. Alarms and Operator Feedback (Minimum):

1. Provide SCADA OI and local HMI indications/alarms for: Device HOA Not Auto, Device failure/fault, Fail-to-open/Fail-to-close for MOVs and FCVs, Mode Inhibited (with reason displayed), Flow Not Achieved (configurable delay; default 120 seconds) where flow control is active, and Batch Complete for Modes 2 through 5.

J. OI SCREENS

1. The HMI shall provide a dedicated display page for each conveyance mode. These pages shall be accessible from the main overview screen and shall display operating status, Auto/Off control status, setpoints, flows, pressures, and alarms associated with that mode.
2. Each conveyance mode may be set to either “Off” or “Auto”. Additional display page requirements, features, and PLC interlocks are described below in Part 5.

K. FCV Controls

1. The PLC shall be configured to monitor and control FCV-1 & FCV-2 and provide corresponding operator interface capabilities at the existing SCADA OI.
2. When the valve is called to open, the solenoid located on the FCV pilot tubing will become energized and either partially or fully open the valve, depending on the valve’s mechanical settings.
3. The valve shall include limit switches such that the PLC monitors valve position to indicate Closed / Not Closed / Open at the OI/HMI.
4. Valve shall have a built in check valve to prevent water from flowing in the two directions.

3.3 Pump Startup and Flow Control

A. Upon a pump-start command, the VFD shall accelerate at an adjustable rate until the flow meter indicates sustained forward flow of approximately **15 gpm, as established during startup and commissioning**. The initial flow threshold and confirmation period shall be adjustable through the PLC/HMI.

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B. Once forward flow is confirmed, the PLC shall initiate a closed-loop flow ramp from the established initial flow to the active flow setpoint. The commanded flow shall increase linearly over not less than **180 seconds**, with the PLC continuously adjusting VFD speed based on measured flow. The ramp shall not rely solely on VFD frequency.

C. The initial flow threshold, confirmation period, ramp duration, acceleration rate, and maximum startup frequency shall be adjustable through the PLC/HMI. Ramp duration shall default to 180 seconds and shall not be set below 180 seconds..

D. If forward flow is not established within the adjustable time period or before reaching the maximum startup frequency, the PLC shall stop the pump and generate a **"Pump Running - No Flow"** alarm.

E. If the active flow setpoint is less than or equal to the initial flow threshold, the PLC shall control directly to the setpoint without the 180-second ramp.

3.4 AUTO CONTROL DESCRIPTIONS

A. Mode 1 Conveyance – Zone D to Zone B

1. BP-1 shall be controlled by operator selection through the SCADA OI or local HMI by selection of either “Off” or “Auto” as displayed on the screen.
2. Instrumentation:
   a. FM-1, located on the discharge side of the BP-1 piping.
   b. PT-1 shall be used as the discharge pressure transmitter for Mode 1 per Table 2.0.
   c. PT-3 shall be used as the suction pressure transmitter for Mode 1 per Table 2.0.
3. Control:
   a. The existing SCADA monitors the liquid level of the Zone B reservoir and Zone D reservoir and the run status of Well 8. The OI screen shall feature operator-adjustable high stop level and low start level setpoints for the Zone B reservoir.
   b. While in “Auto,” the PLC will call BP-1 to run when the low level setpoint of the Zone B reservoir is reached.
      1) MOV positions are not required for Mode 1 operation.
      2) FCVs have built-in check valve and do not open in Mode 1.
   c. When BP-1 is called to run by the PLC, pump speed shall increase gradually until the Flow Rate Setpoint (gpm) is achieved as monitored by FM-1. The screen shall feature a Flow Rate Setpoint (gpm).
      1) The Flow Rate Setpoint shall be limited to a maximum of 200 gpm.
   d. When the high level setpoint of the Zone B reservoir is reached, the PLC will stop BP-1.

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e. If the low level setpoint of the Zone D reservoir is reached, the PLC will stop BP-1.

4. Displays
   a. BP-1 run status, failure alarm, auto status, HOA Not Auto status, and protective shutdown alarms shall be displayed at the OI/HMI.

B. Mode 2 Conveyance – Zone D to HDWD
1. BP-2 shall be controlled by operator selection through the SCADA OI or local HMI by selection of either "Off" or "Auto" as displayed on the screen to route flow from Zone D to HDWD.
2. Instrumentation:
   a. FM-2, located on the discharge side of the BP-2 piping.
   b. PT-2 shall be used as the discharge pressure transmitter for Mode 2 per Table 2.0.
   c. PT-3 shall be used as the suction pressure transmitter for Mode 2 per Table 2.0.
3. Control
   a. The operator will enter a Batch Volume Setpoint (gal) and Flow Rate Setpoint (gpm).
      1) The Flow Rate Setpoint shall be limited to a maximum of 200 gpm.
   b. When Conveyance Mode 2 is in "Auto," and the Operator initiates the batch operation
      1) BP-2 will be called to run based on operator input via the OI screen.
      2) Prior to BP-2 starting,
         a) MOV-1 shall be open.
         b) MOV-2 shall be closed.
         c) MOV-3 shall be closed.
         d) Valve positions proven per Section 3.2 E.
      3) Batch Total (gal) shall reset to zero at batch start. The PLC will increase pump speed gradually until the Flow Rate Setpoint (gpm) is achieved as monitored by FM-2.
   c. The PLC will maintain the Flow Rate Setpoint (gpm) until Batch Total (gal) reaches the Batch Volume Setpoint (gal). When reached, BP-2 will stop and Batch Complete shall annunciate.
   d. If the low level setpoint of the Zone D reservoir is reached, the PLC will stop BP-2 and annunciate that the Batch was abandoned.
4. Displays
   a. BP-2 run status, failure alarm, auto status, HOA Not Auto status, and protective shutdown alarms shall be displayed at the OI/HMI.

C. Mode 3 Conveyance – HDWD to Zone B

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1. BP-2 shall be controlled by operator selection through the SCADA OI or local HMI by selection of either "Off" or "Auto" as displayed on the screen to route flow from HDWD to Zone B.
2. Instrumentation:
    a. FM-1, located on the discharge side of the BP-2 piping.
    b. PT-2 shall be used as the suction pressure transmitter for Mode 3 per Table 2.0
    c. PT-1 shall be used as the discharge pressure transmitter for Mode 3 per Table 2.0.
3. Control
    a. The operator will enter a Batch Volume Setpoint (gal) and Flow Rate Setpoint (gpm).
    b. When Conveyance Mode 3 is in "Auto," and the Operator initiates the batch operation
        1) BP-2 will be called to run based on operator input via OI screen.
        2) Prior to BP-2 starting
            a) MOV-1 shall be closed.
            b) MOV-2 shall be opened.
            c) MOV-3 shall be opened.
            d) Positions proven per Section 3.2 E.
            e) Batch Total (gal) shall reset to zero at batch start.
    c. After verifying MOV positions, the PLC will call BP-2 to run and increase pump speed gradually until the Flow Rate Setpoint (gpm) is achieved as monitored by FM-1.
    d. The PLC will maintain the Flow Rate Setpoint (gpm) until Batch Total (gal) reaches the Batch Volume Setpoint (gal). When reached, BP-2 will stop and Batch Complete shall annunciate.
    e. If the high level setpoint of the Zone B reservoir is reached, the PLC will stop BP-2 and annunciate that the Batch was abandoned.
4. Displays
    a. BP-2 run status, failure alarm, auto status, HOA Not Auto status, and protective shutdown alarms shall be displayed at the OI/HMI.

D. Mode 4 Conveyance – Zone B to HDWD
1. Water will be transported via gravity through FCV-1 by operator selection through the SCADA OI or local HMI by selection of either "Off" or "Auto" as displayed on the screen to route flow from Zone B to HDWD.
2. Instrumentation
    a. FM-, located on the discharge side of the BP-2 piping.
    b. PT-1 shall be used as upstream pressure and PT-2 as downstream pressure for Mode 4 per Table 2.0.
3. Control

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a. The operator will enter a Batch Volume Setpoint (gal) and Flow Rate Setpoint (gpm).

b. When Conveyance Mode 4 is in "Auto," and the Operator initiates the batch operation

1) The PLC shall be configured to monitor and control FCV-1 and provide corresponding operator interface capabilities at the existing SCADA OIC. When the valve is called to open, the solenoid located on the FCV pilot tubing will become energized and either partially or fully open the valve, depending on mechanical settings. The valve shall include limit switches such that the PLC monitors valve position to indicate Closed / Not Closed / Open at the OIC/HMI.

2) The valve will be called to open based on operator input via OI screen.

c. Prior to FCV-1 opening

1) MOV-1 shall be closed.

2) MOV-2 shall be closed.

3) MOV-3 shall be closed.

4) Positions proven per Section 3.2 E.

d. Batch Total (gal) shall reset to zero at batch start. After FCV-1 is called open, the valve will remain open until the Batch Volume Setpoint (gal) has been reached as monitored by FM-2.

e. Once the Batch Volume Setpoint (gal) has been reached, the PLC will call FCV-1 to close and Batch Complete shall annunciate.

f. If the low level setpoint of the Zone B reservoir is reached, the PLC will call FCV-1 to close and annunciate that the Batch was abandoned.

E. Mode 5 Conveyance – HDWD to Zone D

1. Water will be transported via gravity through FCV-2 by operator selection through the SCADA OI or local HMI by selection of either "Off" or "Auto" as displayed on the screen to route flow from HDWD to Zone D.

2. Instrumentation

a. PT-2 shall be used as upstream pressure and PT-3 as downstream pressure for Mode 5 per Table 2.0.

3. Control

a. The operator will enter a Batch Volume Setpoint (gal) and Flow Rate Setpoint (gpm).

b. When Conveyance Mode 5 is in "Auto," and the Operator initiates the batch operation.

1) The PLC shall be configured to monitor and control FCV-2 and provide corresponding operator interface capabilities at the existing SCADA OI. When the valve is called to open, the solenoid located on the FCV pilot tubing will become energized

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and either partially or fully open the valve, depending on mechanical settings. The valve shall include limit switches such that the PLC monitors valve position to indicate Closed / Not Closed / Open at the OI/HMI.

2) The valve will be called to open based on operator input via OI screen.

c. Prior to FCV-2 opening

1) MOV-1 shall be closed.
2) MOV-2 shall be opened.
3) MOV-3 shall be opened.
4) Positions proven per Section 3.2 E. Batch Total (gal) shall reset to zero at batch start.
5) After FCV-2 is called open, the valve will remain open until the Batch Volume Setpoint (gal) has been reached as monitored by FM-3.

d. Once the Batch Volume Setpoint (gal) has been reached, the PLC will call FCV-2 to close and Batch Complete shall annunciate.

e. If the high level setpoint of the Zone D reservoir is reached, the PLC will call FCV-2 to close and annunciate that the Batch was abandoned.

3.5 HOA-HAND MODE INHIBITION

A. FCV-1, FCV-2, MOV-1, MOV-2, MOV-3, BP-1, and BP-2 shall each feature local Hand-Off-Auto (HOA) switches. When a device HOA is in Hand or Off, the PLC shall not issue commands to that device and shall annunciate a Device HOA Not Auto alarm at the SCADA OI/HMI. If a conveyance mode is selected in Auto and any device required for that mode is not in HOA-Auto (or is faulted/unavailable), the PLC shall inhibit that mode, generate a Mode Inhibited alarm, and display the reason(s) on the mode screen. Devices not required for the inhibited mode shall not be forced to Hand.

3.6 CONVEYANCE MODE CONDITIONAL PLC INTERLOCKS

A. Simultaneous selection of "Auto" at the SCADA OI, for multiple Conveyance Modes shall be limited depending on the initial "Auto" selection made by the operator. The following PLC interlocks occur for each Conveyance Mode:

1. When Conveyance Mode 1 is set to "Auto" while Conveyance Modes 2, 3, 4, and 5 are set to "Off":
   a. Conveyance Mode 3 remains in "Off".
   b. Conveyance Mode 4 remains in "Off".
   c. Conveyance Mode 2 may then be set to "Auto" while Conveyance Mode 5 remains in "Off" OR Conveyance Mode 5 may then be set to "Auto" while Conveyance Mode 2 remains in "Off".
2. When Conveyance Mode 2 is set to "Auto" while Conveyance Modes 1, 3, 4, and 5 are set to "Off":
   a. Conveyance Mode 1 may then be set to "Auto".
   b. Conveyance Mode 3 remains in "Off".

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c. Conveyance Mode 4 remains in “Off”.
d. Conveyance Mode 5 remains in “Off”.

3. When Conveyance Mode 3 is set to “Auto” while Conveyance Modes 1, 2, 4, and 5 are set to “Off”:
   a. Conveyance Mode 1 remains in “Off”.
   b. Conveyance Mode 2 remains in “Off”.
   c. Conveyance Mode 4 remains in “Off”.
   d. Conveyance Mode 5 may then be set to “Auto”.
4. When Conveyance Mode 4 is set to “Auto” while Conveyance Modes 1, 2, 3, and 5 are set to “Off”; Conveyance Modes 1, 2, 3, and 5 remain in “Off”.
5. When Conveyance Mode 5 is set to “Auto” while Conveyance Modes 1, 2, 3, and 4 are set to “Off”:
   a. Conveyance Mode 1 remains in “Off”.
   b. Conveyance Mode 2 remains in “Off”.
   c. Conveyance Mode 3 may then be set to “Auto”.
   d. Conveyance Mode 4 remains in “Off”.

3.7 INTEGRATOR SERVICES

A. Programming and configuration to be provided as part of the contract by the following:

Michael Crabtree
760-881-4865

Forshock
13782 Bear Valley Road D-3 #25
Victorville, CA 92392

END OF SECTION

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SECTION 13200

D1 Booster Pump Control Strategies

PART 1 – GENERAL

1.1 Summary

A. This Section defines the control strategy, minimum instrumentation, interlocks, alarms, and operator interface requirements for the D-1 Booster Pump Station, consisting of a single vertical turbine pump (Pump P-413), supplying water from R-1 Reservoir to Reservoir D.

B. Control shall be level-based.

1.2 Design Intent

A. Automatically transfer water from R-1 Reservoir to Reservoir D while:

1. Protecting the pump and piping from abnormal conditions (deadhead/high pressure, loss of prime/no flow, low source level).
2. Providing clear operator control and feedback at SCADA OIC and local panel interface.
3. Providing trendable flow and status points.

1.3 Definitions

A. AUTO: Pump is available for remote automatic operation via SCADA/RTU.

B. HAND: Local operation only (no remote commands).

C. OFF: Device inhibited/disabled.

D. Run-but-No-Flow: Pump commanded to run but flow signal is not detected (or flow remains below threshold) after an adjustable delay.

PART 2 – PRODUCTS / INSTRUMENTATION

2.1 Instruments and Signals

A. Flow Meter (Magmeter), FE/FIT-471

1. Provide 4-20mA output to RTU/PLC.
2. RTU shall calculate totalized volume (gal) and other Owner standard flow calculations.

B. High Discharge Pressure Switch, PSH-413

1. Provide a field-adjustable pressure switch on the D-1 pump discharge header.
2. PSH-413 shall be hardwired to the PLC for alarming and to the pump starter to initiate pump shutdown and alarm.
3. Setpoint shall be coordinated with pump shutoff head, system pressure rating, and surge allowance.

C. Existing Level Signals (Off site)

1. R-1 Reservoir Level: Existing RTU-monitored level shall be used for source low-low protection and inhibit.
2. Reservoir D Level: Provide/confirm SCADA/RTU level indication for start/stop control.

D. Motor Interface (P-413)

Provide pump status/feedback to RTU/PLC at minimum:

1. Run status
2. Fault status

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3. Auto Status

E. Motor Space Heater

Motor space heater is hardwired through the pump elementary diagram. Heater shall be automatically energized whenever the motor is de-energized and shall be automatically de-energized whenever the motor is commanded to run or motor run status is proven.

PART 3 – CONTROL NARRATIVE / EXECUTION

3.1 Operator Interface (SCADA)

A. Provide a dedicated SCADA screen for D-1 Booster Pump (P-413) displaying (*at minimum): SCADA screens shall match Owner Standard layout

1. Mode selection: OFF / AUTO
2. Live values: Flow (gpm), Totalized Volume (gal), R-1 Level, Reservoir D Level
3. Pump: Run, Fault, Auto , and Mode Inhibited/Reason
4. Setpoints
5. Alarm banner and event logging

3.2 Automatic Operation Logic (Level-Based with Flow Control)

A. AUTO Enable

1. Pump shall only start automatically when operator has selected AUTO and all permissives are satisfied.

B. Start Conditions (AUTO)

1. Start P-413 when Reservoir D level is at or below Start Level Setpoint (Low).
2. Start shall be inhibited if
   a. R-1 Reservoir level is at or below R-1 Low-Low Level Setpoint (LL).
   b. Motor starter indicates fault/not ready
   c. HOA not AUTO

C. Pump Control

1. Upon a valid start, RTU/PLC shall issue RUN command to the starter and the pump shall run at full speed.

D. Stop Conditions (AUTO) – Stop P-413 if

1. Reservoir D level reaches Stop Level Setpoint (High).
2. Or R-1 Reservoir level falls to R-1 Low-Low Level Setpoint (LL).
3. Or any protective shutdown/interlock trip (see 3.3).

E. Anti-Short-Cycle

1. Provide minimum off-time before automatic restart (adjustable; default 5 minutes).

3.3 Protective Shutdowns and Interlocks

A. High Discharge Pressure (PSH-413)

1. If PSH-413 trips, RTU/PLC shall remove start command P-413 and annunciate High Discharge Pressure alarm.
2. Pump shall remain inhibited until PSH condition clears and operator manually resets alarm at Pump Station.

B. Run-but-No-Flow Protection

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1. After a start command, if flow remains below a minimum threshold (adjustable; default 10 gpm) within an adjustable delay (default 60 seconds), RTU/PLC shall:
   a. Command P-413 to stop, and
   b. Annunciate No Flow / Fail to Pump alarm.
2. If pump is running and flow drops below the threshold for an adjustable delay (default 30 seconds), RTU/PLC shall alarm Low/No Flow While Running and stop the pump (unless Owner prefers alarm-only; select one approach and keep consistent).

C. Loss of Signal

1. If flow input is lost/invalid while pump is commanded to run, annunciate Flow Signal Failure and stop the pump (safe-state).
2. If level signal required for control is invalid/unavailable, annunciate Level Signal Failure and inhibit AUTO start (and stop if running, if required for protection).

D. Starter Fault

1. Motor fault shall stop the pump and annunciate Pump Fault.
2. Include Fail-to-Start alarm if run status is not proven within an adjustable delay after start command (default 10 seconds).

3.4 Status Indications and Alarms

A. Provide at minimum the following alarms/indications at SCADA OI (and local HMI if provided):

1. Pump Run, Pump Commanded Run, Pump Fail/Fault, HOA Not Auto
2. High Discharge Pressure (PSH-413)
3. No Flow / Fail to Pump; Low/No Flow While Running
4. R-1 Low-Low Stop / Inhibit
5. Reservoir D Start/Stop level reached (optional event)
6. Mode Inhibited (with reason display)
7. Intrusion (building door switch is open)

3.5 Safe State

A. On any protective shutdown, RTU/PLC shall command P-413 STOP and place the control mode into OFF or INHIBITED (per Owner standard) until acknowledged/reset by operator.

3.6 Programming Services

A. Programming and configuration to be provided as part of the contract by the following:

Michael Crabtree
760-881-4865

Forshock
13782 Bear Valley Road D-3 #25
Victorville, CA 92392

END OF SECTION

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SECTION 15042
HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section includes hydrostatic pressure and leakage testing of pressure pipelines and appurtenances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. All related work specified elsewhere, or in other codes or standards, will be as last revised, unless a specific date of issuance is called out in opposition to later revision date(s).

1.3 SUBMITTALS

A. Hydrostatic test plan including proposed test section limits; test bulkhead/test plate locations; thrust restraint and attachment details; methods to prevent excessive pipe wall stresses; blocking to overcome thrust conditions; test pressure calculations including elevation adjustments and maximum allowable pressure; filling/venting plan; dewatering/discharge plan; and calibration certificates for gauges, meters, and recorders.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

A. Provide calibrated pressure gauge(s) (minimum 4-inch dial) with range such that the test pressure is between 30% and 70% of full scale; calibration within the previous 12 months. Provide calibrated recorder/data logger if required, test pump, hoses, fittings, temporary piping, pressure relief device, and a calibrated water meter or other graduated measuring device for verifying make-up water (if applicable).

PART 3 – EXECUTION

3.1 TESTING PREPARATION

A. All labor, materials, tools, and equipment for testing shall be furnished by the Contractor.

B. Prior to hydrostatic pressure testing new pipelines which are to be connected to existing pipelines, isolate the new pipeline from the existing pipeline by means of test bulkheads, test plates, or blind flanges. Continue with connection work after the new pipeline has been successfully tested and approved by the Owner.

C. The Contractor shall provide the BDVWA with a minimum of 3 days' notice prior to the requested date and time for any preliminary hydrostatic test and 7 days' notice prior to the requested date and time for hydrostatic pressure tests.

D. Subject the pipeline and appurtenances to a hydrostatic pressure test after the pipe has been laid and backfilled with a minimum of 36 inches of cover for required restraint. For pipelines which use concrete pipe anchors, collars, encasements and thrust blocks as part of their restraint system, allow concrete to cure in accordance with Section 03002. Do not commence testing until thrust restraint concrete has achieved the minimum compressive strength required for testing (minimum 2,000 psi unless otherwise approved).

E. Contractor shall provide source of water, shall make all connections with the water source, transporting the water, and all other arrangements concerning the water to be used for the pipeline hydrostatic pressure test. Use only metered potable water for the hydrostatic pressure test. **Provide a reduced pressure backflow prevention assembly** if source of potable water is from Owner waterlines. Provide temporary piping to convey and dispose

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of the water used in the pipeline. Disconnect and remove temporary piping after successful completion of the hydrostatic pressure test.

F. No testing will be allowed against existing valves. All testing shall be performed in the presence of the Engineer or their designee.

G. **Test pressure shall be measured at the lowest point of the test section.** Where the pressure gauge is located at a higher elevation than the lowest point, decrease the gauge pressure by 0.433 psi per foot of elevation difference to maintain the specified test pressure at the low point.

H. All pipelines shall be satisfactorily tested prior to the placement of final pavement.

3.2 CLEANING

A. Before conducting hydrostatic pressure tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 3 fps for water testing. Flush pipes for time period as given by the formula:

T = 2L/3

Where:

T = Flushing Time (seconds)

L = Length of Pipe (feet)

B. The Contractor shall submit the proposed location for disposal of flush out water for review and approval of the BDVWA.

3.3 LENGTH OF TEST SECTION

A. Due to excessive length or elevation difference, it may be necessary to test the pipeline in sections. In any one test, do not exceed more than 2,500 feet, the distance between closed valves, or as directed by the Engineer. In any one section, conduct the test so that no pipe section is tested at less than the required test pressure, nor more than 1-1/2 times the pipe pressure class.

3.4 INITIAL PIPELINE FILLING

A. Maximum rate of filling with test fluid shall not cause water velocity in pipeline to exceed 1 foot per second. Expel air from the pipeline while filling and prior to testing. Provide necessary outlets to fill and test pipeline. The following table has been provided to relate the velocity filling rate to an equivalent volume flow rate. Provide temporary blowoffs/vents at high points as required to expel air. Fill and vent slowly to minimize trapped air.

Approximate filling rate in gpm equivalent to filling velocities of 1fps:

Nominal Size (inches)	Flow Rate Q (gpm)
4	40
6	90
8	160
12	355
16	625
20	980
24	1410
30	2200

B. Allow 24 hours for the water filled pipeline to soak and release entrapped air prior to testing. Pipelines with cement-mortar lining shall be filled with water and placed under a minimum pressure of 25 psi for at least 72 hours prior to the hydrostatic pressure test.

3.5 PRESSURE AND DURATION OF TEST

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A. After the pipeline has been filled, the pipeline shall be subjected to the following field hydrostatic test pressures:
   1. All pipeline improvements within Volume 1 Drawings 200 psi
   2. All pipeline improvements in Volume 2 Drawings 150 psi
   3. All piping associated within the pump station improvements of Volume 3 Drawings:
      a. Zone D1 Booster Pump mechanical piping 150 psi.
      b. Zone B Booster Pump Station mechanical piping 200 psi.

B. After reaching the specified test pressure, isolate the test section and allow a stabilization period (minimum 15 minutes) to permit temperature equalization and dissipation of entrapped air before beginning the official test period. Maintain pressure with the pump isolated except as necessary to restore test pressure during the stabilization period.

C. Begin the 2-hour test period after completion of stabilization and maintain zero leakage for a minimum of 2-hours.

D. The test shall be discontinued if a large quantity of water is required to increase the pressure during testing. The source of the problem, such as entrapped air, leakage at joint, or broken pipe, shall be identified and corrected. After repairs or corrections are made the pipe shall be retested for a full two-hour period.

3.6 ALLOWABLE LEAKAGE

A. The allowable leakage for aboveground and buried piping having threaded, soldered, welded, flanged, push-on joint, mechanical joint, and elastomeric gasket joint shall be zero. No visible leakage is permitted at any joint, fitting, valve, appurtenance, or temporary bulkhead. Correct leaks and retest.

3.7 BULKHEAD AND TEMPORARY EQUIPMENT REMOVAL

A. After a satisfactory hydrostatic pressure and leakage test, proceed with disinfection in accordance with Section 15140. Maintain test bulkheads/isolation until both hydrostatic testing and disinfection are accepted (unless otherwise approved). Upon acceptance: drain test water as approved; remove test bulkheads, temporary valves and piping, and other test facilities; connect to existing facilities; and restore pipe coatings.

END OF SECTION

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SECTION 15060
PVC AND DUCTILE IRON PIPING
SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY
A. Section Includes
   1. All piping systems, components, and accessories.

1.2 QUALITY ASSURANCE
A. Reference Standards: see Part 2 - Products

1.3 SUBMITTALS
A. Shop Drawings
   1. See Section 01340 for submittal requirements.
   2. Method of connections to existing piping.
   3. Product technical data showing compliance with specifications.
      a. Pipe
      b. Fittings
      c. O-rings and gaskets
      d. Insulation and heat tracing
      e. Other components
   4. Piping pressure test date notification and test results.
   5. Manufacturer's product data for all devices and appurtenances
      a. Manufacturer's certification for proposed application for fabricated pipe restraints

B. Operation and Maintenance Manuals
   1. See Section 01340 for:
      a. The submittal process
      b. The submittal contents

1.4 DELIVERY AND HANDLING
A. Protect pipe during transit and handling per manufacturer's recommendations
B. Repair damage to pipe per manufacturer's recommendations. Replace pipe which cannot be repaired satisfactorily.
C. All PVC pipe and fittings shall be protected from direct UV light exposure while stored on site.

PART 2 – PRODUCTS

Potable Water Contact Compliance: All materials and products in contact with potable water (pipe, fittings, gaskets, lubricants, coatings, linings, couplings, bolts, etc.) shall be certified to NSF/ANSI/CAN 61 and NSF/ANSI/CAN 372.

2.1 ACCEPTABLE MANUFACTURERS
A. The following manufactures are acceptable subject to compliance with the specifications:
   1. Quick connect couplings:
      a. Kamlok, Dixon, or equal
   2. Insulating unions:
      a. Epco, or equal
   3. Pipe supports:
      a. Anvil, or equal
   4. Pressure and temperature gages
      a. Ametek, Ashcroft, or equal
   5. Pipe insulation

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a. Manville Corporation, or equal
6. Heat tracing
a. Vent Raychem (formerly Tyco, or equal

2.2 PIPING COMPONENTS

A. Quick connect couplings
1. Couplings:
a. Tank truck flanged adaptor
b. Aluminum
c. 4 inch: Aluminum cap, Kamlok 633LAS, Dixon Adapter Flange, or equal
d. 6 inch: Aluminum cap, threaded aluminum fitting, PVC or Cast Iron threaded 150# flange

B. Reducers
1. As required to mate pipe to equipment connections

C. Coating and linings:
1. As specified in pipe schedules and Section 09900
2. Provide for pipe, fittings, and appurtenances.

D. Insulating flanges and unions:
1. Flanges:
a. Dielectric gasket with insulating washers
b. Flat faced
c. Rated for 175 psi, 210 Deg F.
2. Unions:
a. Threaded
b. Rated for 175 psi, 210 Deg F.
c. Dielectric gaskets

E. Flexible couplings
1. Stainless steel with liners
2. Restraining bolts except for natural gas piping.
3. Suitable for pressure rating of piping system

F. Pipe transitions for differing pipe and sizes
1. Adapters and special connections pieces as required
2. All pipe transition fittings restrained

I. Tracer wire: See Section 02201, Trenching.

2.3 PIPE

A. Ductile Iron Pipe
1. Pipe
a. Pipe: AWWA C115, C151
b. Pressure Class: minimum 250
c. Fittings and Flanges: AWWA C110, C115
d. Flanges drilled and faced per ANSI B16.1
e. Exposed nuts and bolts: Type 316 stainless steel or hot-dip galvanized carbon steel (ASTM A307 with zinc coating per ASTM A153), threaded per ASME B1.1, with ends projecting 1/4 IN beyond nuts; provide washers of same material. Apply anti-seize suitable for potable-water service.
f. Buried nuts and bolts: Corrosion-resistant T-bolts and nuts per AWWA C111 (e.g., Cor-Blue coated), or Type 316 stainless steel where specified; apply anti-galling compound on stainless threads.Gaskets: 1/8-inch SBR or EPDM meeting AWWA C111 for potable water; service rating equal to the joint/pipeline rating; temperature up to 180°F.
g. Buried pipe and fittings:
i. Polyethylene encased per AWWA C105 (V-Bio enhanced). Install per AWWA C105, Appendix A, with intact, sealed encasement at joints, fittings, and appurtenances.
ii. Push on or mechanical joint as scheduled.

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iii. Restrained joints unless otherwise shown in pipe schedules or drawings.

2. Manufactured units
   a. Flanged coupling adaptors:
      1. ROMAC RFCA, or equal
      2. Minimum operating pressure rating 300 psi
      3. Grade 30 rubber gaskets
   b. Compression sleeve couplings:
      1. ROMAC 400 RG Restraint Coupling, or equal
      1. Minimum operating pressure rating 300 psi
      2. Grade 30 rubber gaskets
   b. Mechanical joint restraints:
      1. EBAA Megalug Series 1100, or equal.
      2. Minimum operating pressure rating 300 psi
   c. Field-installed flange adaptors (plain end-to flange)
      1. ROMAC Field Flange, or equal
      2. Minimum operating pressure rating 300 psi
      3. Grade 30 rubber gaskets
3. Pipe and fittings exposed to atmosphere
   a. Field paint exposed pipe per Section 09900
4. Lining and coating
   a. Lining: Concrete per AWWA C104 with bituminous coating
   b. Above grade exterior: Do NOT apply bituminous exterior coating or shop primer, field prep and coat pipe per Section 09900.
   c. Buried Coating: shop applied bituminous coatings.
5. Installation
   a. Install per AWWA C600 and manufacturer's instructions
   b. Flange joints
      1. Maximum tolerance for flange face from normal to pipe axis: 0.005 IN per foot of pipe diameter
      2. Coordinate bolt drilling locations with piping, valves, and equipment.
   c. Install bonding jumpers on buried piping

B. PVC Pressure Pipe

Install PVC pressure pipe and appurtenances per AWWA C605 and manufacturer's instructions.

1. AWWA C900-16, 4 in. through 48 in.
2. Standard 20-foot laying lengths
3. AWWA Pressure Class 305, DR 14 rating unless noted otherwise on Drawings.
4. Fittings: Ductile iron AWWA C110, concrete lining as specified for ductile iron pipe
   a. High deflection couplings not allowed
   b. Maximum 305 psi working pressure
   c. Restrained fittings connector:
      i. Push- On: EBAA Megalug, Romac Romagrip, or equal
      ii. Mechanical Joint: EBAA Megalug Series 2000PV, no approved equal.
      iii. Same pressure rating as pipe system.
   b. Transition Couplings
      i. Bolted sleeve-type couplings: AWWA C219. Mechanical-joint adapters: AWWA C110/C153. Gaskets and bolts: AWWA C111.
      ii. Located within restrained areas: EBAA Megalug 2000 (PVC) and EBAA 1100 (DIP), no approved equal.
      iii. Same pressure rating as pipe system.
5. Restrained system for bell and spigot PVC pipe joints
   a. Restrained Joints shall be provided by a clamping ring and an additional ring designed to

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seat on the bell end of the pipe.
b. The rings shall be connected with T-Head bolts or rods.
c. Restraining devices shall provide full (360 degree) support around the circumference of the pipe.
d. No point loading shall be permitted.
e. Restraint of mechanical joint fittings shall be provided by a clamping ring installed on the PVC pipe and connected to the mechanical joint fitting with T- Head bolts or rods.
f. Restraining devices shall meet or exceed the requirements of ASTM F-1674: Standard Test Method for Joint Restraint Products for Use with PVC Pipe.
g. Fully restrain pipeline lengths as indicated on the draws in plan, profile, or details.
h. All bolts and tie rod materials shall be either high strength cast iron containing a minimum of 0.5% copper or high-strength, low alloy steel, as specified in AWWA C-111 for buried mechanical joints.
i. Same pressure rating as pipe system.
j. For diameters 4 to 12 inches EBAA Series 1900, no approved equal.
k. For diameters 14 inches or greater EBAA Series 2800, no approved equal.

2.4 PIPE SUPPORTS

A. See Drawings for pipe support types and construction
B. Pipe support spacing
1. Steel and ductile iron pipe
a. 1-1/2 IN and less: 5 FT max span
b. 2 thru 4 IN: 10 FT max span
c. 5 thru 8 IN: 15 FT max span
d. 10 IN and larger: 20 FT max span
2. PVC pipe
a. 1-1/4 IN and less: 3 FT max span
b. 1-1/2 thru 3 IN: 4 FT max span
c. 4 IN and larger: 5 FT max span
C. Field paint pipe supports per Section 09900

PART 3 – EXECUTION

3.1 INSTALLATION OF BURIED PIPING

A. Provide a minimum of 48 IN of cover unless otherwise show.
B. Installation of ductile iron piping to comply with: AWWA C600
C. Do not deflect joints at fittings unless approved by Engineer
1. PVC C900: use integral bell-end pipe. Joint deflection shall not exceed manufacturer's limits; minimum field-bend radius shall meet the specific manufacturer's recommendation. Do not field-bend at fittings.
D. Provide underground hazard warning tape.
1. Terra Tape, or equal.
E. Install Tracer Wire per Section 02201.
F. Provide insulating components for dissimilar pipe connections.
G. Concrete blocking:
1. Thrust block mix per Section 03002.
2. Provide thrust blocks at all connections to existing Asbestos Cement piping including locations where thrust blocks are not called for on the drawings.
3. For connections to existing PVC, ductile iron, or steel piping use thrust blocks or mechanical restraints as indicated on drawings.
4. Bearing area as indicated on the Drawings.

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5. Extend from fitting to solid undisturbed earth.
6. Installed so joints are accessible for repair.
7. If adequate support against undisturbed earth cannot be obtained, provide metal harness anchorages across the joint and secure by anchoring to the pipes or fittings or other anchorage facilities as required for adequate support.
8. If the lack of a solid vertical excavation face is due to improper excavation, all excess costs shall be borne by Contractor.
9. Maintain all joints, nuts and bolts free of concrete.

F. Protection for Buried Flanges
1. Ductile Iron Pipe: Polyethylene encased per AWWA C105, without tears or openings, sealed around flanges, couplings, and buried valves
   a. Securely terminated and sealed at connections to other pipe materials
2. Where not encased in polyethylene tube.
   a. All buried, flanged non stainless steel ferric piping surfaces such as flanged valves, flanged couplings, flanged coupling adapters, and flange to flange connections, shall be wrapped with petrolatum wax tape coating in accordance with AWWA C-217.
   c. Alternative manufactured tape and coating products will be allowed subject to approval of Engineer.
   d. The fittings and bolts surfaces shall be primed with a blend of petrolatum, plasticizer, insert fillers, and corrosion inhibitor having a paste-like consistency.
   e. Filling covering material shall be a synthetic felt tape, saturated with a blend of petrolatum plasticizers, and corrosion inhibitors that is easily formable over irregular surfaces.
   f. The primed and wax-tape wrapped fitting shall be wrapped with plastic tape covering consisting of 1.5 mil, polyvinylidene chloride or metallocene resin material. The tape shall have high dielectric strength, be stretchable and be able to conform well to irregular shapes.
3. All pipe sections shall be fully inspected by the Engineer before the pipe is backfilled.

3.2 INSTALLATION OF EXPOSED PIPING

A. Support pipe as detailed on drawings and as specified herein.
B. Bushings not allowed for pipe reductions.
C. Pipe stuffing box leakage to floor drain
D. Equipment piping connections
1. Install pipe in a manner to minimize stresses on equipment flanges.

3.3 CONNECTIONS TO EXISTING PIPING

A. Provide appropriate pipe fittings
B. Make connections in a timely manner
C. Remove, handle and dispose of Asbestos Cement Pipe per Section 028213.19 when connecting to existing asbestos cement pipe.

3.4 ACCESS

A. Provide adequate access doors or panels to service piping

3.5 PIPE TESTING

A. See Section 15042 for complete Hydrostatic Pressure Testing Schedule and Requirements.

3.6 CLEANING AND DISINFECTION

A. Cleaning and Protection Prior to Disinfection:
1. Keep pipe interiors clean, dry, and free of debris. Cap or plug all open ends with tight, watertight covers whenever installation is not actively underway (breaks, overnight, weather delays). Replace any cover that becomes contaminated.
2. Storage/handling: Store pipe on dunnage above grade; protect bells/spigots from dirt and standing water. Keep gaskets and lubricants clean and in closed containers; use only potable-water–approved lubricants. Do not drag spigots on the ground.
3. Trench water control: Prevent entry of rain or groundwater into the pipe. Dewater trenches as required; bypass surface flows; keep the pipe ends above any standing

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water.

4. Before assembly: Wipe or swab each spigot and bell to remove dirt and grit. Where practical, swab bells/spigots, fittings, and appurtenance interiors with a ~1% hypochlorite solution immediately prior to assembly (sanitary precaution; not final disinfection).
5. During installation: Keep the upstream open end capped except when inserting a stick. Immediately recap after each joint is made. Keep valves/hydrants bagged/covered until installation.
6. Debris removal: After each installed reach (and at the end of each workday), pull a clean, tight-fitting foam swab (pig) through the segment to remove loose material. Do not use abrasive pigs on PVC.
7. Pre-disinfection flushing: Provide temporary blowoffs and sampling taps at main ends, branches, and dead-ends. Prior to formal disinfection, flush at ≥ 3 ft/s until discharge runs clear. Submit the Contractor's calculation of required flushing flow rates and durations for each pipe size. Handle and dispose of water in accordance with local requirements (dechlorinate if chlorinated water was used).
8. Contamination response: If any segment is exposed to sewage, animals, hydrocarbon spills, trench water, or visible biofilm, notify the Engineer. Remove and replace the segment, or clean, swab, and flush as directed before proceeding.
9. Housekeeping: Keep interiors free of cutting filings, gasket tails, rags, tape, and tools. Maintain daily cleaning logs identifying reaches installed, swabbed, and flushed.

B. Final Disinfection: Perform final chlorination, flushing, and bacteriological testing under Section 15140 – Disinfection of Potable Water Systems.

END OF SECTION

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SECTION 15061
BRASS PIPING AND FITTINGS

PART 1 – GENERAL

1.1 SUMMARY
A. Section Includes
   1. Threaded brass pipe and fittings for potable cold-water service
   2. Pipe nipples, couplings, elbows, tees, unions, and adapters.
   3. Thread sealants and joint compounds approved for potable water.
   4. Pipe supports, hangers, and accessories associated with brass piping systems.
   5. Installation, testing, and cleaning of brass piping systems.

1.2 QUALITY ASSURANCE
A. Reference Standards: Comply with the latest adopted editions of the following, except where more stringent requirements are specified
   1. ASME B1.20.1 – Pipe Threads, General Purpose (Inch)
   2. ASTM B43 – Standard Specification for Seamless Red Brass Pipe, Standard Sizes
   3. ASTM B687 – Standard Specification for Brass, Copper, and Chromium-Plated Pipe Nipples
   4. ASTM B16 – Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes (for fittings)
   5. NSF/ANSI/CAN 61 – Drinking Water System Components – Health Effects
   6. NSF/ANSI/CAN 372 – Lead Content of Plumbing Products
   7. MSS SP-58 – Pipe Hangers and Supports – Materials, Design, and Manufacture
   8. All fittings shall be lead free

1.3 SUBMITTALS
A. Shop Drawings
   1. See Section 01340 for submittal requirements.
   2. Manufacturer's product data for:
      a. Brass pipe
      b. Brass fittings
      c. Unions
      d. Thread sealants and compounds
   3. Certification that all brass piping components comply with:
      a. NSF/ANSI/CAN 61
      b. NSF/ANSI/CAN 372
   4. Installation details showing:
      a. Threaded joint connections
      b. Transitions to other piping materials
      c. Support and hanger locations
B. Test Reports
   1. Pressure test notification and results.
   2. Written certification of successful pressure testing.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Protect pipe during transit and handling per manufacturer's recommendations
B. Store materials above grade on dunnage.
C. Keep threaded ends capped or plugged until installation.
D. Replace damaged or deformed pipe or fittings; repair is not permitted.

PART 2 – PRODUCTS

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2.01 POTABLE WATER CONTACT COMPLIANCE

All materials and products in contact with potable water (pipe, fittings, thread sealants, unions, lubricants, etc.) shall be certified to **NSF/ANSI/CAN 61** and **NSF/ANSI/CAN 372**.

2.02 ACCEPTABLE MATERIALS

A. Brass Pipe
1. Material: Seamless red brass
2. Standard: ASTM B43 or ASTM B687
3. End Connections: Threaded (NPT)
4. Pressure Rating: Minimum 250 psi or Schedule 40.
5. Service: Potable water
6. Brass piping shall be dezincification-resistant alloy

B. Brass Fittings
1. Material: Forged or cast brass suitable for potable water
2. Threaded in accordance with ASME B1.20.1
3. Types:
    a. 90-degree elbows
    b. 45-degree elbows
    c. Tees
    d. Couplings
    e. Unions
    f. Adapters
4. Pressure Rating: Minimum 200 psi

C. Unions
1. Threaded brass unions
2. Pressure rating equal to or greater than piping system
3. Suitable for potable water service

2.03 THREAD SEALANTS

A. Use only thread sealants approved for potable water service.
B. Acceptable types:
1. PTFE tape meeting NSF/ANSI 61
2. PTFE-based pipe joint compound meeting NSF/ANSI 61
C. Do not use oil-based or petroleum-based compounds not approved for potable water.

2.04 PIPE SUPPORTS AND HANGERS

A. Pipe supports shall comply with MSS SP-58.
B. Material: Galvanized steel or stainless steel.
C. Support spacing: Same as ductile iron pipe:
    1. 2 through 4 IN: 10 FT maximum span
D. Supports shall prevent:
    1. Sagging
    2. Joint stress
    3. Vibration transmission
E. Field paint exposed supports per Section 09900.

PART 3 – EXECUTION

3.01 INSTALLATION – GENERAL

A. Install brass piping in accordance with:

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1. Manufacturer's instructions
2. Applicable ASTM and ASME standards

B. Use brass piping only in exposed, above-grade locations.
C. Do not bury brass piping unless specifically shown on Drawings.

3.02 THREADING AND JOINT ASSEMBLY

A. Cut pipe square and ream to full inside diameter.
B. Threads shall be clean, sharp, and concentric.
C. Thread engagement:
1. Full engagement without bottoming
2. No cross-threading permitted

D. Apply thread sealant evenly to male threads only.
E. Tighten joints using proper tools; do not overstress fittings.
F. Backing off threaded joints to align piping is not permitted.

3.03 INSTALLATION OF EXPOSED PIPING

A. Install piping plumb, level, and true to alignment.
B. Cut brass pipe to fit accurately between fittings.
C. Provide unions at:
1. Equipment connections
2. Locations requiring future disassembly

D. Minimize stress at equipment connections.
E. Bushings are not permitted for size reductions; use reducing fittings only.
F. Protect brass piping from contact with dissimilar metals where galvanic corrosion could occur.

3.04 CONNECTIONS TO OTHER PIPE MATERIALS

A. Provide dielectric separation where connecting to steel or ductile iron piping.
B. Use threaded adapters specifically designed for transition between materials.
C. Ensure pressure rating compatibility across connections.

3.05 PIPE TESTING

A. Test brass piping as part of the potable water system.
B. Test pressure: As specified in Section 15042.
C. Zero leakage permitted.
D. Repair and retest all leaks.

3.06 CLEANING AND DISINFECTION

A. Keep pipe interiors clean during installation.
B. Cap open ends when work is not in progress.
C. Remove all debris prior to testing.
D. Final disinfection shall be performed under Section 15140 – Disinfection of Potable Water Systems.

3.07 FIELD QUALITY CONTROL

1. Inspect all threaded joints prior to pressure testing.
2. Verify support spacing and alignment.
3. Correct deficiencies prior to acceptance.

END OF SECTION

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SECTION 15100

VALVES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Valves, valve actuators, and valve appurtenances.

1.2 QUALITY ASSURANCE

A. Reference Standards: see Part 2 – Products, and The American Society for Testing and Materials (ASTM)

1.3 SUBMITTALS

A. Shop Drawings
   1. See Section 01340 for submittal requirements.
   2. Product technical data showing compliance with specifications.
      a. Pressure and temperature rating
      b. Materials of construction
      c. Dimensions and weight
      d. Flow coefficients
      e. Electrical and control diagrams

B. Operation and Maintenance Manuals
   1. See Section 01340 for:
      a. The submittal process
      b. The submittal contents

PART 2 – PRODUCTS

2.1 MATERIALS

1. All valve construction, material, and pressure ratings shall be selected to suit the system in which installed. Pressure rating and manufacturer's name shall be cast on each valve body. Where specified, valves shall be supplies fully packed with Teflon impregnated packing. Where possible, valves shall be of one manufacturer.
2. Stems of all bronze valves shall be silicon bronze or similar alloy to prevent de-zincification. Alloy shall have minimum tensile strength of 60,000 psi, minimum yield point of 24,000 psi per ATSM B584.

2.2 ACCEPTABLE MANUFACTURERS

A. The following manufactures are acceptable subject to compliance with the specifications:
   1. Gate valves
      a. Mueller, no substitutions.
   2. Plug valves:
      a. Non-lubricated: DeZurik, Millikin, Homestead, Pratt, Val-Matic, M&H, or equal
      b. Lubricated: Millikin, Homestead, or equal
   3. Ball valves:
      a. Nibco, Watts, or equal
   4. Check valves:
      a. CLOW, Mueller, Val-Matic, or equal
   5. Butterfly valves:

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a. Mueller, no approved equal.

6. Air-Relief/ Vacuum Valves
   a. DeZurik (APCO), ARI, no approved equal.
7. Flow Control Valves
   a. Cla-Val, no approved equal.
8. Surge Relief Valves
   a. Dezurik (APCO), no approved equal.

2.3 GATE VALVES

A. General
   1. Provide 6-inch resilient-seated gate valves for potable water service, buried below grade, at locations shown on the Drawings.
   2. Valves shall comply with AWWA C509 or AWWA C515.
   3. Valves shall be non-rising stem (NRS).

B. Pressure Rating
   1. Minimum working pressure rating: 250 psig.

C. Materials
   1. Body and Bonnet: Ductile iron, ASTM A536.
   2. Wedge: Ductile iron with fully encapsulated resilient seat (EPDM or NBR) suitable for potable water.
   3. Stem: Stainless steel (Type 304 minimum; Type 316 preferred).
   4. Stem Nut: Bronze.
   5. Coating: Fusion-bonded epoxy or epoxy coating suitable for potable water service (NSF/ANSI 61).

D. Connections
   1. End Connections: Flanged, flat-face.
   2. Flange drilling shall match ANSI B16.1 Class 125 / ASME B16.5 Class 150 (125/150 drilling) unless noted otherwise on the Drawings.
   3. Provide full-face gaskets for buried flat-face flange connections.

E. Operators
   1. Provide 2-inch AWWA operating nut (square) for buried service.
   2. Provide, key riser, valve box, cover, as required for depth of bury and final grade.
   3. Valve box shall be centered and plumb over operating nut; provide adjustable extension and cover as shown on the Drawings.

F. Submittals
   1. Product data and certification of compliance with AWWA C509/C515 and NSF/ANSI 61/372.
   2. Flange drilling and facing details and coating data.

2.4 BALL VALVES

A. ¼ IN thru 3 IN dia.
   1. Pressure rating:
      a. Water: 400 psi, 250 Deg F WOG
   2. Three piece body
   3. Repackable stuffing box
   4. Renewable Teflon seats
   5. No media contact with stem
   6. Direction of opening indicator on handle
   7. Materials:
      a. Body: bronze
      b. Stem: brass
      c. Ball: brass, chrome plated

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d. Seats: reinforced Teflon
e. Handle: vinyl coated

2.5 BUTTERFLY VALVES

A. General

1. Provide rubber-seated butterfly valves for buried/subgrade potable water service.
2. Valves shall comply with AWWA C504, Class 250B (minimum).
3. Provide valves with flanged ends drilled to match ANSI B16.1 Class 125 / ASME B16.5 Class 150 (125/150 drilling) to mate with ductile iron "150#" flange pattern.
4. Wetted materials and coatings shall be suitable for potable water and comply with NSF/ANSI 61 and NSF/ANSI 372.

B. Materials

1. Body
    a. Ductile Iron, ASTM A536, Grade 65-45-12 (or 65-42-12).
    b. Rated for 250 psig minimum working pressure.
2. Disc
    a. Ductile Iron, ASTM A536, Grade 65-45-12 (or 65-42-12).
3. Shaft
    a. Stainless steel, ASTM A276, Type 316 (Type 304 acceptable only if specifically approved by Engineer/Owner).
4. Seat
    a. Elastomeric body seat, EPDM (potable-water grade).
5. Bearings / Bushings / Thrust Washers
    a. Corrosion-resistant, self-lubricating non-metallic or stainless materials suitable for buried waterworks service.

C. Design and Performance Requirements

1. Shutoff: Bubble-tight shutoff at rated pressure per AWWA C504.
2. Seat Type: Elastomeric body seat; comply with AWWA C504.
3. Valve Face: Provide flat-face flanges suitable for waterworks service; provide full-face gasket compatible with potable water.
4. Stem Seals: Adjustable packing and seals suitable for buried service; provide external seals to prevent groundwater intrusion.

D. Actuation

1. Provide operators suitable for indoor, above-grade service.
1. Provide operators that are sealed, lubricated, and sized for required operating torque.
2. Manually Operated Butterfly Valves
    a. Furnish valves with worm-gear operator and handwheel.
    b. Provide position indicator showing OPEN/CLOSED.
    c. Provide adjustable mechanical travel stops.
    d. Handwheel shall be sized to permit operation by one person under specified maximum differential pressure.
3. Motor-Operated Butterfly Valves (MOVs)
    a. Furnish valves suitable for direct mounting of electric quarter-turn actuators (ISO 5211 mounting interface) and provide all required mounting brackets, drive bushings, and hardware. See Part 2.11 this Section.
    b. Provide integral manual override (declutchable handwheel) as part of the electric actuator assembly.

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c. Do not provide a separate manual gear operator in series with the actuator unless specifically required for the actuator mounting arrangement and approved by the Engineer.

E. Coatings
1. Interior and exterior surfaces shall be coated with Ameron high-build epoxy, minimum 12 mil DFT, suitable for buried service and potable water.
2. Repair holidays/field damage per coating manufacturer's written instructions.

F. Basis of Design
1. Mueller Lineseal XPII, AWWA C504 Class 250B, flanged, no approved equal.

2.6 FLOW CONTROL VALVES (RATE OF FLOW CONTROLLER & SOLENOID SHUT-OFF)

A. Valve Function
1. Automatically limits the maximum flow rate to 200 gpm regardless of changing inlet pressure and/or varying downstream demand.
2. Flow control pilot shall modulate the main valve based on differential pressure across an orifice plate installed downstream of the main valve.
3. Valve shall provide solenoid on/off control such that:
a. Solenoid energized: valve opens (permits flow, subject to flow control).
b. Solenoid de-energized: valve closes (shutoff).
4. Provide stable flow control without hunting and with smooth modulation over the expected flow range.

B. Design and Performance Requirements
1. Valve shall be hydraulically operated, pilot controlled, diaphragm actuated, globe pattern.
2. Provide complete factory-assembled valve package including main valve, pilot system, solenoid control, and orifice plate assembly.
3. Provide orifice plate assembly sized as indicated: orifice bore = 2.0 inches.
4. Orifice plate assembly shall be installed directly on downstream flange.
5. Orifice plate assembly shall not be mounted directly to a butterfly valve.
6. **Provide check feature to prevent reverse flow through the valve.**
7. Temperature rating: potable water service up to 180°F (or as required by system).

C. Submittals
1. Product data sheets and cut sheets for main valve, pilot system, solenoid control, check feature, and orifice plate assembly.
2. Shop drawings including valve schematic, pilot tubing layout, accessory list, and recommended installation details.
3. Manufacturer's confirmation of:
a. Maximum flow setting: 200 gpm.
b. Orifice bore: 2.0 inches.
c. Solenoid action: energize-to-open / de-energize-to-close.
4. Electrical data for solenoid coil and limit switches (voltage, AC/DC, duty rating).
5. O&M manuals and startup/field test report confirming stable regulation at the set flow.

D. Manufacturers
1. Basis of Design: Cla-Val Model 43-01 Combination Rate of Flow Controller & Solenoid Shut-Off Valve, utilizing Cla-Val 100-01 Hytrol main valve.
2. Equal or approved per Division 01 substitution requirements.

E. Type and Construction
1. Main valve shall be a full port, pilot-operated automatic control valve with a single moving part (diaphragm assembly).

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2. Pilot system shall include restriction fitting, differential (rate-of-flow) control pilot, solenoid control, and orifice plate assembly (X52E or equal).
3. Solenoid control shall cause the main valve to:
   a. Open when energized.
   b. Close when de-energized.
4. Provide integral check feature (manufacturer's option/feature) to prevent reverse flow through the valve.

F. Materials:
1. Main valve body and cover: ASTM A536 ductile iron.
2. Provide valves with flanged ends drilled to match ANSI B16.1 Class 125 / ASME B16.5 Class 150 (125/150 drilling) to mate with ductile iron "150#" flange pattern.
3. Trim: bronze standard; stainless trim optional (provide stainless trim where shown or required).
4. Diaphragm: nylon reinforced Buna-N.
5. Stem, nut and spring: stainless steel.
6. Pilot system materials (standard): low-lead bronze pilot body; stainless steel trim; stainless steel orifice plate; Buna-N elastomers.

G. Coatings:
1. Fusion bonded epoxy coating (interior and exterior) per AWWA C116.

H. Accessories:
1. Orifice Plate Assembly: X52E or equal, wafer design with holder; 2.0-inch bore.
2. Limit Switches: Provide X105L2 double-pole limit switches to indicate valve position (open/closed) to the control system.
3. Provide pilot supply strainer and isolation valves for pilot lines as required for maintenance.
4. Provide any additional tubing/fittings as required for a complete functioning assembly.

I. Electrical:
1. Solenoid coil shall match project control power and be suitable for continuous duty.
2. Solenoid action shall be energize-to-open and de-energize-to-close.
3. Coordinate wiring/terminations and limit switch contacts with the instrumentation and control drawings.

J. Factory Testing / Field Startup
1. Valve assembly shall be factory tested prior to shipment.
2. Provide field startup and adjustment to verify:
   a. Stable maximum flow regulation at 200 gpm.
   b. Proper open/close operation via solenoid (energize-to-open / de-energize-to-close).
   c. Proper operation and indication of X105L2 limit switches at the control panel/SCADA.
   d. Proper operation of check feature (no reverse flow).

K. Warranty
1. Minimum one (1) year warranty on complete valve assembly from date of acceptance (or as specified in Division 01).

2.7 PRESSURE REDUCING VALVES

A. Valve Function
1. Automatically reduce higher inlet pressure to a steady lower downstream pressure as scheduled, regardless of varying flow rate and/or varying inlet pressure.
2. Valve and pilot shall close drip-tight when downstream pressure exceeds the pilot set pressure.
3. Provide stable regulation without hunting at low flows and shall be field adjustable to the required set pressure.

B. Design and Performance Requirements
1. Valves shall be pilot-operated, hydraulically operated, diaphragm-actuated automatic control valves, globe pattern (angle pattern acceptable where shown).

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2. Comply with AWWA C530 (Pilot-Operated Control Valves), latest edition.
3. Minimum rating: 300 psi maximum steady-state working pressure and differential pressure (unless drawings indicate higher).
4. Provide smooth, non-cavitating operation within manufacturer's recommended range; where high differential pressure is anticipated, provide anti-cavitation trim or cage as required by manufacturer (submit sizing/selection).

C. Submittals
1. Product data and cut sheets for main valve and pilot(s).
2. Shop drawings showing valve assembly, pilot system schematic, tubing sizes, accessory list, and recommended installation details.
3. Sizing calculations (Cv/flow, inlet/outlet pressures, differential pressure, cavitation check).
4. Certification of compliance with AWWA C530.
5. O&M manuals and startup/field-set report confirming set pressure and stable operation.

D. Manufacturers
1. Basis of Design: Cla-Val Model 90-01 (pressure reducing valve).
2. Equal or approved per Division 01 substitution requirements. Provide comparison table showing compliance with AWWA C530 and performance requirements above.

E. Type and Construction
1. Full-port globe style (or angle style where shown), flanged ends, 150# drill pattern.
2. Main valve shall consist of body, diaphragm assembly, and cover, with the diaphragm assembly as the only moving part.
3. Pilot system shall include a pressure reducing control pilot, restriction/needle valve(s), and tubing/fittings arranged for maintenance access.
4. Pilot supply shall be taken from upstream of the main valve, with integral or inline strainer.

F. Materials
1. Valve body and cover:
   a. ASTM A536, ductile iron.
   b. Class 150 flanges (drilling compatible with connecting piping).
2. Bronze disc retainer and diaphragm washer.
3. Stainless steel stem, nut, and spring.
4. Stainless steel trim (seat/disc/working parts).
5. Size as indicated on the drawings.

G. Coatings:
1. Fusion-bonded epoxy coating (interior and exterior) per AWWA C116.

H. Accessories (Provide each PRV Assembly with):
1. Two (2) glycerin-filled pressure gauges: one upstream and one downstream, minimum 4-inch dial, with gauge cocks and snubbers as needed.
2. Isolation valves on sensing line(s) and pilot supply line.
3. Pilot line strainer and blowoff/flush provisions.
4. Optional: check feature / non-return function where shown or required by system hydraulics.

I. Factory and Field Testing / Startup:
1. Each valve shall be factory tested and shipped as a complete, factory-assembled unit with pilot system mounted and piped/tubed.
2. Provide field startup by manufacturer's authorized representative (or qualified technician), including:
   a. Set downstream pressure to scheduled value.
   b. Demonstrate stable regulation over expected flow range.
   c. Verify drip-tight shutoff at/above set pressure.
   d. Provide written startup report.

J. Warranty:

BID SET - NOT FOR CONSTRUCTION

1. Minimum one (1) year warranty on complete valve assembly from date of acceptance (or as specified in Division 01).

2.8 SILENT CHECK VALVES

A. General
1. Provide silent check valves (spring-assisted, center-guided, in-line) for pump station piping, 4-inch, flanged.
2. Valve shall be suitable for potable water and provide non-slam closure to mitigate water hammer.

B. Standards / Certifications
1. Comply with MSS SP-125 (in-line, spring-loaded, center-guided iron check valves).
2. Potable water: NSF/ANSI 61 and NSF/ANSI 372.

C. Design / Performance
1. Silent operating type that begins to close as forward flow diminishes and closes at zero velocity to prevent flow reversal and water hammer.
2. Spring-assisted, center-guided disc/plug with short linear stroke.
3. Rated for not less than the project maximum operating pressure (180 psi) and hydrostatic test pressure (200 psi) (manufacturer to certify).

D. End Connections / Dimensions / Installation
1. Flanged, flat-face, drilled to match ASME B16.1 Class 125 / ASME B16.5 Class 150 (125/150 drilling).
2. Provide full-face gasket compatible with potable water.
3. Face-to-face (lay length): For 4-inch flanged silent check valves, provide a maximum face-to-face dimension of 7-1/4 inches. Any "approved equal" shall meet this maximum dimension and flange drilling requirements without requiring changes to piping spool lengths shown on the Drawings.

E. Materials
1. Body: Ductile Iron ASTM A536.
2. Trim: Corrosion-resistant internals suitable for potable water service (stainless/bronze as standard for specified model).
3. Spring: Stainless steel (316 typical).

F. Basis of Design
1. Val-Matic Series 1800A, Globe Style Silent Check Valve, 4-inch flanged, or approved equal.

2.9 AIR RELEASE VALVES

A. General
1. Provide automatic Air Release Valves for potable water piping at high points and locations shown on the Drawings.
2. Air Release Valves shall automatically release accumulated air/gases from a pressurized pipeline and shall not admit air during normal pressurized operation.

B. Ratings
1. Working pressure rating: not less than the maximum system operating pressure; minimum 200 psi unless noted otherwise on the Drawings.
2. Air release orifice and float mechanism shall be designed to discharge air under full line pressure without water leakage.
3. Valve body shall be suitable for pump station service with clean, reliable seating and repeatable operation.

C. Materials / Certifications
1. All wetted components shall be suitable for potable water and NSF/ANSI 61 certified (per manufacturer).
2. Body: stainless steel or epoxy-coated (lined and coated) ductile iron, manufacturer's standard for potable water service.

BID SET - NOT FOR CONSTRUCTION

3. Internal components (float, lever, trim): corrosion-resistant materials suitable for potable water service (stainless steel and/or reinforced composite).
4. Seat: resilient, replaceable elastomer suitable for potable water service.

D. Connections
1. Provide NPT threaded connection unless shown otherwise.
2. Size as shown on the Drawings (typically 3/4-inch or 1-inch for pump station appurtenances unless noted otherwise).

E. Accessories and Installation Requirements
1. Provide a full-port isolation valve at each air release valve connection.
2. Provide protective vent piping or tubing to a safe location where discharge could impact equipment, finishes, or personnel, where indicated.
3. Provide screen/strainer where installed in locations susceptible to debris/insects.

F. Submittals
1. Product data sheet showing pressure rating, orifice size, materials, connection size/type, and certified potable water compliance.

G. Acceptable Manufacturers
1. Basis of Design: A.R.I. D-040 configured as Air Release (or A.R.I. equivalent Air Release Valve), or approved equal.
2. Approved equal manufacturers: APCO/DeZURIK, Val-Matic, Crispin, or equal meeting the requirements herein.

2.10 COMBINATION AIR VALVES

A. General
1. Provide Combination Air Valves (dual function: Air Release + Air & Vacuum) for potable water service.
2. Valve shall:
   a. Automatically release small pockets of entrapped air while the line is pressurized; and
   b. Automatically discharge/admit large volumes of air during filling/draining and to relieve negative pressure/vacuum conditions.
3. Acceptable Products
   a. Above grade installations: DeZURIK Single Body CAV 143C Body, no substitutions.
   b. Below grade installations: A.R.I. D-040, 250 PSI Combination Air Valve, no substitutions.

B. Ratings
1. Working pressure range: 3 to 250 psi minimum.
2. Factory test pressure: 360 psi minimum.
3. Temperature rating: 140°F continuous, 194°F intermittent minimum.
4. Valve design shall allow high-velocity air discharge without premature closure (dynamic closure feature).
5. Provide smooth air discharge/intake action intended to reduce pressure surges and protect against vacuum/column separation effects.

C. Materials
1. All wetted components shall be suitable for potable water and NSF/ANSI 61 certified (per manufacturer)

D. Connections
1. Provide male NPT threaded connection unless shown otherwise.
2. D-040 sizes available: 3/4-inch, 1-inch, and 2-inch.
3. Where flanged air valves are required, provide the manufacturer's flanged variant available in 2-inch and 3-inch flange sizes.

E. Accessories

BID SET - NOT FOR CONSTRUCTION

1. Provide manufacturer's screen/strainer to reduce debris/insect entry where indicated or where installed in a location susceptible to debris.
2. Provide manufacturer's air valve enclosure where air valves are installed above surface in areas subject to damage/vandalism (if applicable).

F. Submittals
1. Product data sheet showing: pressure ratings, temperature ratings, connection size/type, and certified materials.

2.11 ELECTRIC QUARTER-TURN ACTUATORS (MOVs)

A. General
1. Provide electric quarter-turn (part-turn) actuators for motor-operated butterfly valves (MOVs) as shown on the Process/Instrumentation Diagram.
2. Service: OPEN/CLOSE (on/off) duty only; not modulating.
3. Basis of Design: Rotork IQT3 Pro electric part-turn actuator, or approved equal.

B. Functional Requirements
1. Travel: 90-degree rotation, fully OPEN to fully CLOSED.
2. Local Control: Provide integral Local/Off/Remote (L/O/R) selector at each MOV, consistent with the P&ID.
3. Manual Override: Provide declutchable manual override handwheel operable without electrical power.
4. Torque/Limit Control:
    a. Adjustable OPEN and CLOSED end-of-travel limit switches.
    b. Torque limiting protection to prevent damage to valve/shaft.
5. Sizing:
    a. Actuator shall be factory sized by the actuator/valve supplier for the furnished butterfly valve to fully open and fully close under static (no-flow) conditions at a maximum differential pressure of 180 psi.
    b. Provide minimum service factor of 1.5 on the maximum required seating/unseating torque.
6. Coordination/Mounting Kit: Provide the complete actuator-to-valve mounting kit, including ISO 5211 (or valve manufacturer's standard) mounting bracket/baseplate, drive bushing/adapter, fasteners, and any required hardware to provide a fully compatible assembled valve and actuator. Valve and actuator suppliers shall coordinate to provide a complete, direct-mount assembly.

C. Control / I-O
1. Provide discrete remote control inputs (OPEN and CLOSE) and valve position feedback (VALVE OPEN and VALVE CLOSED) for each MOV as indicated on the Electrical Drawings.
2. Discrete signal type, voltage level, and terminations shall be compatible with the RTU/PLC and shall be provided as indicated on the Electrical Drawings.
3. Provide terminal block terminations and labeled wiring for all control and status points.

D. Enclosure
1. Provide actuator enclosure suitable for indoor pump station environment, minimum NEMA 4 (NEMA 4X acceptable).
2. Provide corrosion-resistant external fasteners and hardware.
3. Provide local position indication (OPEN/CLOSED) visible at the actuator.

E. Submittals
1. Actuator product data and wiring diagrams.
2. Actuator sizing documentation showing required valve seating/unseating torque and selected actuator rated torque (including service factor) for 180 psi differential pressure under static conditions.

BID SET - NOT FOR CONSTRUCTION

3. Certified statement that I/O points and local control features comply with the P&ID and Electrical Drawings.

F. Startup and Settings
1. Factory set and field verify open/closed limits and torque settings.
2. Provide startup/commissioning support and settings documentation for inclusion in O&M manuals.

2.12 SURGE RELIEF ANGLE VALVES

A. Valve Function:
The surge relief valve shall limit surge pressure by opening when the system pressure exceeds the relief pressure setting of the valve disc. As the disc opens the surge pressure exceeds the relief pressure setting of the valve disc. As the disc opens the surge pressure is spilled and dissipated through the valve.

B. Manufacturers: Dezurik, no approved equal.

C. Spring pipe assembly diameter as indicated on drawings.

D. Materials:
1. Valve body and cover:
a. ASTM A536, Ductile Iron, Angle Style
2 Flanged ASME 150 inlet and outlet.
3. 316 Stainless Steel disc
4. 316 Stainless Steel body seat
5. Submit all other component materials for review in submittal.

F. Coatings: Fusion bonded epoxy coating (interior and exterior) per AWWA C116-03

G. Establish pressure set point as described below.

2.13 VALVE STEM BOXES

A. Christy G5 box or equal

B. Precast box with cast Iron lid

C. Provide at each buried valve with non-rising stem and operating nut.

D. Provide with PVC riser

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify piping alignment, flange drilling, pressure class, and flange face type prior to installation.

B. Verify valve size, orientation, actuator voltage, and control type match the Drawings and approved submittals.

C. Do not install valves that are damaged, improperly coated, or contain foreign material.

3.2 INSTALLATION – GENERAL

A. Install valves in accordance with manufacturer's written instructions and applicable AWWA standards.

B. Install valves plumb and true with no pipe strain. Piping shall be properly supported and aligned prior to tightening flange bolts.

C. Flanged Connections:
1. Provide full-face gaskets for flat-face waterworks flanges.
2. Tighten bolts in a star pattern to manufacturer-recommended torque.
3. Do not use bolt torque to draw misaligned piping into place.

D. Buried Valves:
1. Install with operating nut vertical.
2. Provide valve box centered and plumb over operating nut.

BID SET - NOT FOR CONSTRUCTION

3. Adjust valve box to finished grade.
4. Backfill and compact around valve body and box in accordance with Section 02201.

E. Above-Grade Valves:

1. Provide supports so valve weight is not carried by piping.
2. Install with adequate clearance for maintenance and actuator removal.

F. Install valves with flow direction as indicated by manufacturer markings.

3.3 INSTALLATION – CONTROL VALVES

(Pressure Reducing, Flow Control, Surge Relief)

A. Install control valves with recommended upstream and downstream straight pipe lengths per manufacturer.

B. Provide isolation valves upstream and downstream of each control valve assembly.

C. Install pressure gauges, sensing lines, pilot tubing, and accessories in accordance with approved shop drawings.

D. Pilot Tubing:

1. Neatly routed and properly supported.
2. Protected from mechanical damage.
3. Installed to allow maintenance access.

E. Provide flush/blowoff provisions where indicated.

3.4 INSTALLATION – SILENT CHECK VALVES

A. Install in horizontal piping unless otherwise approved.

B. Verify internal disc orientation per manufacturer.

C. Ensure face-to-face dimensions match piping layout shown on the Drawings.

3.5 INSTALLATION – AIR RELEASE AND COMBINATION AIR VALVES

A. Install at high points and locations shown on the Drawings.

B. Provide isolation valve below each air valve.

C. Where vent piping is required, route discharge to a safe location and secure piping.

D. Protect above-grade air valves with enclosure where indicated.

3.6 INSTALLATION – ELECTRIC ACTUATORS (MOVs)

A. Coordinate installation with Electrical Contractor.

B. Verify proper mounting kit installation and alignment between actuator and valve stem.

C. Field set and verify:

1. Open and closed limit switches.
2. Torque switches.
3. Local/Off/Remote selector operation.

D. Verify proper rotation direction prior to final energization.

E. Do not electrically operate actuator until valve is fully installed and system is ready for commissioning.

3.7 FIELD TESTING AND ADJUSTMENT

A. General:

1. Valves shall be hydrostatically tested as part of the piping system per Section 15042.
2. Inspect all joints for leakage.

B. Gate and Butterfly Valves:

1. Operate fully open and fully closed.
2. Verify smooth operation and full travel.
3. Verify no leakage past packing.

BID SET - NOT FOR CONSTRUCTION

C. Pressure Reducing Valves:
1. Field set downstream pressure to value shown on the Drawings.
2. Demonstrate stable regulation over expected flow range.
3. Verify drip-tight shutoff above set pressure.
4. Submit written startup report.

D. Flow Control Valves:
1. Verify maximum flow setpoint (200 gpm).
2. Demonstrate stable operation without hunting.
3. Verify solenoid energize-to-open / de-energize-to-close operation.
4. Verify limit switch indication at control panel/SCADA.

E. Surge Relief Valves:
1. Set relief pressure per Drawings.
2. Verify proper opening and reseating in accordance with manufacturer recommendations.

F. Check Valves:
1. Verify non-slam closure during pump shutdown.
2. Inspect for leakage after system testing.

3.8 DISINFECTION

A. All valves installed in potable water systems shall be disinfected as part of the piping system in accordance with AWWA C651 and Section 15140.

B. Flush pilot systems and sensing lines prior to final service.

3.9 PROTECTION

A. Protect coated surfaces from damage during installation.

B. Repair damaged epoxy coating per manufacturer's written instructions.

C. Keep valves closed or capped until system commissioning.

3.10 MANUFACTURER STARTUP SERVICES

A. Provide manufacturer-authorized startup for:
1. Pressure Reducing Valves
2. Flow Control Valves
3. Surge Relief Valves
4. Motor-Operated Valves

B. Submit written startup/commissioning report for inclusion in O&M manuals.

END OF SECTION

BID SET NOT FOR CONSTRUCTION

SECTION 15140
CLEANING AND DISINFECTION OF WATER MAINS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes cleaning, flushing, disinfection, and bacteriological testing of newly installed potable water mains and appurtenances.

B. Perform work in accordance with AWWA C651 and Owner requirements.

1.2 REFERENCES

A. AWWA C651, Disinfecting Water Mains, latest edition.

B. AWWA B300, Hypochlorites, latest edition.

C. California Waterworks Standards, latest edition (where applicable).

1.3 SUBMITTALS

A. Disinfection Plan: Submit not less than 7 days prior to disinfection activities. Include method, chlorination calculations (dosing and contact time), segment limits, injection equipment, flushing plan, disposal/dechlorination plan, and safety measures.

B. Product data for sodium hypochlorite and dechlorination agent.

C. Proposed schedule and notification plan.

1.4 COORDINATION

A. Coordinate flushing, disinfection, and sampling activities with Agency Operations. Provide minimum 72 hours notice prior to beginning disinfection and bacteriological sampling.

PART 2 – PRODUCTS

2.1 DISINFECTANT

A. Sodium hypochlorite: comply with AWWA B300; NSF/ANSI 60 certified for potable water use.

2.2 DECHLORINATION AGENT

A. Provide sodium thiosulfate or approved equal for dechlorination of chlorinated discharge water when required by permits and Owner.

2.3 MISCELLANEOUS MATERIALS

A. Provide temporary taps, blowoffs, hoses, diffusers, backflow prevention devices, and other appurtenances required for flushing, disinfection, and sampling.

PART 3 – EXECUTION

3.1 CLEANING

A. Pre-Installation

1. Clean interior of piping systems thoroughly before installing.
2. Maintain pipe in clean condition during installation.

B. During Installation

1. Prior to assembly, clean gasket and joint surfaces; remove grit and excess lubricant.

BID SET - NOT FOR CONSTRUCTION

Keep disinfection chemicals off gasket sealing surfaces unless approved by manufacturer.

2. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
3. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system.

3.2 FLUSHING

A. Flush each completed segment prior to disinfection in accordance with AWWA C651.

B. Provide flushing velocity per AWWA C651 (minimum 2.5 ft/s unless otherwise approved by Agency).

C. Contractor shall submit proposed location for discharging flushing water for review and approval by BDVWA, minimum 72 hours prior to disinfection activities.

D. Dechlorinate chlorinated discharge water.

3.3 DISINFECTION OF WATER MAINS

A. Disinfection of Potable Water Systems:

1. Provide BDVWA a minimum of 72-hours notice prior to beginning disinfection activities.
2. Perform work, including preventative and corrective measures during construction, in full compliance with AWWA C651 (latest edition).
3. Perform disinfection using sodium hypochlorite complying with AWWA B300.
4. Flush piping as specified in Paragraph 3.2 prior to chlorination.

B. The BDVWA will collect and process bacteriological samples in accordance with AWWA C651. Contractor shall coordinate access, furnish and install all additional fittings required for taps/blowoffs, and assist as directed by Agency.

C. Provide cleaning and disinfection of water mains in compliance with Section 64580 of the California Waterworks Standards (latest edition).

3.4 BACTERIOLOGICAL TESTING

A. After disinfection and final flushing, bacteriological samples will be collected by Agency personnel in accordance with AWWA C651 and applicable regulatory requirements. Agency will collect and submit bacteriological samples and pay laboratory fees; retesting required due to failed samples or nonconforming Work shall be at Contractor's expense in accordance with Section 01400.

B. Do not place the water main into service until bacteriological results are acceptable to the Agency.

C. If any sample fails, re-flush and re-disinfect the affected segment and re-sample until acceptable results are obtained.

D. If the contractor elects to use the slug method for disinfection, while also pressure testing, the results of the pressure test shall be approved by the Engineer prior to collection of samples for Bacteriological Testing. No bacteriological samples may be collected until the pressure test has been confirmed successful by the Engineer.

3.5 RETURN TO SERVICE

A. Upon acceptance of bacteriological testing, place the main into service only as directed by Agency. Open valves slowly and verify air release, leaks, and proper operation of appurtenances.

B. Remove temporary blowoffs, taps, and appurtenances; restore surfaces and facilities affected by flushing and disinfection activities.

END OF SECTION

BID SET - NOT FOR CONSTRUCTION

SECTION 15800
HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Heat Pump for Electrical Building.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
   a. Applications Handbook, Chapter on Sound and Vibration Control.
2. National Electrical Manufacturers Association (NEMA).
3. National Fire Protection Association (NFPA):
   a. 90A, Installation of Air Conditioning and Ventilating Systems.
4. Underwriters Laboratories, Inc. (UL).
   a. UL 1995, Heating and Cooling Equipment (or ETL equivalent).
5. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
   a. 210/240, Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
6. California Building Standards Code (Title 24): California Mechanical Code (CMC) and California Electrical Code (CEC).
7. California Energy Code (Title 24, Part 6): Provide equipment and installation compliant with current energy efficiency requirements.

1.3 SUBMITTALS

A. Shop Drawings:
1. Product technical data including:
   a. AHRI certificate and reference number for submitted equipment.
   b. Efficiency ratings (SEER2, EER2, HSPF2) and ENERGY STAR certification (where applicable for product class).
   c. Extended performance data for cooling and heating at project-relevant outdoor ambient conditions (e.g., 5°F and 17°F heating; 95°F and 115°F cooling).
   d. Startup/commissioning documentation including refrigerant pressure test, evacuation level (microns), and functional performance checks.
   e. Acknowledgement that products submitted meet requirements of standards referenced.
   f. Manufacturer's installation instructions.
   g. Wiring diagrams.
   h. Control diagrams.
   i. Manufacturer's catalog cuts and technical data.
   j. Manufacturer’s Operations Manual

BID SET - NOT FOR CONSTRUCTION

PART 2 - PRODUCTS

2.1 AIR CONDITIONER

A. Mini-Split Air Conditioner and Heat Pump.
1. BTU Cooling Rating: 24,000
2. BTU Heating Rating: 24,000

3. Wall mounted interior unit and pad mounted exterior condenser unit.
4. Ductless.
5. Variable-speed DC inverter compressor
6. Hand-held remote control.
7. Electrical: 208/230V, 1-phase, 60 Hz (verify with available power).
8. Location where shown on drawings.
9. Ductless Aire Energy Star 24,000 BTU 2 Ton Ductless Mini Split Air Conditioner and Heat Pump Variable Speed Inverter - 220V/60Hz Model# DA2421-H2, or equal.
10. Acceptable manufacturers: Daikin, Mitsubishi Electric, Fujitsu, LG, Carrier (or approved equal meeting requirements).
11. Equipment shall be AHRI certified; submit AHRI reference number.
12. Minimum efficiency: Comply with current California Energy Code (Title 24, Part 6). Provide SEER2/HSPF2 ratings with submittal.
13. Provide extended heating performance data at 5°F and 17°F outdoor ambient and confirm capacity is suitable for project design conditions.
14. Provide manufacturer's standard warranty, not less than 5-year compressor and 1-year parts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Per Manufacturer's recommendations
B. Install equipment in accordance with CMC, CEC, and manufacturer's published instructions.
C. Provide dedicated circuit and lockable, visible disconnect within sight of the outdoor unit.
D. Refrigerant piping: Type L ACR copper tubing with closed-cell insulation; braze joints with nitrogen purge; support per manufacturer.
E. Pressure test refrigerant piping with dry nitrogen; minimum 300 psig; hold for 24 hours with no pressure loss.
F. Evacuate system to 500 microns or less prior to releasing refrigerant charge; document final micron reading.
G. Condensate: Provide trapped drain line sloped minimum 1/8 inch per foot to an approved discharge point; do not discharge onto walkways or equipment pads.
H. Wall penetrations: Provide sleeve where required; seal annular space with a listed firestop system and provide exterior weather-tight caulk/sealant.
I. Install outside unit on concrete pad
    1. Anchor unit to concrete slab with anchor bolts as recommended by Manufacturer.
J. Mount inside unit to wall with appropriate CMU anchors
    1. Mollies not allowed
K. Core drill CMU wall for condenser piping
    1. Slope penetration and piping as required to maintain positive condensate drainage to the approved discharge location.
    2. Seal annular space with listed firestop system (per firestopping section) and provide exterior weather-tight caulk/sealant.

BID SET - NOT FOR CONSTRUCTION

END OF SECTION

SECTION 310523
UTILITY POTHOLING AND FIELD VERIFICATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for locating, exposing, and verifying existing underground utilities by potholing in advance of trenching, boring, or other excavation activities.

B. The Contractor's Work includes:

1. 811 notification and coordination with various utility contacts.
2. Field locating of public and private utilities prior to excavation.
    a. Verification of utility type.
    b. Verification of utility depth from existing grade.
    c. Verification of conduit or pipe diameter.
    d. Verification of conduit or pipe material.
3. Potholing to physically verify horizontal and vertical location.
4. Protection and temporary support of utilities.
5. Compilation of all potholing data within the record drawings.
6. Notifying the Engineer or Construction Manager of potential utility conflicts.
7. backfilling and surface restoration.

C. Utility locations shown on the Drawings are based on record information and are approximate only.

1.2 RELATED DOCUMENTS

A. Section 01010 – Summary of Work
B. General Conditions
C. Supplementary Conditions
D. Section 01015 – Sequence of Construction
E. Section 02201 – Trenching
F. Section 02513 – Asphaltic Concrete Vehicular Paving and Repair

1.3 REFERENCE TO FRONT-END REQUIREMENTS

A. Utility locating, protection of existing facilities, coordination with utility owners, permits, and interruption of service shall comply with Division 01 requirements and the General and Supplementary Conditions.

B. In the event of conflict between this Section and Division 01 or the General Conditions, the more stringent requirement shall govern.

1.4 UTILITY RISK ALLOCATION

A. Information shown regarding existing utilities is for reference only and is not represented as complete or accurate.

B. Contractor shall perform all investigation necessary to determine actual horizontal and vertical utility locations prior to excavation.

BID SET – NOT FOR CONSTRUCTION

C. Contractor acknowledges that the Contract Price includes full compensation for investigation of subsurface utility conditions necessary to complete the Work.
D. Failure to properly investigate, locate, or protect utilities shall be at Contractor's sole expense.

1.5 CONTRACTOR RESPONSIBILITIES

A. Contractor shall notify Underground Service Alert (811) and obtain valid ticket numbers prior to excavation.
   1. Notify 811 at least two (2) working days before excavation and no more than fourteen (14) days before excavation in accordance with California Government Code.
B. Contractor shall coordinate directly with all public and private utility owners.
C. Do not interrupt utilities without written permission from Owner and minimum two (2) working days advance notice.
D. Immediately notify Engineer and utility owner if unmarked utilities are encountered.

1.6 UTILITY AND AGENCY CONTACT INFORMATION

Utility Type	Agency / Company	Contact / Department	Phone
Water	Bighorn-Desert View Water Agency	Marina West	(760) 365-2315
Natural Gas	Southern California Gas Company	Bruce Lombardi	(760) 228-1400
Disposal	Burrtec	Jennifer Salcicciola	(760) 365-2015
Water	Hi-Desert Water District	Ron Wortham	(760) 365-8333
Electricity	Southern California Edison	Map Requests / Public Works	(714) 796-9932
Telephone	Verizon California	Larry Moore	(760) 778-3610
Cable	Time Warner Cable	Cynthia Franklin	(760) 674-5404
Highway	Caltrans District 8	District Office – Martin Morris	(909) 645-0579
Highway (General)	Caltrans	General Hotline	(866) 383-4631
Non-Potable Water	Mojave Water Agency	Adnan Anabtawi	(760) 946-7000
County Roads	SBCO Public Works Transportation Division	Joseph E. Brady	(909) 387-7910
Special Districts Department	SBCO Permitting	Carlos Martinez	(909) 386-8821
County Water & Sewer	SBCO Special Districts	Ted S. Moreno	(909) 386-8800

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County Roads	Permits/Operations Support Division-Transportation	Silvia Gomez (DPW)	(909) 387-8212
Flood Control	SBCO Flood Control	Stacy Serrano	(909) 387-8005

Contact information is provided for reference only. Contractor shall verify current contact information prior to excavation.

1.6 SUBMITTALS

A. The Contractor shall prepare a proposed potholing location map for Owner review and approval prior to starting. Potholing must be complete a minimum of 3 weeks prior to starting construction and all data must be provided to the Engineer at least 2 weeks prior to the start of construction of any piping segment.

BID SET - NOT FOR CONSTRUCTION

PART 2 – PRODUCTS

2.1 BACKFILL MATERIALS

A. Backfill shall comply with Section 02201.
B. Asphalt concrete repair shall comply with Section 02513. Cold patch may be used only as temporary repair unless approved.

PART 3 – EXECUTION

3.1 WORKING HOURS

A. All potholing shall be performed during normal working hours between 8 a.m. and 5 p.m. or in accordance with the County encroachment permit whichever is more stringent. All traffic control associated with all potholing efforts shall be included in the Traffic Control line item.

3.2 NON-DESTRUCTIVE EXCAVATION REQUIREMENTS

A. Within the legal tolerance zone (24 inches each side of marked utilities), excavation shall be performed using non-destructive methods.
B. Acceptable methods include hydro-vac, air-vac excavation, or careful hand excavation.
C. Mechanical excavation shall not be used within the tolerance zone.

3.3 ELECTRICAL AND COMMUNICATION UTILITIES

A. Final exposure within 12 inches of electrical or communication facilities shall be performed by hand using wooden or fiberglass-handled tools.
B. Contractor shall assume all utilities are energized unless confirmed otherwise by the utility owner.

3.4 PROTECTION

A. Support exposed utilities to prevent settlement or damage. Repair damaged utilities at Contractor's sole expense.

3.5 BACKFILL AND RESTORATION

A. Backfill potholes immediately after verification and compact per Section 02201 or per County Standard Specifications where required.
B. Sawcut asphalt edges and restore pavement per Section 02513. Replace temporary cold patch within 7 calendar days.

END OF SECTION

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SECTION 16010
ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall install, ready for use, the electrical and instrumentation system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary/required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.

B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete and operational electrical & instrumentation system as shown on the E&I - Series Drawings, included in these Specifications or required for fully operating facility.

C. Examine the Specification and Drawings for mechanical equipment and provide all circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitively stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.

D. It is recommended that the Electrical Contractor attend the job walk for the site and shall have accomplished the following:

1. Thoroughly examine existing conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to have examined the site or to have failed to report any discrepancies to the Owner prior to bid.

2. It is the Contractor's responsibility to be fully familiar with the existing utility locations, conditions and local requirements and regulations.

3. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between Work shown on the Drawings and measurements at the site.

E. Any major deviations in location and conduit routing that the Contractor makes without the express written review or direction of the Engineer, shall be considered to have been made at the Contractor's sole responsibility. Such deviations made by the Contractor shall be reflected on the Contractor supplied "Record Drawings." The Owner will reimburse the Engineer and the Owner will then deduct an amount equal to said reimbursement from the Contractor's contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings due to any major unauthorized changes.

F. The major areas in the scope of work shown on E&I - Series Contract Drawings and Device Index located in Appendix "B" which includes both the furnishing and installation:

1. Zone B Booster Pump Station

a. Motor controls, instrumentation and other miscellaneous devices for a new Booster Pump Station at Zone B.

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b. Meter/main panel and Manual transfer switch.

c. Programmable Logic Controllers (PLCs) for controlling the booster pump, valves and other miscellaneous devices supplied by Foreshock.

2. Zone D-1 Booster Pump Station

a. Motor Controls, motor saver instrumentation and other miscellaneous devices for a new Booster Pump at the Zone D-1 Booster Pump Station.

b. Conduit and wire from new booster pump control panel to existing RTU Control Panel.

3. Provide all necessary conduits, junction boxes, grounding system, field interconnection wiring, hardware, fittings, and devices to connect the designated equipment and wiring.

4. Installation of primary devices, equipment and instruments are not completely detailed on Contract Drawing plan sheets. Use Device Indexes and Contract Drawings installation details for installation and mounting requirements.

5. All necessary miscellaneous shut off, sample, and calibration valves to sensors.

6. Trenching, back filling, compaction and resurfacing to match existing surfaces for each underground conduit route.

7. Grounding system and equipment grounding.

8. Concrete pads and supports for electrical and instrumentation equipment.

9. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.

10. SCADA & PLC Programming

a. SCADA graphic screen & Autodialer configuration and modifications to existing system shall be by Foreshock.

b. PLC programming will be by Forshock.

11. A bid price for the Forshock PLC Control Panel and SCADA & PLC programming work will be renegotiated prior to bid time for bid purposes.

G. Existing site is limited in space. It is the Contractor's responsibility to provide an electrical and instrumentation package to fit in the allocated space.

H. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections.

I. All electrical equipment and materials, including installation and testing, shall conform to the applicable codes and standards listed in this and other Sections. All electrical work shall conform with the National Electric Code (NEC) 2023 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

J. It is the Contractor's responsibility for obtaining instrumentation configuration software, and manuals necessary for the Contractor to program and configure the PLC and instrumentation. All software shall be licensed and turned over to the Owner.

K. The following specifications incorporate specific equipment and devices that are standards of the Owner because of their serviceability, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under

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existing maintenance contracts; however, favorable alternatives proposed in writing will be considered by the Owner.

L. Contractor shall field verify all existing conditions, equipment, wires, conduit, etc. as required to complete the project

1.2 CODES AND STANDARDS

A. All electrical/instrumentation equipment and materials, including installation and testing, shall conform to the following applicable codes and standards:

1. ANSI – American National Standards Institute, Inc.
2. EIA – Electronics Industries Association.
3. ETL – Electrical Testing Laboratories.
4. FM – Factory Mutual.
5. GO128 – General Order No. 128, Rules for Construction of Underground Electrical Supply and Communication Systems, Public Utilities Commission of the State of California.
6. IEEE – Institute of Electrical and Electronics Engineers.
7. ICEA – Insulated Power Cable Engineers' Association.
8. ISA – International Society of Automation (ISA) Standards (formerly Instrument Society of America.
9. NEC – National Electrical Code, 2023 Edition.
10. NEMA – National Electrical Manufacturers Association.
11. NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association.
12. NESC – National Electrical Safety Code.
13. NFPA – National Fire Protection Agency & NFPA820
14. OSHA – Occupational Safety and Health Act Standards.
15. UL – Underwriter's Laboratories, Inc.

B. The revisions of these codes and standards in effect on the date of issuance of the Contract Documents shall apply.

C. Codes and standards referenced shall be considered minimum acceptable work.

D. In instances where two or more codes are at variance, the most restrictive requirements shall apply.

E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to the preceding codes and standards.

F. All work shall also be performed in accordance with the Owner, State, County or Owner standards, and local Utility codes.

G. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these codes and standards, even though the work is not explicitly mentioned in the Specifications or shown on the Contract E- Series Drawings.

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H. Amperage listed on the single-line Drawings for motors are per NEC Table 430.250 and may not necessarily match that of the equipment supplied. It is the electrical system supplier and Contractor's responsibility to furnish equipment sized for the motors supplied for this project at no additional cost.

I. All electrical work shall conform with the National Electric Code (NEC) 2023 issue and the latest NFPA 70E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Provide electrical system that interfaces to work performed under other Mechanical and Equipment plans.

B. The following is part of Division 16:

1. Section 16605 – Electrical Systems Analysis

1.4 ELECTRICAL CONTRACTOR QUALIFICATIONS

A. It is the intent of this Division that the complete responsibility for management and installation of the electrical and instrumentation required for this project be by a qualified Electrical Contractor. This responsibility includes, but not limited to, supervision and coordination of work performed by all suppliers of Division 16.

B. Uncertified electricians shall not perform electrical work for which certification is required per Labor Code Section 3099. Electricians shall be required to carry proof of certification on their person at all times. Electricians found on the jobsite without proof of certification will be asked to leave, prohibited from working on-site until proof of certification has been provided and may be reported to the Contractors State License Board (CSLB).

C. The Electrical Subcontractor shall meet the following minimum qualifications:

1. Has a current C-10 Electrical Subcontractor's License.

2. Has regularly engaged in similar electrical contracting for the Municipal Water Industry.

3. Has successfully performed work of similar or greater complexity on at least two previous projects under one company name and under the present company name.

4. Has all persons performing work as electricians certified by the California Apprenticeship Council per California Labor Code Section 3099.

5. Has been actively engaged in the type of electrical and instrumentation work specified in this Division for a minimum of two years.

D. Bid package shall include a list of five (5) completed projects of similar size and nature for water treatment plants the Electrical Contractor has completed:

1. Provide completion dates of projects.

2. References of Owner Representative in charge of project, including contact name and telephone number.

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1.5 SYSTEM SUPPLIER QUALIFICATIONS

A. General:

1. It is the intent of this Division that complete responsibility in the supplying of the Control Panels/PLC, and all instrumentation in Appendix "B" Device Index and other equipment required for this project be supplied by one System Supplier. This responsibility includes, but not limited to, all work necessary to select, furnish, program, supervise installation, calibrate, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.

2. The system supplier shall have an on staff project engineer with prior experience on similar sized projects. This project engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The system supplier project engineer shall attend all coordination meetings and be on-site when requested by the Owner's Engineer.

3. System supplier shall have completed and started-up five (5) projects of similar size and nature for water / wastewater treatment plants under one company name and under the present company name.

4. Factory tests for this project shall be held within 150 miles of project location at the System Suppliers shop.

5. Additional information for clarification as requested by the Owner in writing shall be provided by the System Supplier asking for the qualification or qualification will automatically be denied.

1.6 CONTRACT DOCUMENTS

A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error, omission, or minor details missing in either shall not relieve the Contractor from the obligations there under to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.

B. The Contract drawings are generally diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the more restrictive of the two shall take precedence in the event of conflict.

C. Conflicts between the Contract drawings and the specifications shall be brought to the attention of the Engineer.

D. The Contract Electrical elementary, elevation and one-line diagrams are the basis of the electrical system to be provided and are for reference only. It is the Contractor's responsibility to adjust and make minor revisions to the diagrams as necessary for operational system at no additional cost to the Owner. Additional isolators, relays, wiring, terminal blocks, and appurtenances, shall be provided for an operation system at no additional cost to the Owner.

E. Location at facilities of new equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost.

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F. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available.

1. It is the Contractor's responsibility to modify the conduit schedule based upon Shop Drawings for the actual equipment. Such modifications in conduit sizes and numbers of conductors shall be at no additional cost to the Owner, if such changes are the direct result of the equipment selected by the Contractor.

2. A copy of the Conduit and Wire Routing Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.

G. Electrical & instrumentation, conduit & wire lengths shown on Contract Drawings are approximate. The Contractor is responsible for determining actual lengths for bidding and installation purposes. Contractor is to be made aware that equipment may be installed in the lower levels of the building and instrumentation manufacturer's cable length depends on conduit routing.

H. The Contractor shall examine the architectural, mechanical, structural, electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.

I. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.

J. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.

K. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc., as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.

L. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review within 30 days after award of Contract.

M. When existing conduits are to be used, it is the Electrical Contractor's responsibility to verify conduit size and routing. This includes all potholing or other location methods. Existing conductors and conduits damaged by Contractor during construction shall be repaired or replaced at no cost to Owner.

N. The resolution of conflicting interpretation of the Contract documents shall be as determined by the Engineer.

O. The Contractor shall coordinate with other Suppliers on the project for a complete and operable system.

P. It is the System Supplier's responsibility for obtaining instrumentation transmitter configuration software, manuals, USB drives and disks necessary for the Contractor to program and configure the instrumentation transmitters.

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Q. The Electrical Contractor shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size blue-line Electrical (E-Series) and Instrumentation (I-Series) Contract Drawings.

1. These documents are to be used specifically for recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or document changes.

2. These Record documents shall be kept up-to-date during the progress of the job, with all "change orders", submittal modifications, and construction changes shown and stamped with “As-Built” at end of job.

3. These Record documents shall not be used for daily construction use and shall not contain any mark-ups that are unrelated to as-built corrections.

4. The following lists the record documents shall be as-built by Electrical Contractor:

   a. E-Series Drawings.

   b. Panelboard schedules.

   c. Conduit and Wire Routing Schedule.

   d. Lighting Schedule.

   e. Duct banks and their routing with offset measurement and indicate changes in depth. Duct bank elevations shall not be drawn or penciled in by hand. Provide CAD drawings of duct banks.

5. The following lists the record documents that shall be as-built by System Supplier to be maintained by Electrical Contractor:

   a. I-Series Drawings

   b. Instrumentation Index

6. Record documents shall be kept current weekly with all "change orders," submittal modifications, and construction changes shown. Record Documents shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Record Documents are not accurate or current.

7. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:

   a. Additions - red

   b. Deletions - green

   c. Comments - blue

   d. Dimensions - black

8. Show the following on the Electrical (E-Series) Record Contract Drawings by dimension from readily obtained base lines:

   a. Exact location, type and function of electrical and instrumentation equipment and devices.

   b. Precise routing and locations of underground conduits, pullboxes, junction boxes, and appurtenances that make-up the raceway system.

   c. Show the dimensions, location and routing of electrical work, which will become permanently concealed.

   d. Show complete routing and sizing of any significant revisions to the systems shown.

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9. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.7 COORDINATION

A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in the work of others.

B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.

C. The electrical and instrumentation modifications and additions are to be made at facilities that need to remain powered at all times. The Contractor shall schedule all the required work with the Owner, including each shutdown period. Each shutdown shall be implemented to minimize disruption of the existing operations. Shutdowns may be required outside of normal working hours when necessary. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.

1. The Contractor shall limit all scheduled shutdown periods to less than 2 hours (120 minutes) and only with prior approval of the Owner.

2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Owner. Submit shutdown schedule and plans at least 10 working days in advance of when the scheduled shutdown is to occur.

3. Contractor shall make provisions for portable generators and automatic transfer switches when facilities will be without power.

4. The Owner reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of system.

D. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Owner it is necessary to do so.

E. Prior to commencing construction, the General Contractor shall arrange a conference with the General Contractor, Electrical Contractor, System Supplier, Resident Engineer & Owner as well as all equipment and system suppliers vital to the current phase of work. During the meeting, the equipment supplier shall verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. The Equipment and System Suppliers shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time.

F. It is the responsibility of the Contractor to make all equipment approval arrangements and scheduling with the power utility company connected with this project. Schedule within 30 days after award of contract all service installations and connections with the power and telephone utility. Lack of effort by the Contractor to properly schedule Utility service will not be considered valid justification for delays in project completion and no extension in contract time will be given.

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G. The Contractor shall coordinate with Owner, PLC programmer, witnessing Engineer and System Supplier to test the entire system.

1.8 SUBMITTAL AND DRAWING REQUIREMENTS

A. General:

1. Submit shop documents and drawings for approval in accordance with this subsection.

2. Electrical submittals shall be submitted for favorable review by the Owner or Engineer per this subsection. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

3. A copy of the appropriate Division Specification Sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

   a. Check marks (√) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, each deviation shall be underlined and denoted by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications.

   b. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications.

   c. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.

4. The Contractor shall coordinate submittals and required meetings with the work, panel fabrication and factory tests so that project will not be delayed. This coordination shall include scheduling the different categories of submittal, so that one will not be delayed for lack of coordination with another.

5. No material or equipment shall be allowed at the job site until the submittal for such items has been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted."

6. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

7. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Contractor's expense, by an unbiased laboratory that is satisfactory to the Engineer.

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8. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Engineer it is necessary to do so.

9. No submittal documents shall be labeled as proprietary. Labeling documents as proprietary will be sufficient cause for rejection of entire submittal. The Owner reserves the right to copy or duplicate any and all portions of the documents provided for the project including copyrighted documents as desired.

10. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:

    a. 1st submittal: 1.

    b. 1st resubmittal: 1A.

    c. 2nd resubmittal: 1B, etc.

B. The electrical submittals shall include but not be limited to data sheets and drawings for each product together with the technical bulletin or brochure. No FAX copies of documents are allowed. Color copies shall be provided when black and white copies do not show adequate clarity. The electrical submittals shall include:

1. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and subtab section. Also list the project name, contract number and equipment supplier's name, address, phone number, and contact person on the index page.

2. Bill of Materials: A complete Bill of Materials list shall be provided at the inside of the front cover. The Contractor shall provide Bill of Material for electrical components formatted as shown in Appendix "A".

3. A separate set of Material Listing forms shall be provided for the MCC, spare parts, and another listing all field equipment. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.

4. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs.

5. Product (item) name used herein and on the Contract Drawings.

6. The manufacturer's model or other designation.

7. Tag name/number per the P&ID drawings, schedules, and indexes.

8. Detailed electrical one line, elementary control diagrams and interconnection diagrams showing all wiring requirements for each system.

9. Complete documentation with full description of operation.

10. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.

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11. All copies shall be clear and legible.

12. Location of assembly at which it is installed.

13. Input-output characteristics.

14. Range, size and graduations as required.

15. Physical size with dimensions and mounting details. System Supplier submit a letter listing all instrumentation pipe sizes, pipe connections, flange types, and ANSI ratings signed by Contractor and System Supplier to certify coordination for proper installation prior to flow elements being purchased.

16. Enclosure fabrication and color.

17. Enclosure layout and elevation drawings to scale.

18. Quantity and quality requirements for electric power.

19. Materials of construction of components.

20. Nameplate schedule.

21. Interconnection diagrams.

22. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Data sheets shall be printed on blue or pink paper. Provide an index with proper identification and cross-referencing of each data sheet.

23. Submit USB electronic copies of all submitted drawing in AutoCAD format.

24. For each resubmittal, provide a copy of the previous submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

25. Electronic PDF version of submittals shall be provided with table of contents regardless of hard copy format of submittal. PDF shall be "bookmarked" at each index, subtab, copy of appropriate check-marked Specification Section, Bill of Materials, copy of submittal comments (for resubmittals), Contractor's response to submittal comments (for resubmittals), drawings, etc. Failure to bookmark PDF may be grounds for immediate rejection, without review. Bookmarks shall not be out of order; the English description shall match that listed in the Submittal's Table of Contents.

26. Electronic submissions of submittals may be provided for submittals less than 80 pages and without drawings. Submittals equal to or over 80 pages or those that contain drawings shall be provided in a hardcopy format. Hardcopy submittals shall be provided in binders as specified herein. The Owner reserves the right to reject submittals that fail to be organized as described herein.

27. Exceptions to the Contract specifications or drawings shall be clearly defined by the equipment supplier.

    a. Data shall contain sufficient details so a proper evaluation may be made by the Engineer. Contractor shall provide separate letter (located in the front of the submittal) detailing specific exceptions to the Contract Specifications or Drawings.

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b. Exceptions that are noted in the marked-up Drawings or Specifications, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.

28. Request for information (RFIs) shall not be included in submittals. RFIs supplied with submittals will not be answered. RFIs shall be submitted following proper channels.

C. All drawings shall be generated with a computer utilizing AutoCAD or later drafting package. Standard preprinted drawings simply marked to indicate applicability to the Contract will not be acceptable. Drawings shall be prepared in a professional manner and shall have borders and a title block identifying the project, system, drawing number, drawing title, AutoCAD file name, project engineer, date, revisions, and type of drawing. Drawings shall be no smaller than 11" x 17" and printed with a laser jet printer or plotted in ink on vellum. The lettering shall be legible and no smaller than 0.075 inch in height. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. A Drawing Index shall be provided that lists each Drawing title and drawing number. Each Drawing title and number shall be unique. The index shall not include drawings listed as "This Page Intentionally Left Blank". The shop drawings shall include:

1. Electrical one or three line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one- or three- line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; generator; automatic transfer switch; utility metering; voltage; amperage; number of wires and phases; fault interrupt ratings; ground size and connections; neutral size and connections; power fail and other protective devices; fuse size and type; panelboard; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit equipment motor voltage, phase and full load amps provided for this project for verification of accuracy of submitted one line drawings.

2. Elementary diagrams shall be provided for all relay logic, power supplies, PLC I/O and other wiring. All elementary diagrams shall be drawn in JIC EMP/EGP format and standards similar to those shown on the E-series elementary diagrams showing ladder rung numbers and coil and contact cross referencing numbers.

3. Analog and digital PLC I/O wiring diagrams shall be provided showing the wiring requirements for each instrument loop. Graphic symbols shall conform with ISA S5.4 drawing standards. A loop diagram shall be furnished for each analog and digital I/O process and all PLC I/O points. Loop diagrams shall include the following as a minimum:

   a. The loop diagram shall be drawn with sufficient detail to express control philosophy. The diagram shall show all components and accessories of the instrument loop, highlighting special safety and other requirements. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and for maintaining or troubleshooting that system.

   b. Analog and digital I/O shall be arranged on the diagram in the same order as the physical arrangement of the group terminations. All termination points on the diagram shall be shown with the actual equipment

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identification, device and relay terminal number or letter, and I/O point P&ID English descriptor and tag name.

c. A separate drawing shall be prepared for each analog and digital card. Each card shall be arranged on the diagram in the same order as the physical arrangement of the card terminations.

d. Energy sources – electrical power, air supply, pneumatic and hydraulic fluid supply, designating voltage, current, pressure, etc. shall be shown in detail on the diagram. Input and output signals (e.g., 1-5 VDC, 4-20 mA DC, 3-15 psig, etc.), power and instrument supplies to devices (e.g. 120 VAC, 24 VDC, 80 psig, etc.) shall be shown.

e. Engineering units shall be shown on the diagram. Each wire label, equipment identification terminal number or letter and color code shall be shown. Signal and DC polarities shall be shown.

f. All spare wires, cables and termination points shall be shown. All jumpers, grounding, shielding, power supply details shall be shown.

4. Enclosure and Elevation layout diagrams shall be provided to show all deadfront, front panel and backpan devices drawn to scale. Show fabrication methods and details; including material of construction, paint color, support and latching mechanisms, fans and ventilation system, and conduit entrance areas.

5. Interconnection diagrams shall show for each piece of equipment all wiring between all devices, panels, cabinets, terminal boxes, control equipment, motor control centers and any other devices and equipment. An interconnection diagram shall be furnished for each electrical and instrumentation system, even if one was not shown explicitly on the Contract Drawings. Interconnection diagrams shall be prepared for all conduits listed in the Conduit and Wire Routing Schedule. Each interconnection diagram shall show the following as a minimum:

a. Interconnect drawings shall be prepared for all equipment by the System Supplier.

b. The diagrams shall be utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of equipment interconnect.

c. The diagrams shall show wiring as field labeled at the end of the project when as-builts are submitted.

d. Each wire labeling code as actually installed shall be shown. The wiring labeling code for each end of the same wire must be identical.

e. All devices and equipment labeling codes shall be shown.

f. All Interconnection wires listed in the Conduit and Wire Routing Schedule for each conduit shall be shown only on one interconnect drawing. Interconnection diagrams shall be of the continuous line type with identified lines. Diagrams of the wireless or wire schedule type are not acceptable. Bundled wires shall be shown as a single line with the direction of entry/exit of individual wires clearly shown.

g. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc. "??" in lieu of terminal number is unacceptable.

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h. Diagrams shall include raceway numbers, raceway size, raceway type, cable numbers, wire color code, and wire numbers.

i. Each wire size, and cable size and color code shall be shown. Each conduit with the conduit label and conduit size and wire fill shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.

j. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown. Place "øA", "øB", and "øC" label next to each breaker to identify phase connected to.

k. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.

l. The diagrams shall show all other Contract and Supplier drawing numbers, for reference, that are associated with each device that is interconnected. Attached to each interconnect, a copy of all the support documents used in preparing interconnects shall be submitted. This includes current issues of panel schematics, elementary diagrams, panelboard schedules, conduit schedules, one-line diagrams, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the "Reference Documents" corner of Interconnect Drawings.

m. Interconnects shall include list of all applicable reference drawings, request for clarifications, field instructions and change orders. All deletions and additions of equipment, wire and cables shall be clearly shown.

n. Field wiring shall not start before the Interconnection Drawing has been submitted by the Contractor and approved by the Owner.

o. Do not show the same wires or jumpers, or panel wiring on both the connection and interconnection diagrams. All jumper, shielding, and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.

p. Interconnection diagrams shall be submitted and approved by Owner for each electrical and instrumentation system. The Contractor shall not pull in any wires into conduits that do not have approved interconnects. If the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, the Contractor will not be reimbursed for labor for re-pulling in wires even if there was an error in wire fill or sizing. Also, if the Contractor pulls in wire without Owner approval of associated Interconnect Drawings, then all progress payments related to field wiring for that particular area of work will be withheld until approved Interconnect Drawings are in use.

q. All interconnection diagrams shall be prepared by a System Supplier under the supervision of or by a State of California Registered Electrical Engineer and shall bear that Engineer's professional stamp and signature for all Interconnection Drawings submitted for approval including as-builts and those used in the field installation.

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r. Example format of Interconnection diagram is shown on Contract "E" Series Drawings or may be obtained from the Engineer.

s. Interconnect drawings submitted with wiring of a single conduit run separated onto multiple interconnect drawings will be rejected without review. A single conduit run with wiring shown on separate interconnect drawings will be allowed only after written approval is given by the Engineer for each conduit run prior to submitting the associated interconnect drawings.

t. Only field wiring between MCC, Panelboards, Control Panels, and other electrical and instrumentation devices or equipment shall be shown on interconnection drawings. No internal panel wiring shall be shown on interconnect drawings except jumper or other wiring to be installed in field by Electrical Contractor.

u. Interconnect Drawings along with the corresponding support documents shall be submitted in a separate submittal package. Interconnect drawings submitted with non-interconnect drawing packages will be rejected.

v. Provide a notes section on each interconnect drawing. In the note section, list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires will not be processed until interconnect drawings have been received for such work.

w. The field electrician shall mark-up all interconnection diagrams during installation to show accurate as-built wiring, conduits runs, terminations, etc.

x. The System Supplier shall be responsible to collect all information necessary to complete each interconnection drawing. This includes making field trips to collect all terminal connection data for new and existing, MCCs, switchboards, panelboards, instruments, equipment and electrical panels.

y. An index of drawings shall be provided with each Interconnection submittal listing the unique drawing number and the description of the interconnect drawing (e.g. Drawing 4321-IC1004 Pump 1004 Interconnect Drawing).

z. Provide conduit and interconnect drawing cross reference indexes. Interconnect Conduit Index shall list all conduits listed in the Conduit & Wire Routing schedule and its associated Interconnection Drawing number. An Interconnection Drawing Index shall list all Interconnection drawings and the conduits shown on that specific drawing. These two indexes shall be at the front of all interconnection drawing submittals.

aa. Interconnection submittals that contain more than two motor control panels/centers shall have heavy duty dividers with permanent plastic labeled index tabs separating each group of drawings.

6. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:

a. Dimensions of nameplate.

b. Exact lettering and font for each nameplate.

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c. Color of nameplate.

d. Color of lettering.

e. Materials of construction.

f. Method and materials for attachment.

g. Drawing showing location of nameplates on each panel and enclosure.

7. For sites with new buildings, provide conduit layout diagrams drawn to scale utilizing AutoCAD, with all conduit tags and size listed, shall be submitted and approved prior to underground conduits being installed. Conduit, duct bank and enclosure entries shall be drawn to scale. The following conduit layout diagrams shall be prepared and submitted by Electrical Contractor for approval.

   a. Diagrams for conduit stub-up locations into the bottom of:

      1) All Panels and Enclosures with 10 or more conduit entries.

      2) All new MCCs.

      3) Power Transformers.

   b. Diagrams for conduit cross sections for:

      1) All concrete duct banks.

      2) Each conduit run between all vaults and pull boxes shown on Contract Drawings.

      3) Pullbox and Vault side entries.

      4) Power Transformers.

8. Copying contract drawings and providing them as submittals will be considered unresponsive and the submittal will be rejected without review.

9. Each drawing title block shall contain the English description name for drawing contents (i.e. Lift Pump No. 1 Interconnect Drawing) and drawing number. All pages and drawings in the submittal shall be numbered sequentially (with no number skipped) in lower right hand corner.

D. Shop documents and drawings shall be submitted for all devices and components in the electrical system. The Contractor is notified that this is a "Fast Track" project and all electrical & instrumentation drawings shall be submitted in a timely manner as not to delay completion of the project.

1.9 SUPERVISION

A. The Contractor shall schedule all activities, manage all technical aspects of the project and attend all project meetings associated with this Section.

B. The Contractor shall supervise all work in this Division, including the electrical system general construction work, from the beginning to completion and final acceptance.

C. The Contractor shall supervise and coordinate all work in this Division to insure that each phase of the project, submittal, delivery, installation, and acceptance testing, etc., is completed within the allowable scheduled time frames.

D. The Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Section, which shall include transmittals, submittal, forms, documents, manuals, instructions, and procedures.

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1.10 INSPECTIONS

A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have an "No Exceptions Taken" or "Make Correction Noted" submittal status; then the Contractor shall, within three days after being notified by the Owner, remove the unacceptable material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.

B. The Contractor shall give the Owner 10 working days' notice of the dates and time for inspection. Date of inspection shall be as agreed upon by both the Contractor and Owner.

C. Work shall not be closed in or covered over before inspection and approval by the Owner. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.

D. The Contractor shall cooperate with the Owner and provide assistance for the inspection of the electrical system under this Contract. The Electrical Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

E. Before request for final inspection is made, the Contractor shall submit to the Owner in writing, a statement that the Contractor has made his own thorough inspection of the entire project enumerating punch list items not complete and that the installation and testing is complete and in conformance with the requirements of this Division.

F. The Owner may arrange for a facility inspection by Cal-OSHA Consultation Service at any time. The Contractor shall make the necessary corrections to bring all work in conformance with Cal-OSHA requirements, all at no additional cost to the Owner.

G. Contractor will be Responsible for any Additional Cost for Overtime, Weekend Overtime or Differential Time, Expenses for Inspection of Defective Work that has to be re-inspected.

1.11 JOB CONDITIONS

A. The Contractor shall make all arrangements and pay the costs thereof for temporary services required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from each site as the property of the Contractor.

B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Owner. Where equipment is stored or installed in moist areas, such as unheated buildings, provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.

C. The elevation of the project site is shown on Contract Civil Drawings. All equipment shall be derated, as recommended by the manufacturer or in accordance with ANSI C37.30.

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D. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 110 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to Owner.

E. The jobsite is prone to vandalism and theft. Contractor shall be responsible for securing all materials and equipment against theft and vandalism for the duration of the project.

F. Contractor & Subcontractors shall utilize temporary services during construction of the project. No Contractors shall utilize building power, receptacles, etc. during construction.

1.12 MEASUREMENT AND PAYMENT

A. No measurement will be made. Full compensation for conforming to these requirements, including all the labor, materials, tools, equipment, incidentals and for doing all the work involved in this section necessary for completion of the work, as shown on the Contract Plans, as specified in the Standard Specifications, these special provisions and as directed by the Engineer, shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed.

1.13 CHANGE ORDER PRICING

A. All change order pricing by Contractor or System Supplier shall be broken out into the following minimum categories:

1. Labor per hour listed per discipline, i.e. Engineer, Drafter, Estimator, Programmer, Secretarial, etc.
2. Materials and equipment itemized per component and quantity.
3. Rentals, travel, per Diem, etc.
4. Tax.
5. Shipping.
6. Overhead and profit.

B. Lump sum change order pricing is not acceptable.

C. If Contractor or System Supplier refuse to provide a change order with broken out pricing, the Engineer reserves the right to obtain independent estimates from other Contractors or System Suppliers. The Contractor or System Supplier who refused to provide the change order with broken out pricing, will be charged for the preparation of the independent estimates.

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PART 2 - MATERIALS

2.1 QUALITY

A. It is the intent of the Contract Specifications and Drawings to secure the highest 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.

B. 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 and 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. 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.

C. Products that are specified by manufacturer, trade name or catalog number established 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.

D. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.

E. When required by the Contract specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

F. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored.

G. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

H. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

I. It is the System Supplier's responsibility to visit jobsite to collect and document existing conditions and equipment device part numbers in order for all similar called out new equipment to match existing.

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2.2 NAMEPLATES AND TAGS

A. EQUIPMENT EXTERIOR NAMEPLATES: Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering, except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the Drawings. No letters are allowed smaller than 3/16". All phenolic nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two 316 stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable.

1. Each major piece of electrical equipment shall have a manufacturer's nameplate showing the Contract specified name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, calibration, etc.

2. For each device with a specific identity (pushbutton, indicator, field control station, disconnect switches, etc.) mounted on the exterior or deadfront of a piece of equipment, provide a nameplate with the inscription as shown in the Contract Documents. Where no inscription is indicated in the Contract Documents, furnish nameplates with an appropriate inscription providing the name and number of device.

3. For all receptacles and switches, including devices located on Switchboard or MCC), provide a faceplate engraved or stamped with the panelboard and circuit number it is fed from. Also, include on faceplate or on a separate nameplate for each light switch identification use such as "OUTSIDE BUILDING LIGHTS", "PERIMETER LIGHTS", "MCC ROOM", etc.

4. All field instruments and devices shall be labeled with designation shown on P&ID diagrams.

5. All transformers and panelboards shall have nameplates with ½" high letters and be engraved with designations as shown on one-line Drawings.

6. All safety and disconnect switches shall have nameplates with ½" high letters and be engraved with designations as shown on one-line drawings.

7. Underground Pull Box and Vault Cover Identification: Engrave or bead weld pullbox covers with minimum 1/4"thickness and 1/2" letters and covers shall be engraved with designations as shown on Contract drawings or as directed by Owner.

8. Aboveground Pull Box Cover Identification: 316 stainless steel screws attached stamped 316 stainless steel plate nameplates with 1/2" letters and be engraved with designations as shown on Contract drawings or as directed by Owner.

9. Provide engraved nameplate at service entrance equipment (red with white lettering) indicating type and location of standby generator per NEC 702.7 (A).

10. Provide engraved nameplate at service entrance equipment per NEC 702.7(B).

11. METERING – Service Equipment Label: Per NEC 110.24 (A) Service equipment shall be legibly marked in field with the maximum available fault current. Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled.

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12. All subpanels shall be identified with an engraved phenolic label of the power source location feeding it (i.e. MCC-100, Panelboard LP-1, etc.)

13. Specific equipment fed from more than one feeder shall be properly identified ("Fed from MCC-B and the standby generator").

B. EQUIPMENT INTERIOR NAMEPLATES: Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering.

1. The size of the nameplate tape shall be no smaller than ½" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear adhesive to hold the nameplate securely in place when necessary.

2. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate located above the device with the inscription as shown in the Contract Documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the Submittal Drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.

3. Nameplates shall not be attached to wireway covers or to removable devices.

4. For all receptacles and switches (including devices located in Control Panel, provide a faceplate printed with the panelboard and circuit number it is fed from.

5. Provide nameplate on all deadfront doors indicating panelboard and circuit number it is fed from. When multiple panelboard circuits are feeding panel, identify which components are fed from which panelboard circuits.

C. EQUIPMENT TAGS: The Contractor shall attach a tag to the equipment (including instruments) with the same inscriptions as specified above in paragraph A. The tag shall be made from 316 stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with 316 stainless steel wire of the type normally used for this purpose. SST wire must be crimp connected. Twisting ends together is not acceptable.

D. Engrave or machine print the tags with inscriptions as approved by the Engineer in the nameplate submittal.

E. Provide temporary labels for all instruments and devices immediately when installed. Temporary labels shall be provided with ½" letters minimum and labeled with P&ID tag number.

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2.3 WIRE

A. This Section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

B. Material: Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:

1. Conductors shall be copper, with a minimum of 97% conductivity.
2. Wire shall be Class B stranded. Solid wire conductor prohibited.
3. ASTM B8, soft drawn copper, maximum 12 months old.
4. Insulation of all conductors and cables shall be rated 600 volt.
5. Insulation type for all conductors shall be moisture and heat resistant thermoplastic NEC Type XHHW-, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal.
6. Field wire minimum AWG sizes
   a. #12 for wires used for individual conductor circuits 480 volt and above. #12 for wires used for individual conductor circuits 100 volt and above, except for PLC I/O which may be #14 AWG.
   b. #14 for wires used for individual conductor circuits below 100 volt.
7. Non-field or panel wire minimum AWG sizes if properly protected by fuse or breaker:
   a. #14 for wires used for individual conductor circuits 100 volt and above.
   b. #18 for wires used for individual conductor circuits below 100 volt and above if properly protected by fuse or breaker.
8. Instrument Wiring
   a. Field: Instrument cables shall have 600V tray cable rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) Cables shall be Belden, Manhattan, or approved equal.
   b. Non-Field: Instrument cables shall have 300V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Single twisted shielded pair (T.S.P.R.) cables shall be Belden, Manhattan, or approved equal.
   c. General: Instrument cables shall have 600V rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden, or approved equal.

C. Wire Marking

1. Wire Identification: All wire terminations including field interconnect as well as wiring interior MCC cubicles, switchboard, panels, equipment, junction panels and boxes shall be identified with machine printed labels. Hand lettered labels are not acceptable and shall be replaced at the Contractor's expense. The wire identification code for all field interconnect and panel interior wiring, shall be similar to the designations shown on the Contract example drawings.
2. Wire Labels: The labels shall be machine printed with indelible ink, heat shrink type capable of accepting a minimum of 23 machine printed characters per sleeve label by Brady "Bradysleeve" or equal. Labeling shall be neatly installed for visibility and shall be clearly legible. Each wire and conductor shall be labeled with wire label as shown on approved loop, elementary and interconnect Drawings. Labels shall not be wrap around or snap-on type.

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3. Where there is insufficient space for labels on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals, these labels may be omitted. “Locally” is defined as wires no longer than 8”.

4. Wire labels for lighting and receptacles shall be installed and consist of the panelboard and circuit number (i.e., Panelboard “LP100”, circuit breaker #3 would have wire label line “LP100-L3” and neutral “LP100-N3”).

5. All spare wires shall be labeled with conduit followed by SP1, PS2, etc. (i.e. A151-SP1 for first spare wire, A151-SP2 for second spare wire, etc.).

6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

7. Ethernet patch cables and fiber cables shall be labeled with primary devices it is connected to (i.e. “PLC”, “OI”, “PLC-2” etc.). Label shall be white plastic with black machine printed lettering as produced by a KROY or similar machine with lettering no smaller than 3/8”. Securely attach to cable with clear tape.

D. Special Purpose Wiring

1. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer’s recommendations.

E. Color Code

1. Color code of all wire shall conform with the following table.

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WIRES COLOR CODE TABLE

Description	Phase/Code Letter	Field Wire or Tape Color	Non-Field Wire Color
480 V, 3 Phase	A	Brown	Brown
	B	Orange	Orange
	C	Yellow	Yellow
240 V or	A	Black	–
208 V, 3P	B	Red (Orange if high leg)	–
	C	Blue	–
240 / 120 V, 1 P	L1	Black	Black
	L2	Red	–
24 V Positive	24P	Pink	Pink
24 V Negative	24N	Black/White Stripe	Black/White Stripe
AC Control		Violet	Red (Yellow for Foreign Circuits)
DC Control		Blue	Blue
Neutral	N	White	White
Ground	G	Green	Green
Shielded Pair	+	Black	Black
	–	Clear (White)	Clear (White)

2. No other colors shall be used without prior approval of the Owner.

3. The same color shall be connected to the same phase throughout the panel.

4. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.

5. Neutral used for AC Control shall be white.

6. Phase color insulation shall be provided for complete length of #8 wire or smaller, colored phase tape is not allowed on #8 and smaller wire.

2.4 COMPONENTS

A. Fuses

1. Fuses used in circuits 200 VAC and above shall be time-delay type FNQ or approved equal, 13/32" x 1-1/2", and have an interrupting rating of 42,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.

2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4" x 1-1/4", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.

3. Fuses used in signal and 24 VDC circuits shall be fast acting type GMA or approved equal, 5 mm x 20 mm/1/4" x 1-1/4", and have an rating of 250 VAC. Fuse-holders shall be of the terminal block type.

4. Fuses shall be sized in conformance with the NEC.

B. Switches and Pushbuttons

1. Switches and pushbuttons for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, standard 30 mm diameter, with round plastic clamp ring. Switches shall be Allen-Bradley 800H, or approved equal.

2. Switches and pushbuttons shall have contacts rated 10 amperes continuous and 600 VAC.

3. Manufacturer's standard size legend plates shall be provided and engraved to specify each switch and pushbutton function. The legend plate color shall be black.

4. Selector Switch Positions

   a. Hand-off-auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.

   b. On/Off shall have the ON position to the right.

   c. Local/Remote shall have the REMOTE position to the right.

   d. Open-Close-Auto applications shall have the open position to the left, close in center, and auto in the right position.

5. Selector switch handles and pushbutton caps shall be black.

6. Potentiometer be 10kohm, manual single turn potentiometer.

7. Lockout stop shall be a pushbutton with red cap and pad locking assembly for pushbutton.

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C. Relays and Timers

1. GENERAL: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise stated. Supply power or coil voltage shall be 120 VAC unless shown otherwise on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. The following is a summary of abbreviations associated with relays and timers:

CR	–	Control relay
TR	–	Timing relay
PFR	–	power fail relay
TDOE	–	Time delay on energization
TDOD	–	Time delay on de-energization

2. The power fail relay (PFR) shall continuously monitor the three phases for power loss, low voltage, phase loss, and phase reversal. The power fail monitor shall have a drop-out voltage adjustment, an adjustable delay on make time delay (0.2 to 8.0 minutes) and a status indicating LED. Power fail relays shall be Diversified SLJ, Time Mark, or approved equal.

3. Control relays (CR) shall be plug-in type with indicating lights and clear see-through sealed or enclosed housing to exclude dust. Sockets for plug-in relays shall be standard industrial blade type with barrier pressure screw terminals. Provide IDEC Type RR, to match existing. Two form-C contacts (minimum) shall be provided on each relay.

4. Time delay relays (TR) on energization or de-energization shall be solid state plug-in relays with a timer adjustable over the range 1 second to 3 minutes unless other ranges are indicated or required. Provide LED timer energized indicator lamp. Sockets for plug-in timers shall be standard industrial type with barriered pressure screw terminals. Time delay relays shall be IDEC GTS to match Owner standards.

D. Indicating Lights

1. Indicating Lights for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, High intensity multi-chip LEDs, full voltage (unless shown otherwise), standard 30 mm diameter, with round plastic lens and miniature bayonet lamp base. Indication lights shall be Allen-Bradley 800H, to match Owner Standard.

2. Manufacturer's standard size legend plates shall be provided and engraved to specify each light's function. The legend plate color shall be black.

3. All Indicating lights shall be provided with a push-to-test switch and wiring.

E. Circuit Breakers

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action or Motor Circuit Protectors (MCP) as shown on One-Line Diagrams. Circuit breakers feeding Soft Starters or VFDs shall have true adjustable long, short and instantaneous trip units.

2. Main Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces

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specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open. Main Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.

3. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 35,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.

4. Fused disconnects shall not be used in place of breakers.

5. Breakers shall be sized and have a minimum interrupting capacity as shown on Drawings and as required for the supplied equipment.

6. All breakers shall be supplied with the correct sized copper only lugs for wire sizes as listed in "Conduit & Wire Routing Schedule". Provide larger frame breaker or lug adapters as necessary when connecting to the listed oversized wire.

F. Surge Protective Device

1. The surge protective device (SPD) shall be rated for use on a 3 phase system at voltage shown on Contract One Line diagram. The transient current the surge protective device shall have a max surge rating of 130kA per Mode/2600kA per phase, 2000kA short circuit current rating.. Provide fuses feeding the SPD. Locate SPD so that the indicating lights are viewable without removing panels. The surge protective device shall be Leviton M3480 series, Eaton, or approved equal

G. Motor Starters:

1. Motor starters (M) shall be magnetically operated, electrically held, full voltage, nonreversing except as shown on the Drawings. NEMA sizes shall be as required for the horsepower of the supplied equipment. Contactors shall be UL rated and listed. Motor starters shall be Allen-Bradley Bulletin 509, or approved equal.

2. Each motor starter shall have a 120 volt operating coil rated for continuous operation.

3. Auxiliary contacts shall be provided as shown on the Drawings or as required. Each motor starter shall be furnished with a minimum of two spare auxiliary contacts in excess from those shown to be used. Auxiliary contacts shall be convertible, in the field, from normally open to normally closed, or vice versa.

4. Starters shall have adjustable bi-metallic overload relays. Adjustable overload relays shall be adjustable for trip point and for automatic or manual reset. Each overload shall be ambient compensated with a visible trip indicator. Each overload shall be ambient compensated and shall trip on 600% of full load current in less than 6 seconds. Each overload relay shall have a test trip pushbutton built-in and an adjustable calibrated trip with indicating dial. Three-phase starters shall have 3 overload relays. Each overload relay shall have a normally closed holding contact and a normally open isolated contact for overload shutdown. Motor Overloads shall be Allen-Bradley or approved equal.

H. Control Power Transformer:

1. Control power transformer (CPT) shall be provided with a time-delay, slow-blow secondary fuse rated to protect the transformer and interrupt 10,000 amperes at 120VAC. Two primary fuses with KAIC interrupt rating of corresponding power

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connection shall be provided. Transformer size minimum ratings shall be as shown on Contract E-Series Drawings.

I. Terminal Blocks:

1. Control Panel Terminal Blocks

a. Terminal blocks to be clamp type, 6mm spacing, 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Phoenix Contact to match Owner Standard. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 20% spare terminals for future additions.

b. Provide terminal blocks with "follower" plates that compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks that compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.

c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end. Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number. Terminal blocks are to be labeled to match the wire landed.

d. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.

e. Provide a ground terminal or connection point for each grounding conductor.

f. Provide a separate terminal block for every two neutral terminations or as coordinated with the interconnect diagrams.

2. MCC – Motor Starter Cubicles Terminal Blocks:

a. MCC cubicle terminal blocks shall be pull-apart as supplied standard by MCC manufacturer.

3. Power Termination Blocks shall be rated for 600V main power connection. The power termination blocks shall be rated to accept Copper or Aluminum cable rated as shown on Contract one-line diagrams. The power termination block shall be capable of being mounted anywhere in a termination box. Each termination block shall be provided with lug shield to prevent contact with power connections. The power termination blocks shall be Connectron, Cooper or approved equal.

2.5 CONTROL PANEL - ZONE B

A. Control panel will be provided by Foreshock.

B. Foreshock will provide SCADA and PLC programming.

C. Coordinate with Foreshock to terminate wires.

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2.6 EXISTING PLC CONTROL PANEL MODIFICATIONS – ZONE D-1

A. Land new control wires in relocated existing RTU Cabinet. Provide necessary components.

B. Foreshock will provide SCADA and PLC programming.

C. Coordinate with Owner where to terminate new wires.

2.7 FIELD DEVICES

A. Magnetic flowmeter

1. The magnetic flow meter shall consist of a flow tube FE and a converter FIT, complete with all necessary interconnecting cables and conduits. The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to the flow rate, with the duration not less than 100 milliseconds. The meter shall be suitable for bi-directional flow with full scale flow rates from 3 to 31 feet per second. Complete zero stability shall be an inherent characteristic of the metering system. Meters requiring field zero adjustment will not be acceptable. The meter accuracy shall not be affected by changes in fluid pressure, temperature, viscosity, or conductivity.

2. Flange connections shall be ANSI Class 150 or flangeless type as required by mechanical Drawings. Flanges shall be coordinated with Contractor installing piping.

3. Stainless steel grounding rings shall be provided at both ends of the flow tube when required by the manufacturer. The tube internal liner material shall be polyurethane, unless recommended otherwise by the manufacturer for the application and approved by the Engineer. Electrode material shall be 316 stainless steel and shall be flush type. The meter shall incorporate a high impedance amplifier of 100,000 Megohms or greater, eliminating the need for electrode cleaning systems.

4. The converter electronics shall be mounted remotely as shown on Contract Drawings. The converter shall be microprocessor controlled, utilizing digital signal processing with automatic zero correction to provide a linear 4-20 mA signal proportional to the forward flow rate and switched output for flow totalization pulses. The electronics shall provide totalized pulse output and positive zero return control. Rangeability shall be field adjustable over a 100 to 1 range. Field adjustable signal dampening shall be provided. Low flow cutoff shall be provided to eliminate flow transients when no flow is present in the pipe. A rate indicator and totalizer scaled in engineering units shall be provided and shall be viewable on a LCD display. The converter shall have self-diagnostics which constantly check for proper operation. If a failure occurs, a fault indication shall be provided to notify the operator of a problem. The converter shall contain a self-test mode to allow the operator to manually simulate the output 4-20 mA signal to any value between 0% and 100% to check out any driven devices in the loop. The converter shall be rated to operate in an ambient temperature range from 14° F to 122 °F.

5. The meter, converter, and components shall be designed for operation from a power source of 24VDC, with a power consumption of less than 20 watts.

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6. The flowmeter manufacturer shall supply the cable without splices from the flowtube to the remote electronics. Remote converter/indicator (FIT) shall be capable of being located up to 1000 feet from flow element (FE).

7. When converter electronics are shown to be mounted remotely, additional special cabling (Cabling between flow element and remote mounted flow indicating transmitter), mounting hardware, and devices necessary to complete the installation shall be provided by the manufacturer at no additional cost to the Owner. Electronics shall be provided in NEMA rated enclosures specified in Instrumentation and Device Index.

8. The meter shall be hydraulically calibrated at a facility located in the United States and the calibration shall be traceable to the National Bureau of Standards. A certified copy of the calibration test results shall be submitted to the Owner prior to shipment of the meter.

9. The accuracy of the complete metering system including flow tube and converter electronics shall be 0.25% of rate over the range settings of 0.033 to 33 feet per second. Variations in temperature, voltage, and frequency within the ranges listed herein shall not affect the accuracy in excess of 0.5% of flow rate.

10. The flowmeter element (FE) shall be accidental submergence proof for forty-eight hours under 30 feet of water. Conduits between flowmeter element and electronics shall be sealed to retain submergence rating per flowmeter manufacturer's requirements.

11. The flow meter shall be a McCrometer UltraMag 5000 with transmitter, with remote signal converter/indicator units to match Owner Standard.

B. Pressure Indicating Transmitter

1. Transmitter:

a. The pressure transmitter shall incorporate a high-accuracy capacitance sensor. With this sensor, process pressure is transmitted through the isolating diaphragm and fill fluid to the sensing diaphragm in the center of the capacitance cell. Capacitor plates on both sides of the sensing diaphragm detect its position. The differential capacitance between the sensing diaphragm and the capacitor plates shall be directly proportional to process pressure.

b. The transmitter shall incorporate a temperature measurement to compensate for thermal effects.

c. The pressure transmitter electronics shall convert the capacitance and temperature input signals directly into digital format for further processing by the electronics module.

d. Configuration data shall be stored in nonvolatile EEPROM memory in the electronics module of the transmitter.

2. Software Functionality:

a. The PC based HART protocol software and cables shall be provided.

b. Configuration: The transmitter shall be configured by the System Supplier. Configuration shall consist of operational/parameters and informational data.

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c. Test: The pressure transmitter shall perform continuous self-tests.

d. Format: The format function is used during the initial setup of a transmitter and for maintenance of the digital electronics.

Requirements: Range:	Per Pressure Device Index.
Output:	Two-wire 4-20 mA output. Digital process variable superimposed on 4-20 mA signal.
Power Supply:	Loop power supply required.
Indication:	4-digit LCD meter setup with Engineering Units.
Zero Elevation and Suppression:	Anywhere within the sensor limits.
Overpressure Limits:	Limit is 0 psig to 3,626 psig (25 Mpa) without damage to the transmitter.
Temperature Limits:	Process: 0° F to 185°F (-18° C to 85°C). Ambient: -4° F to 175°F (-20° C to 80°C).
Humidity Limits:	0 – 100% relative humidity.
Accuracy:	±0.075% of span for spans from 1:1 to 10:1 of URL.
Stability:	±0.2% of URL for 12 months.
Process-Wetted Parts:	Isolating Diaphragms: 316 SST. Drain/Vent Valves: 316 SST. Flanges: 316 SST. Wetted O-rings: Glass-filled TFE.

3. The pressure transmitter shall be Rosemount Smart family 3051 with HART transmitter, or approved equal.

4. Calibration Valve - Each calibration valve assembly shall have integral stainless steel block and bleed valving. Valve shall have a non-rotating tip stem and a fully back-seated bonnet. Block and bleed valve shall be Hex HB59 or approved equal.

C. Pressure Switch

1. Pressure switch shall be a rated minimum of 15 amps @ 120VAC. Pressure switch shall consist of a pressure sensing mechanism and the switch itself enclosed in a NEMA rated housing with ranges as listed in the Pressure Device Index. Pressure switch shall be of the bourdon tube type with stainless steel wetted parts and mechanical snap switch (mercury switches not acceptable). Pressure switch shall be equipped with two independent setpoint adjustments (trip & reset setpoints) settable from exterior of unit. Pressure switch shall have transparent viewing window for visible on-off operation. Switch shall have two tamperproof setpoint adjustments with setpoint indicator calibrated in engineering units. Pressure switch shall be UL listed. The pressure switch shall be Dwyer Mercoid Control DAW series; Square "D" or approved equal.

2.8 MOTOR CONTROL CENTER

A. General:

1. The motor control center (MCC) shall be built and tested in accordance with:

a. NEMA Standards.

b. ANSI.

c. Underwriter's Laboratories, Inc.

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2. The MCC shall comply with all provisions of UL 845, and bear a separate UL label on each individual MCC Section. In addition, all wiring, devices, and components contained therein, shall be UL labeled for the application. UL approval and labels shall be provided for the individual MCC Sections prior to delivery from the factory. Field UL labeling will not be allowed.

3. MCC shall be 600 volt class rated to operate from an incoming power as shown on Contract one-line diagrams.

4. MCC construction shall consist of NEMA rated as shown on Contract Drawings deadfront enclosure. MCCs shown as NEMA 12 shall have gasketed doors to reduce dust entry. The height of the MCC shall be 90 inches.

5. MCC fabrication shall be NEMA Class II with NEMA Type B wiring.

6. The MCC shall be provided with the type, capacity, and ratings of components shown on the Drawings or otherwise specified. The 460 VAC breakers shall be rated to withstand an available fault current shown on contract Drawings.

7. MCP and TM breakers shall be selected to have trip and breaker size based on the motor full load amps of motor loads supplied for this project.

8. Top of operator interface, pilot devices, breaker, operator panels, etc. to be maximum 66” above finished floor.

B. Qualifications:

1. MCC structures shall provide for all equipment detailed on the single line Drawings including all spares and spaces. Where possible, the MCC shall be built in strict accordance with overall sizing and component layouts as detailed on the Drawings and no deviations will be allowed without prior approval of the Owner.

2. When physical size requirements for individual components are different than those detailed on the MCC elevation Drawings, the single line Drawing shall supersede the elevation Drawing and the Supplier shall furnish additional vertical Sections based on the Owner's approval as required to provide for all equipment including spares and spaces at no additional cost to Owner.

3. MCC shall have major components and subsystems therein (i.e., breakers, contactors) that are standard for the MCC manufacturer.

4. All devices and components located in different MCC cubicles (i.e., VFDs, contactors, control relays, timers, etc.), shall be the product of same manufacturer throughout for each device or component type.

5. When the circuit breaker/MCP size changes due to a different motor size and full load amps than that shown on the Contract Drawings, the Contractor shall provide the properly sized circuit breaker/MCP breaker at no additional cost to Owner.

6. Provide extension handles for breakers with center of the grip of the operating handle, when in its highest position, is above 78" from floor in order to conform with NEC Article 404-8.

7. MCC components such as relays, starters, breaker, lights, switches, etc. shall meet the requirements as specified herein.

8. MCC shall be Eaton, Allen-Bradley Centerline 2100 or approved equal.

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C. Construction:

1. The MCC shall consist of standard metal-enclosed, freestanding, dead-front and dead-back vertical Sections, not more than 90 inches in height and not less than 20 inches deep. The framework shall be made of 12-gauge steel channels. The composite MCC shall consist of vertical sections that are of equal height.

2. Working height excluding the upper and lower wireways of MCC shall be 72 inches (min). Minimum compartment height shall be twelve inches.

3. Each Section shall be provided with a horizontal top and bottom wireways. Wireways shall be readily accessible and isolated from all busing by grounded steel barriers. The bottom wireways shall have adequate conduit entrance area and shall not be obstructed by transformers, capacitors, or other devices. The wireways in each Section shall line up with wireways in the adjacent Sections, with openings between, so that wires may be pulled the entire MCC length.

4. Where shown on the Drawings, isolated vertical wireways shall be provided, each with a separate full height door. Vertical wireways shall intersect the top and bottom horizontal wireways for easy cable routing. Vertical wireways shall have wire hangers for wire tie-down spaced throughout the complete vertical trough. Vertical wireway doors shall be latched by quarter turn indicating type fasteners.

5. The MCC shall be designed for front access maintenance. All wiring, bus joints, and other mechanical parts requiring tightening or other maintenance shall be accessible from the front. Rear or side access shall not be necessary for inspection or maintenance.

6. All steel work shall be immersion cleaned and phosphated to inhibit rust prior to painting. Paint finish shall be electrostatically applied dry powder, baked to thermoset. MCC compartment interior color shall be white. All other interior and exterior MCC structure surfaces shall be finished in an ANSI 61 gray color. No field painting will be allowed except for "touching up" of damaged areas.

7. A manufacturer's nameplate shall be attached to each MCC giving the model number, serial number, bus amps, voltage, and other manufacturer's information pertaining to the MCC construction.

8. MCC shall be furnished completely factory assembled and shipped to the jobsite in shipping sections. Assembly of components into MCC at the jobsite is not allowed (except for connection of shipping section). Removable lifting angles or eyes shall be provided on the top of each MCC shipping section.

9. MCC shall be factory inspected and witness tested by the Owner prior to it being shipped to the jobsite. If a MCC shows up at the jobsite and has not been previously inspected and tested by the Owner, then the Supplier shall remove the MCC from the jobsite and return it to the factory for factory inspection and witness testing, all at the expense of the Supplier.

D. Bus system:

1. All bus material shall be copper. Aluminum buswork is not allowed. All buses, except ground buses, shall be completely isolated by steel plates or insulating material.

2. A continuous horizontal bus shall be furnished and rated as shown on the Contract one-line Drawings.

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3. A full length vertical bus shall be furnished in each Section and rated as shown on the Contract Elevation diagrams. Current rating shall apply to the full length of the vertical bus, tapered bus shall not be allowed. Vertical buses shall be insulated and isolated with glass polyester or equivalent continuous barriers. Cutouts shall be provided in the barriers for plug-in stab connections. Unused stab openings shall be plugged. Lower ends of vertical buses shall be insulated.

4. Buses shall be sized and braced to withstand a fault of symmetrical amperes listed on Contract one-line drawings. MCC protective breaker(s) shall have an interrupting capacity to isolate a fault current of this magnitude.

5. A copper ground bus shall be provided in the bottom horizontal wireway of each Section. The ground bus shall be rated 300A minimum. It shall be electrically continuous the entire width of each MCC. Provide cable lugs on ground bus for incoming power grounding conductors.

E. Compartments:

1. Compartments shall be isolated from each other by separate horizontal steel plates without openings that are a part of the unit itself. Draw-out units shall totally isolated enclosed equipment. All unused openings to the adjacent vertical wiring space shall be plugged. All openings used for wiring shall have insulating grommets.

2. Doors for each compartment shall be fabricated from formed sheet steel of not less than 14 gauge thickness. The door opening shall be of sufficient size to permit ready removal of any of the devices in the compartment. Doors shall be mounted on adjustable and removable pin type concealed hinges so arranged that compartment doors may be removed without disturbing compartment doors above or below. Door latches shall be quarter turn indicating type fasteners. Overload relays shall be reset from outside the enclosure by means of an insulated button mounted on the door.

3. An operator mechanism mounted on the draw-out unit shall provide the means for operating the compartment breaker or disconnect switch. The operator shall extend through an opening in the compartment door and shall clearly indicate whether the disconnect is "on", "off", or "tripped." This indication shall function whether the door is open or closed. The operating mechanism shall not be attached to the compartment door.

4. Each compartment for combination starters, breakers, and disconnect switches shall be draw-out construction, containing individual units. Draw-out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. The stabs shall be tin plated copper alloy and shall provide a self-aligning pressure connection. The stab design shall ensure a consistent low-resistance contact with the vertical bus even after repeated insertions and removals. Power wiring to stabs shall be contained within the draw-out unit. No wire shall extend behind the unit.

5. All similar compartments shall have the same structural features and the units shall be interchangeable.

6. With the disconnect in the "on" position, a mechanical interlock shall prevent opening of the door. This interlock shall be provided with a defeater so that authorized personnel may gain access to the compartment without interrupting

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service. This interlock shall also prevent unintentional closing of the disconnect when the compartment door is open. A second mechanical interlock shall prevent any possibility of removing or reinserting the draw-out unit while the disconnect is in the "on" position.

7. The operator mechanism shall allow padlocking of the disconnect in the "off" position with up to three padlocks.

8. All compartment interconnect wiring to field devices shall be connected to pull apart terminal blocks.

9. Pushbuttons, selector switches, and indicating lights shall mount where shown on the Drawings on a removable device panel which is part of the draw-out unit. The device panel shall not be part of the door.

10. Compartments containing motor starters shall each have an overload selection table posted inside the door.

11. MCC compartments labeled as “SPACE” shall have a blank hinged door and drawout relay panel installed, occupying the full space area.

12. Provide removable metal filters for all vents.

F. Floor mats:

1. Provide flat, smooth, rubber mats in front of each MCC. Mat shall extend the full length of the MCC section. Mat shall have a minimum width of 36 inches extending out from in front of MCC. The mat supplied shall be specifically made for this insulation/isolation application.

2.9 VARIABLE FREQUENCY DRIVE

A. General:

1. The variable frequency drive shall be Allen-Bradley 753 Power Flex, with embedded I/O, air cooled with remote digital controller and display unit or approved equal. Each VFD shall have motor terminator unit supplied and installed near motor.

B. Load - The VFD shall be designed to continuously operate the following motor/pump load.

1. The power section shall consist of six (6) SCRs, rated for a minimum repetitive peak inverse voltage of 1400 V at 480 VAC.

2. Pump, per Mechanical Division Specification.

3. Horsepower, size (minimum) with 1.15 service factor shown on Contract Drawings, at Full speed R.P.M. for supplied pump motor.

4. Continuous current at rated voltage, as shown on Contract single line diagrams, three phase, 60 cycle.

C. The VFD manufacturer shall provide, as a minimum, input line series reactors and motor terminators as shown on Contract One-Line diagrams to prevent VFDs from interacting with the incoming Utility power line or the generator. Harmonics generated by a VFD shall not affect any device on the existing power distribution system; harmonics from any device on the existing power distribution system shall not affect the operation of the VFD. The series reactor shall be as manufactured by TCI, MTE, or approved equal.

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D. The harmonic distortion shall meet the requirements of IEEE519. Provide additional filtering equipment as required at no additional cost to Owner.

E. The VFD shall be able to start into a spinning motor. The VFD shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the VFDs shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.

F. The VFD shall not be affected by or generate excessive electro-magnetic interference (EMI). The VFD shall be provided with a radio interference filter (RIF) to meet the following requirements:

G. The use of a 4 Watt hand-held VHF/UHF transceiver within three feet of the VFD with its doors closed shall not cause erratic operation, loss of configuration, or any other deviation from normal operation.

H. Provide RFI/EMI filter on line side of VFD. Filter shall attenuate conducted radio frequencies or EMI to meet FCC standards for conducted emissions.

I. The worst case conducted and radiated EMI generated by the VFD shall not be enough to prevent the use of hand held VHF-UHF transceivers within three feet of the VFD with its doors closed.

J. Digital programmer/controller –The VFD shall be provided with a door mounted alpha-numeric human interface module (HIM) digital display with keypad to view and adjust the diagnostic and status indicators. Provide manual single turn potentiometer for manual speed control.

K. Each controller shall automatically restart upon reapplication of power after a loss of line power without requiring a manual reset. Momentary or sustained power failures shall not fault trip out the controller or blow any fuses.

L. Input and Output Terminations - The VFD assembly shall have functional conduit entry provisions and termination points at terminal blocks as shown on the Contract "E"-Series and Elementary Drawings.

M. Provide Ethernet port for future PLC communication.

N. Enclosure - The enclosure shall be as shown on Contract Drawings. All components shall be accessible from the front of the enclosure. Rear or side access shall not be required in order to remove or service any component. The enclosure shall include the following in its construction:

1. Copper lugs sized for wires listed in the Conduit & Wire Routing Schedule and provisions for connecting the motor power leads to output of the SSS shall be provided at the bottom of the enclosure.

2. The VFD shall incorporate fans for cooling. The air flow through the VFD compartment shall provide proper cooling of the operating VFD at an ambient temperature of 110° Fahrenheit. The thermostat shall be designed to regulate and monitor air temperature in the VFD enclosure. Thermostat shall have bi-metallic

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adjustable set point range of 30 to 140° F. Thermostat shall have a switching capacity of 10A at 120 VAC.

3. The complete VFD unit, including the enclosure assembly, shall be U.L. listed for a minimum of 65,000 RMS symmetrical ampere fault withstand capability. VFD assemblies consisting of the VFD, enclosure and all accessories that are not U.L. listed will not be approved.

4. Provide all vents and louvers with removable metal filters.

2.10 UTILITY METERING

A. Provide a dead-front type, utility metering main panel, size as shown on Contract Drawings one line and elevation diagrams. Main panel will include meter socket, factory installed main breaker and test by-pass facility. Breaker shall be lockable in the off position. Voltage, phase and amperage rating shall be continuous at amperage shown on one-line diagrams. Meter/Main panel enclosure shall be rated as shown on Contract Drawings.

B. Design entrance features per NEC, local codes and power utility requirements.

C. Submit to the power Utility proposed meter enclosure, meter socket, and service entrance drawing details. Provide a written statement from the Utility that shows approval of the proposed metering main panel and service entrance drawings.

D. Provide voltage test station with flashing voltage indicator and safe test point module to monitor presence of voltage and test voltage on phases. Test station shall be housed in a UL Type 4 housing and mounted to the front of the main breaker section. Voltage test station shall be Grace Technologies P-S10S21-M3RX Voltage Test Station or approved equal.

E. Where generators are installed, provide engraved re phenolic nameplate with 1" letter per NEC 702.7(A).

F. Utility metering main panel shall be B-Line (Circle AW), or approved equal.

2.11 PANELBOARD

A. The Contractor shall furnish a panelboard of the type indicated on the Contract E-series Plans and specified herein. Panelboard to be provided with breakers shown on Contract Drawings. Panelboard with a 240V high-leg (stinger) shall not be used.

B. The panelboard shall comply with the applicable sections of UL, NEC, W.U.E.S.S.C., OSHA and NEMA and shall be manufactured by Eaton, Square D, ITT or approved equivalent.

C. Provide engraved panelboard nameplates with ½-inch lettering. Nameplate inscription shall be the panel name listed on the Panelboard Schedule.

D. Provide a removable machine typed circuit directory with clear plastic cover on inside of panelboard of door breaker identification when panelboard is delivered to site. Update the panelboard legend at end of project to reflect as-built conditions. "Sticker" type panelboard schedules are not acceptable.

E. Provide circuit number tags next to each circuit breaker, including existing panelboards.

F. Panelboards mounted external of MCCs shall be provided with engraved nameplates listing Panelboard name, voltages, and location feeding it (i.e. "MCC-100 via Transformer XFMR-100", "Power Panel 100", etc.). Engraved nameplate shall be as specified herein

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2.12 PANELBOARD TRANSFORMER

A. The panelboard transformer shall be ventilated dry type. Voltage, phase and KVA ratings shall be as shown on the Contract One-line drawing. The transformer shall be as manufactured by G.E. Type QL, Eaton, Jefferson, or approved equal.

B. The transformer shall have 115 degrees Celsius rise, insulation 220 degrees Celsius rise class H insulation system.

C. Vibration isolators shall be installed between the transformer and its mounting surface to reduce case vibration and compensate for slight unevenness of the mount. They shall be sized for the appropriate loading at twice the fundamental frequency. The Transformer housing shall be securely fastened to the mounting surface to eliminate possible sound generation.

D. The transformer shall be finished with two coats of heavy enamel to resist rust and corrosion.

E. Transformers that require neutral grounding shall be grounded in accordance with NEC 250.26, 450.10 and any applicable local ordinances. Protection of the grounding attachments shall be per NEC 250.24.

F. Transformers mounted external of MCCs shall be provided with engraved or metal stamped nameplates listing transformer name, primary / secondary voltages, KVA size and manufacturer part number. Laser printed or sticker style labels are not acceptable.

G. Provide an engraved nameplate for each external transformer as specified herein.

2.13 CONDUIT, RACEWAYS, AND WIREWAYS

A. General: Conduit, raceways, wireways, wiring methods, materials and installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications:

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.

2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.

3. The minimum size conduit shall be 3/4-inch unless indicated otherwise on the Drawings or for special connections to equipment.

4. Conduit stubs for future use shall be capped with pullrope, coupling, nipple, plug, and cap and each end identified with conduit labels.

5. Conduits to be abandoned that protrude above graded shall be cut flush and filled with grout

6. Conduits shall not be filled to more than 50% of their total cross – sectional area.

7. Conduits entering enclosures shall be fitted with locknut and insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

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B. Conduit Marking

1. All conduits listed in the "Conduit and Wire Routing Schedule" shall have conduit tags at both ends of each conduit segment. This includes all conduits transitions, in pullboxes and in vaults.

2. Tag material shall be 19 gauge brass or stainless steel tag with engraved lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than 7/16". Tags shall be heat and UV resistant, stainproof, and non-corroding. Securely fasten tags in place using 316 stainless steel wire of the type normally used for this purpose. Stainless steel wire shall be crimp connected. Twisting ends together is not acceptable. Engrave the tags, on both sides, with the conduit number as listed in the Conduit and Wire Routing Schedule on the Contract "E"-series Drawings. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1, or approved equal.

3. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have ½-inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

C. Galvanized Rigid Steel Conduit (GRS)

1. Rigid steel conduit, couplings, bends and nipples shall be in accordance with ANSI C80.1 and UL-6. Fittings/conduit bodies shall be malleable. Threadless connectors/couplings shall not be permitted. Conduits entering boxes shall have Myers hub. Cuts and threads shall be recoated with cold galvanizing spray.

2. Hotdip galvanized inside and outside after fabrication and then coated with a zinc bichromate finish.

3. Minimum trade size – three-quarters inch (3/4") unless otherwise shown on Contract Drawings.

4. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

5. Galvanized rigid steel factory elbows for indoor 90 degree transitions.

6. EMT or IMC is not considered an equivalent to GRS.

7. GRS conduit is allowed only when specifically called out in the "Conduit and Wire Routing Schedule".

D. Galvanized Rigid Steel Conduit – PVC Coated (GRS-PVC)

1. Standard weight, galvanized conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit to be Robroy Plasti-bond Red, Thomas and Betts OCAL or approved equal.

2. Provide PVC coated galvanized rigid steel factory elbows for 90 degree transitions.

3. Fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable. Fittings shall be Robroy Liquitite coated fittings, Thomas and Betts or approved equal.

BID SET - NOT FOR CONSTRUCTION

4. All junction boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness except where 316 stainless steel boxes are called out.

5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

6. Support channel and pipe straps shall be PVC coated. Exposed metal/nuts, all-thread rod shall be 316 stainless steel.

7. PVC coating patching material shall be as provided by the manufacturer.

8. PVC coated Aluminum conduit is not acceptable.

E. PVC Conduit (PVC-40 OR PVC-80)

1. Shall be high impact polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. PVC conduits shall be UL listed and labeled for “direct” burial.

2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.

3. Bends, elbows, and risers shall be made with rigid steel (GRS) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.

4. Risers shall be made with rigid steel (GRS) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.

5. PVC fittings shall have watertight solvent-weld-type conduit connections.

6. PVC conduit shall be stored on a flat surface and shielded from the sun.

7. PVC conduit shall not be used above grade.

F. Liquid Tight Flexible Metal Conduit (FLEX)

1. Minimum trade size one-half inch (1/2").

2. All flex conduits shall be galvanized steel with PVC coated metallic with insulated bushings.

3. Final connections to vibrating equipment such as motors and fans shall be made with flexible conduits.

4. Flexible conduit lengths shall not be greater than 36 inches. Extend steel conduit to meet this length. Brace vertical GRS (NEMA 12 area) or GRS-PVC (NEMA 4X area) conduit with Stainless Steel unistrut, unistrut base and anchored to concrete pad.

5. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.

6. Flexible conduit shall only be installed in exposed or accessible locations.

7. Flexible conduits shall be used for conduit coupling to all vibrating and shifting equipment.

BID SET - NOT FOR CONSTRUCTION

G. Warning Tapes:

1. Bury detectable warning tapes approximately 12 inches above all underground conduit runs of two or more outside of building. Align parallel to and within 3 inches of the centerline of the conduit or duct bank.

2. Plastic tape shall be colored for particular underground service, 3-inch minimum width, utilize tape made of material resistant to corrosive soil. Tape shall have aluminum backing to facilitate locating it underground using a non-ferrous locator. Use red tape for "Electric" service and orange tape for "Communication" service. Use tape with printed wording listing type of service. Manufacturers and types: Seton, Blackburn, Griffolyn Co., Terra-Tape, Brady, or equivalent.

2.14 WIRING DEVICES

A. Boxes

1. Device boxes shall be of zinc-galvanized steel type with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to structure by means of screws, anchors, or bolts.

2. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC articles 314 requirements.

3. Non-Weatherproof Boxes - Surface boxes shall be cast ferrous, deep FD type with threaded hubs.

4. Weatherproof (WP) Boxes - PVC-coated cast ferrous boxes may be used in place of 316 stainless steel boxes, except where boxes contain devices on cover. Boxes shall be deep, FD type with threaded hubs or stainless steel with watertight Myers hubs. Single gang boxes shall have cast hubs.

B. Switches

1. General purpose switches shall be manufactured in accordance with UL 20. Switches shall be one pole rated, 20 amps, at 277 VAC. Bodies shall be of ivory phenolic compound supported by mounting strap having plaster ears. Switches shall have copper alloy contact arm with silver cadmium oxide contacts. Switches shall have slotted terminal screws and a separate green grounding screw. Furnish Hubbell 1221, Leviton 1221, or approved equal.

C. Receptacles

1. General purpose receptacles shall be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals. Face color shall be white or ivory. General purpose receptacles shall be Leviton 5362, Bryant, Hubbell, or approved equal.

2. GFI (ground fault circuit interrupting) receptacles shall be used in all boxes shown as weatherproof. GFI receptacles shall be duplex, 20A, 120V, with "test" and "reset" buttons with shallow design for mounting and standard screw terminals for direct wiring. Receptacles shall be designed, manufactured, and tested to prevent nuisance tripping from voltage spikes, RFI, EMI, or electronic component failures. Chaining multiple receptacles from one GFI unit is not acceptable. GFI receptacles shall be Leviton 6899, Arrow-Hart or approved equal.

BID SET - NOT FOR CONSTRUCTION

D. Device Plates and Covers

1. General purpose device plates and covers shall be 316 stainless steel. Plates or covers shall be attached with 316 stainless steel screws. Circuit breaker number and panelboard name shall be stamped on each cover.

2. PVC coated device boxes shall have PVC-coated gasketed covers.

3. Weatherproof switch, outlet, and receptacle boxes shall be fitted with gasketed covers rated for wet locations in accordance with NEC 404.4.

4. Weatherproof switch, outlet, and receptacle boxes shall be fitted with cast aluminum gasketed cover rated for wet locations. Each receptacle access cover shall have a gasketed spring door to maintain the weatherproof integrity with plug inserted in accordance with NEC 406.8 for unattended locations. Final decision of type of access cover for specific location shall be per Engineer. Screws and hinge springs shall be 316 stainless steel. Receptacles located outside shall have tumbler key lock.

5. Weatherproof access covers shall be Hubbell, Crouse-Hinds, or TayMac Safety Outlet Enclosures, or approved equal.

6. Receptacle & light switch plates shall be stamped or engraved as specified in section Nameplates and Tags.

2.15 MANUAL TRANSFER SWITCH

A. Switch shall be provided with the voltage, and amperage rated as shown on the one-line and other Contract Drawings. All switches shall be UL 1008 labeled.

B. Switches to be NEMA 3R double coated, cold-rolled steel enclosure.

C. Integral utility and generator manual disconnects shall be interlocked to prevent cross connecting power sources.

D. Provide surge protective device in MTS.

E. Outer door shall be padlockable. Provided hinged plate for when portable generator cables are not in use.

F. Provide terminal strips for future remote generator start and generator fail monitoring.

G. Equipment ground kits shall be furnished for each switch.

H. Provide matching 400A Camlocks plug male connectors.

I. Generator receptacles and generator lug panels shall have engraved nameplate with ½" letters (red with white lettering) per NEC 702.7.(C).

J. Manual Transfer Switch shall be ESL Power Systems Storm Switch with matching 400A Camlok plug malle connectors, to match Owner Standard.

2.16 PULL BOXES

A. Underground pull boxes, where shown or required by length of conduit runs, shall be prefabricated concrete type with the size shown on the Drawings or larger to allow for adequate pull area. Extension sections shall be provided as necessary to reach the depth of underground conduits. All boxes shall have galvanized steel hold down bolts and hardware. Boxes located in paved areas or other areas which vehicles may travel shall be H/20 loading rated and have diamond plate steel traffic covers. Steel covers or lids shall be galvanized.

BID SET - NOT FOR CONSTRUCTION

Pull box covers shall be labeled with pull box designation. All underground pull boxes shall have a 12-inch bedding of 3/4-inch nominal crushed rock. Pull boxes shall be Christy Concrete Products, Brooks, or approved equal.

2.17 ELECTRICAL ENCLOSURES AND BOXES

A. Enclosures and boxes to be wall mounted, minimum 14 gauge, type 316 stainless steel with seams continuously welded & ground smooth, and fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box.

B. Provide accessories consisting of breaker to disconnect incoming power, heater, fan, removable metal louvers, and thermostats, where shown on Contract drawings.

C. All fans, vents and louvers shall be provided with removable metal filters

D. Provide larger enclosure as required to accommodate the supplied equipment at no additional cost to the Owner

E. Provide metal data pocket within each enclosure and box to hold as-built drawings.

F. All panel doors shall be installed with ground straps.

G. Panels shall be provided with engraved nameplate identifying name of panel, voltage and location of power source feeding it (i.e. MCC-100, Panelboard LP-1, etc.).

H. Enclosure shall be Hoffman, Circle AW or approved equal

2.18 GROUNDING SYSTEM

A. The ground rod shall consist of not less than 10 continuous feet of 3/4-inch copper coated electroplated high grade carbon steel. The ground rod shall be an Eritech 613400, NEHRING type NCC, Weater 348 or approved equal.

B. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney Type GRC, Burndy Type GAR or GP, or approved equal.

C. All ground rod, pipe, and steel plate and buried bond connections shall be made by welding process equal to Cadweld.

D. Provide a 13 inch diameter, 9-inch nominal throat, concrete ground rod box, minimum 12 inches deep, with a cast iron traffic cover embossed or engraved "GROUND."

E. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding conductors required per NEC. Screw-type lugs shall be provided on all ground busses for connection of grounding conductors.

F. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO D-167 series, or approved equal.

G. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.

H. All raceway systems, supports, enclosures, panels, and equipment housings shall be permanently and effectively grounded.

BID SET - NOT FOR CONSTRUCTION

I. One side of the secondary on all transformers shall be grounded.

J. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main over-current protection.

K. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.

L. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250.122, whichever is larger.

M. Grounding and bonding wires shall be installed on all conduits with grounding bushings, expansion joints and for continuity of raceways transitions. Bonding wires at endpoints shall be connected to enclosure ground bus or equipment grounding lug.

N. Conduit grounding bushings shall be installed on all metallic conduits. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire. Ground bonding wire shall be bare wire and shall be sized per NEC.

O. Conduit shall be rigidly secured to panels and other electrical equipment terminal boxes with locknuts and bushings in such a manner that each system shall be electrically continuous throughout

P. All receptacles shall have their grounding contact connected to a grounding conductor.

Q. Branch circuit grounding conductors for receptacles, or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.

R. Negative side of all VDC power supplies shall be grounded.

BID SET - NOT FOR CONSTRUCTION

PART 3 - EXECUTION

3.1 ELECTRICAL WORKMANSHIP

A. All work in this Section shall conform to the codes and standards outlined herein.

B. The Electrical Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel 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 improper installations at no additional expense to the Owner.

E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

3.2 ELECTRICAL CONSTRUCTION METHODS, GENERAL

A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by round-head 316 stainless screw attached retainer. Where space is available, such as in electrical cabinets, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 50%. Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wireways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Tie-wraps shall be T & B TY-RAP's or approved equal.

B. Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by plastic spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections.

C. All devices shall be permanently labeled and secured in accordance with subsections labeled "NAMEPLATES AND TAGS".

D. All field wires and panel wires have wire markers as specified in the "WIRE" subsection.

E. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.

F. Spacing and clearance of components shall be in accordance with UL, JIC and NEC standards.

G. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered with spliced wires shall be rejected and the Contractor required to replace all such wiring, at no additional cost to the Owner.

H. No wires shall be spliced without prior approval by the Engineer.

BID SET - NOT FOR CONSTRUCTION

I. Where splices are allowed or approved by the Engineer they shall conform with the following:

1. Splices of #10 and smaller, including fixture taps, shall be made with see-through nylon, self-insulated twist on wire joints; T & B “Piggys”, Ideal “Wing Nut”, or approved equal.

2. Splices of #8 and larger shall be double crimped splices, or approved equal, insulated with hear shrink tubing, or approved equal.

3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M “Scotchcast” cast resin splice kits and shall have a date marking for shelf life. Do not use splice kits with a date marking for shelf life that has expired.

4. Wire splicing devices shall be sized according to manufacturer’s recommendations.

5. Tape on splices shall not be allowed.

6. Splices for motor leads shall be made with T&B MSC series splice kit, or approved equal.

J. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber based, elastic putty in tape form. Varnished cambric shall not be used.

K. Connections to terminals shall be as follows:

1. Use connector or socket type terminals furnished with component.

2. Connections to binding post screw, stud or bolt use:

a. For #10 and smaller wire, T & B “Sta-Kon”, Buchanan “Termend” or approved equal, self-insulated locking forked tongue lug.

b. For #8 to #4/0 wire, T & B “Locktite”, Burndy QA or approved equal lug of shape best suited.

3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

4. Connections to terminals shall be as follows:

a. Use connector or socket type terminals furnished with component.

b. Connections to binding post screw, stud, or bolt use:

1) For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend", or approved equal, self-insulated locking forked tongue lug.

2) For #8 to #4/0 wire, T & B "Locktite", Burndy QA, or approved equal, lug of shape best suited.

c. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

d. Connections for all terminals shall be made with insulation stripped per manufacturer's instructions.

L. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written “change order” authority by the Engineer. When field changes are made, the components, materials, wiring, labeling,

BID SET NOT FOR CONSTRUCTION

and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.

M. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.

N. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.3 ELECTRICAL EQUIPMENT FABRICATION, GENERAL

A. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device. Do not paint nameplates, labels, tags, switches, receptacles, conductors, etc.

B. All doors shall be fully gasketed with non-shrinkable, water and flame resistant material.

C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer, otherwise they shall have a 316 stainless steel flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.

D. No fastening devices shall project through the outer surfaces of equipment.

E. Each component within the equipment shall be securely mounted on an interior subpanel or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.

F. HARNESS: Where space is available, all wiring shall be run in slotted plastic wire ways or channels with dust covers. If space is not available for wireways, then all wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by high bond adhesive retainers. Wire ways or channels shall be sized such that the wire fill does not exceed 50%.

G. HINGE LOOPS: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N, or approved equal.

H. RETAINERS: Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be Panduit High Bond Adhesive back mounts SGABM series, or approved equal.

I. ROUTING: Wires shall be routed in slotted plastic wire-ways with snap covers.

1. Wires carrying 120 VAC shall be separated as much as possible from other low voltage wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible.

BID SET - NOT FOR CONSTRUCTION

2. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts is not allowed without prior written approval of the Owner.

3. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.

4. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.

5. Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.

J. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors are not allowed.

1. Provide 2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Owner.

2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.

3. Terminal blocks and same equipment type termination wiring shall have all wiring terminated with appropriate sized ferrules with insulation collars. Ferrule crimping (full ratcheting) tool with proper sized jigs shall be used per manufacturer's recommendations.

4. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp on type that form gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.

5. On shielded cables, the drain wire shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.

6. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.

7. Heat shrink shall be placed on ends of shielded cable to cover foil.

8. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e., solenoid valves, level probe, etc.).

BID SET - NOT FOR CONSTRUCTION

9. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.

K. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250.122, whichever is larger.

L. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 373.6(A) & (B).

M. Wire sizes shall not be installed smaller than those shown in NEC Article 310 for each circuit amperage rating.

N. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 15 percent usable future space.

O. Doors shall swing freely a minimum of 90º and close with proper alignment.

P. Provide larger motor termination boxes as required to accommodate conduit and wires.

3.4 DELIVERY

A. Contractor shall inspect each electrical and instrumentation item delivered to the jobsite.

B. Contractor shall unpack each item for inspection within two (2) days of arrival.

C. Complete written inventory shall be produced by Contractor and submitted to Owner within (2) days after arrival on jobsite for record keeping prior to any payment for the item.

D. All panels and enclosures be delivered with as-built drawings in clear plastic packets within each panel and enclosure.

3.5 DAMAGED PRODUCTS

A. Damage products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the Owner.

3.6 FASTENERS & LUGS

A. Fasteners for securing equipment shall be 316 stainless steel. The fastener size shall match equipment mounting holes. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

B. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

C. Anchor Methods:

1. Hollow Masonry: Sleeve type anchors.

2. Solid Masonry: Sleeve type anchors or epoxy anchors bolts.

3. Metal Surfaces: Machine screws, bolts, or welded studs.

BID SET - NOT FOR CONSTRUCTION

4. Concrete Surfaces: Wedge or expansion 316 stainless steel anchors.

5. Structural Steel: Right angle, parallel and edge type rigid metal clamps. Do not weld or drill structural steel.

D. Equipment Mounting:

1. The Electrical Contractor shall be responsible for furnishing and setting all anchor bolts required to install his equipment.

2. Electrical equipment shall be unistrut "stand off" mounted a minimum of ½ - inch from the wall in a manner so that the rear of the equipment is freely exposed to air circulation. Unistrut material shall be 316 stainless steel in NEMA 4X areas and galvanized in non-NEMA 4X areas unless called out specifically in details.

3. All equipment enclosures shall be of the NEMA classification noted on the electrical plan Drawings for the area in which the device will be mounted.

4. Reinforced concrete pad with 316 stainless steel anchor bolts shall be provided for each electrical freestanding equipment.

E. Dissimilar metals such as aluminum, stainless steel, steel, galvanized steel between enclosures, devices, etc. and mounting surfaces shall be isolated from each other using insulated tape or nonmetal spacers. Tape and spacers used shall be specifically manufactured for this application.

3.7 INSTALLATION, GENERAL

A. System

1. Install all products per manufacturer's recommendations and the Drawings.

2. Contract Drawings are intended to show the basic functional requirements of the electrical system and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.

3. Keep a copy of the manufacturer's installation instructions on the jobsite available for review at all times prior to and during the installation of the associated equipment.

B. Provide all necessary hardware, conduit, terminal blocks, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:

1. Provide additional devices, wiring, terminal block, conduits, relays, signal converters, isolators, boosters, and other miscellaneous devices as required to complete interfaces of the electrical and instrumentation system.

2. Changing normally open contacts to normally closed contacts or vice versa.

3. Adding additional relays to provide more contacts as necessary.

4. Installing additional terminal blocks to land wires.

5. Provide larger circuit breakers, conduit and wire, as required for the horsepower of the supplied equipment, when the supplied equipment is larger than that specified, at no additional cost to the Owner.

BID SET - NOT FOR CONSTRUCTION

6. When generator supplier provides block heaters that do not match Contract Drawings, modify panelboard schedule, circuit breaker sizes, wire sizes, conduit sizes, etc.

7. Provide larger pullboxes and junction boxes to accommodate the conduits and wires shown in the Conduit & Wire Routing schedule at no additional cost to Owner.

8. Other work implied by contract documents.

C. All programmable devices, shall be programmed, set-up and tested by the Contractor prior to start of witness testing. This includes UPS, PLCs, VFD and instrumentation. Programming and set-up parameters shall be adjusted or changed as directed by the Owner or Engineer during start-up and throughout the warranty period, at no additional cost to the Owner. Coordinate with the Owner and setup all alarm, process, time delays and operation setpoints.

D. Coordinate with the Owner and setup all alarm, process, and operation setpoints.

E. Panels and Enclosures

1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.

2. Install level and plumb.

3. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.26.

4. Box supports shall be located and oriented as directed in field by Owner.

5. Seal all enclosure openings, including bottom edge of all pad mounted enclosures to prevent entrance of insects, rodents, dirt, debris, etc.

6. All conduits entering outdoor panels and enclosures shall use watertight hubs. These hubs shall be located on sides or bottom only. Top entry of outdoor panels or enclosures is not allowed unless specifically shown on plans.

7. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e. solenoid valves, level probe, etc.)

8. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.

9. All panels and enclosures be delivered with as-built drawings in clear plastic packets within each panel and enclosure.

10. Provide larger motor termination boxes as required to accommodate conduit and wires.

F. Conduits and Ducts

1. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.

BID SET - NOT FOR CONSTRUCTION

2. Exposed conduits runs shall not be run directly on the ground or roof. Secure conduits to 316 stainless steel unistrut.

3. Install conduit free from dents and bruises.

4. All conduits shall be labeled with conduit tags on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations. All spare conduits shall be labeled.

5. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.

6. Route all above grade outdoor conduits or conduits in rated areas parallel or perpendicular to structure lines and/or piping.

7. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with 316 stainless steel Unistrut stanchions or PVC coated clamps with backplates.

8. Duct-taping conduits together is not acceptable. Conduits, installed into concrete pads, shall be installed with a minimum of 2" distance between conduits to allow installation of bushings.

9. Conduit entrances: Seal each conduit entrance from below grade into the panels, and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents.

10. Special "Soft–Jaw" type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.

11. Conduits shall be painted to match the color of surface attached to as directed by Owner.

12. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have ½-inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

13. All spares shall be mandrel and have pull ropes installed.

14. All existing conduits that are reused shall have a mandrel or conduit piston pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witness by the Owner.

15. Install new conduit tags for reused conduits at all transition boxes and endpoints. Conduit & Wire Routing Schedule shall be updated as these modifications take place.

16. Flex conduits shall be limited to less than 36 inches. Brace vertical GRS (NEMA 12 area) or GRS-PVC (NEMA 4X area) conduit with Stainless Steel unistrut, unistrut base and anchored to concrete pad.

17. Conduits installed indoors, and not braced to wall or ceiling and exceeding 2 feet in height shall be braced in place with stainless steel unistrut stanchion with backplates.

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G. Conduit and Wire Routing Schedule

1. Conduit material, wire size, and quantity listed in schedule take precedence over Division 16 Specifications.

2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.

3. Wire sizes listed are in AWG or Kcmil and are copper conductors.

4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule" which shall be labeled on both ends with a unique wire label. All spare wires shall be labeled with conduit followed by SP1, PS2, etc. (i.e. A151-SP1 for first spare wire, A151-SP2 for second spare wire, etc.).

5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only. A credit or add-on will be provided by Contractor based on the actual work performed by Contractor for the Utility service.

6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.

8. Vertical offsets and sloping of conduits are not detailed on plans, the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.

9. Seals

   a. Seal around all conduits, wires, and cables penetrating between panels, walls, ceilings, and floors in all buildings with a fire stop material. Seal shall be made at both ends of the conduit with a fire stop putty. Seal shall have a minimum two hour rating. Fire stop sealing shall be International Protective Coatings Flamesafe, or approved equal.

   b. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.

   c. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.

   d. Seal conduits entering any electrical instrument and install conduit drains as necessary to prevent corrosion from water condensation.

   e. Conduit entrances: Seal each conduit entrance from below grade into the MCC and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the enclosures shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be PRC-DeSoto (formerly Courtaulds) Aerospace Semco PR-868 or approved equal.

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H. Excavation and Back Filling

1. The Electrical Contractor shall provide the excavation for equipment foundations, and trenches for conduits or buried cables.

2. Underground conduits outside of structures shall have a minimum cover of 24 inches, except for utility conduits depth, shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.

3. Trenches for all underground utility lines shall be excavated to the required depths.

4. Repave any area that was paved prior to excavation. Backfill and surface all areas as shown on the Drawings or where not shown to the original condition that was present prior to the excavation.

5. Contractor shall uncover any uninspected covered conduit trenches, at no additional cost to Owner, to verify proper installation.

6. Excavation and back fill conduit trenches shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required. Backfill shall consist of 3/4 inch class 2 aggregate base material, unless otherwise noted.

7. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

I. Wiring, Grounding and Shielding

1. It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only (source end), the shield at the other end (receive end) shall be encased in an insulated material to isolate it from ground.

2. Special cables shall be provided when required by manufacturer or necessary to correct noise or distortion interference at no additional cost to Owner.

3. Field wiring shall not begin until interconnection drawings have been submitted by the Contractor and approved by the Engineer.

J. Cutting and Patching: The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Paint patched surfaces to match the original color.

K. Housekeeping Pads:

1. Concrete housekeeping pads are required for all free standing electrical equipment. Housekeeping pads shall be 3-1/2” inches above surrounding finished floor or grade, unless otherwise shown, and shall be 4 inches (minimum) larger in width on all sides of equipment. The depth of housekeeping pads shall be 18 inches (minimum).

2. Housekeeping pads shall be installed for future units as shown on the Contract Drawings.

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3. Housekeeping pad shall be Class "A" concrete with rebar crossway network. The minimum size rebar allowed is #3. Concrete shall be precisely leveled so that equipment set in place will not require shimming.

L. Cleaning and Touch Up

1. Prior to startup and at completion of the work prior to final acceptance, all parts of the installation, including all equipment, exposed conduit, devices, and fittings shall be cleaned and given touch up by Contractor as follows:

a. Remove all grease and metal cuttings.

b. Any discoloration or other damage to parts of the building, the finish, or the furnishings, shall be repaired.

c. Thoroughly clean any of his exposed work requiring same.

d. Vacuum and clean the inside of all MCC and electrical and instrumentation enclosures.

e. Clean all above and below ground pull boxes, junction boxes, and vaults from all foreign debris prior to final acceptance.

f. Paint all scratched or blemished surfaces with the necessary coats of quick drying paint to match adjacent color, texture, and thickness. This shall include all prime painted electrical equipment, including enclosures, panels, poles, boxes, devices, etc.

g. Remove all decals and lettering from both sides of support plates.

h. Repair damage to factory finishes with repair products recommended by Manufacturer.

i. Repair damage to PVC or paint finishes with matching touchup coating recommended by Manufacturer.

3.8 ELECTRICAL TESTING

A. General Requirements

1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.

2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction.

a. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization.

b. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment.

c. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor.

d. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.

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3. The testing shall not be started until the manufacturer has completed fabrication, wiring, setup, and programming; performed satisfactory checks and adjustments; factory testing sheets approved by Owner; and can demonstrate the system is complete and operational.

4. Factory Test Scheduling:

   a. The testing shall not be started until:

      1) The manufacturer has completed fabrication, wiring, and setup; performed satisfactory checks and adjustments; and can demonstrate the system is complete and operational.

      2) Submittals associated with the equipment have been approved by the Engineer

      3) Certification of completion of Contractor's in-house tests shall be submitted prior to scheduling of factory testing.

   b. If factory test equipment is significantly different from submittal drawings, this shall be grounds for cancellation and rescheduling of factory tests at no additional costs to Owner or extension of Contract time.

5. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off and complete prior to the start of any of the Post-Energization Tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.

6. Testing Sheets and Procedures:

   a. The supplier shall submit for approval, the proposed factory & field testing sheets at least two weeks prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date.

   b. Separate test procedures in separate binders shall be submitted for approval for the Factory and Field Tests. Testing shall not commence until the test procedures have been reviewed and approved by the Owner. Tests forms shall be similar to those shown on Appendix "A".

7. All tests shall be witnessed by the Engineer and/or Owner personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments.

   a. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy.

   b. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction.

   c. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.

   d. The Contractor shall notify the Owner and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates

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agreed to by the Owner and the Engineer in order that the testing be scheduled and witnessed.

e. The Contractor shall fill in & submit for approval the "Scheduled Test Request Form" located in Appendix "A" for each requested inspection, factory and field test.

B. FAILURE-TO-MEET TEST:

1. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the Owner.

2. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineer; these additional tests shall be done at no additional cost to the Owner.

3. If testing, installation or configuration work performed is deemed inadequate by Owner or Engineer, then the Contractor shall provide a qualified technician to meet these requirements. No extension of Contract time will be allowed.

4. If Owner Representative determines that the System Set-up is not ready for testing, the Owner Representative reserves the right to cancel the Factory Test as the equipment is found to be not fully and completely ready for factory testing. The Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing when it has been cancelled.

C. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturer's safety precautions shall be followed.

2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.

3. The Contractor shall have two or more personnel present at all tests.

4. Two non-licensed portable radios are to be made available by the Contractor for the testing organization to conduct tests.

5. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.

6. Field inspections and pre-energization tests shall be completed prior to applying power to equipment.

D. ELECTRICAL FACTORY TEST

1. The System supplier shall conduct a thorough and complete factory test by qualified factory-trained personnel witnessed by Owner per the criteria specified herein. Factory test shall be held within 150 miles of project location.

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2. The “System set-up” for factory testing shall consist of, but is not limited to:
    a. Meter/Main Panel
    b. Manual Transfer Switch
    c. MCC
    d. Pump Control Panel
    e. Sunshield
    f. Any miscellaneous associated electrical equipment or panels.
3. Temporary wiring and equipment shall be setup during these tests to simulate the complete assembled system.
4. The length of the factory testing for the “System setup” shall be a minimum of one (1) working days. If in the opinion of the Owner or Engineer the factory testing is not completed at the end of the working day, the testing shall be extended, at no additional cost to the Owner or extension in Contract time.
5. All factory tests shall be conducted at the Supplier’s facility. All factory tests shall be completed prior to shipment of any of the “System set-up” to the jobsite. The “System set-up” shall be fully assembled, programmed, and connected as it will be installed in the final configuration. If the “System set-up” is found to be not fully and completely ready for factory testing, the Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing. Factory testing is to ensure that there are no defects. The hardware and software shall be tested for compliance with the plans and Specifications included herein and for the ability to perform the control functions.
6. All components of the system setup shall be completely assembled and thoroughly pre-tested by the supplier or manufacturer before start of factory test.
7. Provide a complete clean copy of System Supplier drawings for Owner and Engineer’s use during Factory Test prior to starting the tests. These drawings shall reflect the equipment being tested.
    a. If Owner Representative determines that these drawings do not adequately reflect the actual equipment being tested or differs substantially from the approved equipment submittal, the Owner Representative reserves the right to cancel the Factory Test as the equipment is found to be not fully and completely ready for factory testing.
    b. Equipment that differs substantially from the approved equipment submittal shall be resubmitted. Factory test will be rescheduled after revised submittals have been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted".
    c. No extension of Contract time will be allowed. Cancellation and rescheduling of factory tests shall occur at no additional costs to Owner
    d. The Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing when it has been cancelled.

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8. The associated factory tests for each of the factory testing sheets that are to be performed by the supplier and witnessed by the Owner/Engineer shall include the following for the "System set-up" as a minimum:

   a. Inspections of the panels as follows:

      1) Visual and Mechanical:

         a) Inspect for physical damage, proper support, and wiring.

         b) Check all starters, breakers, and other components for proper sizes.

      2) The Contractor shall fill in test form TF4 located in Appendix "A".

   b. Testing of the Equipment as follows:

      1) Each line of control logic on the elementary or loop diagrams shall be checked. After a line of control logic is tested, the person performing test shall initial or highlight the corresponding line on the elementary diagram. When the complete elementary diagram has been checked, it shall be signed and dated by testing person and person witnessing test.

      2) I/O points to terminal blocks shall be simulated for the complete checkout of PLC interfaces.

      3) The tests, as a minimum, shall simulate all operating conditions including steady state, transients, upsets, startup, shutdown, power failure, and equipment failure conditions (for control logic).

      4) The Contractor shall complete each test and fill in the I/O test form TF13 located in Appendix "A".

   c. Testing of Control, as follows:

      1) To facilitate testing and system simulation of the "System Set-up", the Supplier shall connect a separate toggle two position on-off switch to each status and alarm digital input. Three digital multi-meters (minimum +/- 0.2% accuracy) with clip-on leads shall be supplied and utilized during testing for measurement of digital and analog outputs. The supplier shall use simulated input signals to replicate varying field device signals during the factory tests in order to verify the proper functioning of hardware and software.

   d. The structured factory tests to be performed by the System Supplier and witnessed by the Owner shall include the following as a minimum:

      1) Control Checkout Tests: Simulate the digital or analog signals (or combination thereof) at the panel field terminals using the test hardware to verify that each control is functional and properly configured. Verify that all parameters (i.e., relay logic operations, relay timing, controller setpoints, etc.) of the control system are defined and operate according to the design documents.

      2) Alarm Checkout Tests: Simulate the digital or analog signals (or combination thereof) at the panels using the test hardware to verify that each I/O point is functional and properly configured. Verify that all parameters (i.e., description, engineering units, span, enable/disable, setpoints, runtimes, totalization, logic type,

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etc.) of the alarms are defined and operate according to the Specifications.

e. Unstructured factory tests are required as part of the factory testing phase. These additional tests shall include any and all unstructured tests as directed by the Owner or Engineer. The various unstructured tests shall include, but are not limited to, the following:

1) Verify the correct inventory of hardware, etc. All spare parts shall be included in the inventory.

2) The factory tests, as a minimum, shall simulate all normal and abnormal operating conditions including steady state, change of state, variable changes, fluctuations, transients, upsets, start-up, shutdown, power failure, and equipment failure conditions.

9. The factory test will be considered complete only when the integrated system has successfully passed all tests to the satisfaction of the Owner or Engineer and the Factory Test checkout form TF11 has been signed & dated by Owner.

10. No electrical equipment shall be shipped to jobsite without authorization from the Owner or Engineer that the factory test has been completed. Equipment that were shipped to the jobsite without authorization shall be shipped back to the System Supplier for witness testing at no additional cost to Owner.

11. Acceptance and witnessing of the factory tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.

12. The testing personnel shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.

13. During the testing period, under the supervision of the supplier, the Engineer and other Owner personnel shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.

14. Spare parts, including spare I/O for the system shall also be tested during this test period. The supplier shall prove by temporarily connecting the spare hardware to the system that any or all of the spare parts function in a manner equivalent to the original equipment under test.

15. The Contractor shall pay all expenses incurred by his personnel which includes labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during the factory testing.

16. Faulty and/or incorrect hardware operation of major portions of the system may, at the discretion of the Owner Engineer, be cause for suspension or restarting of the entire factory test, at no additional cost to the Owner or extension in contract time.

17. All modifications to drawings and documentation as a result of the factory tests shall be corrected and completed before shipment of drawings with equipment and the submittal and delivery of “operation and maintenance” manuals.

18. Copies of the completed, signed, and witnessed factory testing forms shall be placed in the Operation and Maintenance Manual.

E. Electrical Field Tests

1. The Contractor shall engage and pay for the services of an approved qualified testing company for the purpose of performing inspections and tests as herein

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specified. The testing company shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. The Electrical Contractor shall be present on site for all field tests.

2. Prior to start of any field testing, the Field Test Procedures, Interconnection Drawings and Preliminary Operation and Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer. Also, prior to start of field testing of equipment, correct machine printed wire labels shall be in place on all wires associated with that equipment.

3. The Electrical Contractor shall complete and submit "Schedule Test Request Form" as illustrated in Appendix "A" for each electrical field test.

4. The Electrical Contractor shall be at the jobsite to assist with all Electrical Field Tests.

5. Pre-Energization Tests: These tests shall be completed prior to applying power to any equipment.

    a. Inspections:

        1) Visual and mechanical inspections:

            a) Inspect for physical damage, proper anchorage and grounding.

            b) Compare equipment nameplate data with design plans and starter schedule.

            c) Compare overload setting with motor full load current for proper size.

        2) Performed NETA acceptance testing for each piece of equipment.

        3) The Testing Company shall compile, by visual inspection a record of all motor nameplate data, the following minimum data shall be neatly tabulated in spreadsheet form and submitted to Owner:

            a) Manufacturer

            b) Part and model number

            c) Equipment driven

            d) Motor horsepower

            e) Nameplate amperes, volts and phase

            f) Service factor

            g) Temperature ratings

            h) Overload catalog number

            i) Overload current range and setting

            j) Circuit breaker rating

            k) Circuit breaker trip setting, for magnetic only circuit breakers

        4) The Contractor shall fill in, for each piece of equipment, Test Form TF4 located in Appendix "A".

    b. Torque Connections:

        1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening

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screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC Annex I for torque values as guidelines.

c. Wire Insulation & Continuity Tests:

1) All devices that are not rated to withstand the 500V megger potential shall be disconnected prior to the megger tests.

2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each field conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.

3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 10 Meg-ohms shall be replaced.

4) Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

5) The Contractor shall fill in test forms Power and Control Conductor Test Form TF1 and Instrumentation Conductor Test Form TF2 located in Appendix "A".

d. Grounding System Tests:

1) Visual and Mechanical Inspection:

a) Verify ground system is in compliance with Drawings and Specifications.

2) Electrical Tests:

a) Before backfilling trenches, and placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.

b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.

c) The grounding test shall be in conformance with IEEE Standard 81.

d) The current reference rod shall be driven at least 100 feet from the system under test.

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e) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.

f) Point-to-Point: Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3) Test Values:

a) The resistance between the main grounding electrode and equipment ground shall be no greater than five ohms per IEEE Standard 142.

b) Investigate point-to-point resistance values that exceed 0.5 ohms.

c) The Contractor shall fill in Grounding System Test Form TF3 located in Section 16010Appendix "A".

d) Plots of ground resistance shall be made and submitted to the Engineer for approval.

e. Panelboard Tests

1) Visual and Mechanical Inspection:

a) Inspect for physical damage, proper anchorage and grounding.

b) Compare equipment nameplate data with design plans and panelboard schedules.

c) Compare breaker legend for accuracy.

d) Check torque of bolted connections.

2) The Contractor shall fill in Panelboard Test Form TF5 located in Appendix "A".

f. Breaker Test:

1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check tightness of connection with torque wrench in accordance with manufacturer's recommendations.

2) All MCPs and breakers 100 amps and above shall be tested. Time current characteristic tests shall be performed bypassing three hundred percent (300%) rated current through each pole separately. Trip amps and time shall be measured. Instantaneous pickup current shall be determined by run up or pulse method. Clearing times should be within four (4) cycles or less. All trip times shall fall within NETA Table values. Instantaneous pickup current levels should be within 20% of manufacturer's published values.

3) Contact and Insulation Resistance: Contact resistance shall be measured and be compared to adjacent poles and similar breaker. Deviations of more than 50% shall be reported to Engineer.

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Insulation resistance shall be measured and shall not be less than 50 megohms.

4) At end of test the all breakers trip settings shall be set by Contractor to values listed in protective device coordination study to properly protect equipment.

5) The Contractor shall fill in MCC Device Test Form TF8 and Breaker Test Form TF9 located in Appendix "A".

6. Post Energization Tests

a. Panels and Enclosure Tests:

1) During these tests, test all local and remote control operations and interlocks.

2) Electrical Tests:

a) Perform operational tests by initiating control devices to affect proper operation.

b) The Contractor shall fill in Operational Device Checks and Test Form TF6.

b. Phase Rotation Tests:

1) Check connections to all equipment for proper phase relationship. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three phase equipment shall be tested for the phase sequence "ABC" front to back, left to right, and top to bottom.

2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.

3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Appendix "A".

c. Motor Testing:

1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.

2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.

3) Record the Ohm's on phase to phase with low Ohms tester.

4) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:

a) Equipment driven.

b) Motor horsepower.

c) Nameplate amperes.

d) Service factor.

e) Temperature rating.

f) Overload catalog number.

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g) Overload current range and setting.

h) Circuit breaker rating.

i) Circuit breaker trip setting, for magnetic only circuit breakers.

5) The Contractor shall fill in Motor Test Form TF10, located in Appendix "A."

6) Additional motor testing requirements per Division 11.

d. Instrumentation Tests

1) The Contractor shall provide a minimum of two (2) hours of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.

2) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.

a) As a minimum, all the tests indicated/specified on the test form TF14 in Appendix "A" shall be performed by the Contractor for each of the instruments listed in Appendix "B" Device Index.

3) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.

4) Testing shall be accomplished using simulated inputs only with prior written approval of the Owner.

5) Calibration stickers shall be supplied for all equipment and instruments. Calibration stickers shall list the following information:

a) Tag number.

b) Calibrated by who (name), firm, city and telephone number.

c) Date calibrated.

d) Calibration range.

e) Comments.

e. Control System Tests: The following tests shall be performed for all MCCs and for the control panels listed in Section 16010Appendix "B", including all non-Division 16 Control Panels:

1) Component Tests:

a) Measure insulation resistance of starter phase to phase and phase to ground with the starter contacts closed and the protective device open. Test voltage and minimum acceptable values shall conform to NETA Section 3 "Test Values." Measure insulation resistance of each control circuit with respect to ground.

b) Motor overload units shall be tested by injecting primary current through overload unit and monitoring trip time.

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c) Test the motor circuit protectors and thermal breakers as specified herein.

2) Control Tests:

a) Remove motor overload heaters from each motor starter or disconnect pump/motor coupling. In case the motor overload heaters are fed by current transformers, the motor conductors shall be removed and insulated away from the load lugs of the motor starter.

b) Verify the pump control circuits are wired and operate as shown on the elementary diagrams. Check the indicator lights, alarm lights, local & remote selector switches, alarm contacts, power fail relays, overloads, etc., for proper operation.

c) Reinstall all heaters and all wiring removed for this test.

f. PLC Control System Tests:

1) All the I/O points for the PLC shall be tested by the system supplier in the field with Owner Programmer for proper operation of alarms, status, analog, control, display functions. Where practical, the final element shall be used, i.e. trip the intrusion switch or change levels. Testing shall be accomplished using simulated inputs only when necessary.

2) During this task the System supplier shall have:

a) Qualified field technician with experience in the startup of similar systems with PLC controls, and other field devices.

b) Test instruments as required.

c) A pair of radios for communication.

3) Contractor to fill in "I/O Point Checkout Sheet" TF13 located in Appendix "A".

g. Trial Operations: The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated. Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

F. Operational Testing:

1. After all the previous tests in this subsection 3.07 and 3.08 are complete, the Contractor shall conduct operational testing.

2. The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the Owner and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the Owner and at the discretion of the Owner and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.

3. For the operational testing the new equipment shall be activated to automatically run for 5 days, 24 hours per day, Monday through Friday. During this five day period the Owner will run the different combinations of the monitoring options. If

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equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through Friday. This shall be continued until the new equipment functions acceptably for 5 consecutive days.

4. The Electrical Contractor, testing firm and System Supplier shall re-visit the jobsite as often as necessary until all field tests, start-up and operation tests are completed and approved.

3.9 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals covering instruction and maintenance on each type of equipment shall be furnished prior to completion of the project.

B. These instructions shall provide the following as a minimum:

1. Each set bound in a three ring binder and organized as specified herein. Binder shall be sized such that when all material is inserted the binder is not over 3/4 full.
2. "As Constructed" set of submittal shop documents, data sheets, and drawings (with all field changes included) for all items in the electrical system.
3. A complete list of items supplied, including serial numbers, ranges, options, and other pertinent data necessary for ordering replacement parts.
4. Full technical specifications on each item.
5. Instrument data sheets for all instruments supplied on the project, clearly identifying the instrument tagname, range, part number, serial number, size, etc.
6. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts lists with stock numbers shall be provided on the components that make up the assembly.
7. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
8. Safety precautions and procedures.
9. Record of the following:
    a. Each motor nameplate data including manufacturer, full part number, size, voltage, amps, service factor, bearings, etc.
    b. Each breaker and overload heater element including manufacturer, full part number, size, setting etc.
    c. Spread sheet listing all setpoints and programmable parameters entered for this project for VFD, UPS, HIM, etc.
10. No photo copies are allowed of standard published manuals available from manufacturers such as for the PLC. All of the manuals shall be originals, not copies.
11. Software program & documentation including complete as-installed PLC ladder logic, and PLC configuration printouts.
12. Include all completed and signed test data and forms from factory and field testing.
13. Warranty certificate with start dates, duration and contact information.

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14. Troubleshooting instructions.

15. Record of all settings or parameters for all programmable devices.

C. At the end of the project these manuals shall be updated to show "as-built or as-installed" conditions.

D. Provide to the Owner four (4) sets of USB drives on lanyards and two sets of DVDs (DVDs shall contain all documents in both PDF format and unlocked AutoCAD - DWG format, version 2010 or later):

1. As-built Contract electrical and instrumentation drawings prepared for this project.

2. As-built set of all required Drawings for the project.

3. As-built sets of other computer generated documents prepared for this project, including PLC ladder logic files, and Bill of Materials prepared for this project.

   a. Software ladder logic programs

   b. Software OI programs

4. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. PDF shall "bookmarked" to at each index and subtab listed in O&M.

5. These disks shall be the property of the Owner, for its use on this and future projects.

6. Label drives with site name using clear plastic with black machine printed lettering as produced by a KROY or similar machine. The size of the nameplate tape shall be with 3/8-inch lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on the USB drive using the adhesion of the tape.

7. No passwords shall be enabled on software or hardware developed for this project. All electronic disk copies provided to Owner shall not have any password protection enabled on them or the software. Software submitted with password protection will be removed by Owner and the Contractor will be backcharged for the cost thereof. Any software developed for this project shall be non-proprietary.

3.10 TRAINING

A. All training sessions shall be held on dates and times agreeable to Owner. A total of 5 or fewer Owner personnel shall be trained.

B. After "Operation Testing" has started the Contractor shall provide a period of not less than 8 hours training for instruction of operation and maintenance personnel in the use of all the new electrical and instrumentation systems. The Contractor shall make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

C. Training to include instruction on the use, operation, calibration, programming, and maintenance of the field devices listed in Appendix "B".

D. Acceptable Operation and Maintenance Manuals shall be on site and available when training sessions are implemented.

E. See the following sections for additional training requirements:

1. Section 16605 – Electrical System Analysis

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3.11 SPARE PARTS

A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to each site in a heavy duty plastic storage bag. Bag shall be clearly labeled on the outside with part name and number and the corresponding equipment tagname.

B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the instrumentation equipment throughout the warranty period.

C. The following spare parts shall be provided to the Owner as part of this Contract for each site:

1. Five (5) fuses for each type of fuse.
2. Five (5) lamps for each type of light.
3. Two (2) relays for each type of control, power fail and time delay relay.

D. See other Division 16 sections for additional spare parts to be provided.

3.12 WARRANTY

A. The Contractor shall warrant all electrical and instrumentation equipment including software programming for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

B. The Contractor shall provide all labor and material to troubleshoot, replace, or repair any hardware or software that fails or operates improperly during the warranty period, at no additional cost to the Owner.

C. The Contractor shall warrant all electrical and instrumentation equipment including PLC software programming for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

D. Software support which shall be provided by Foreshock:

1. Free technical PLC / OI software and hardware configuration phone support for a period of one year. PLC / OI phone support shall be provided directly from the group that configured the PLC / OI. Phone support shall be available between 8 a.m. and 4 p.m. Pacific Standard Time Monday through Friday.
2. The supplier shall correct any PLC / OI software configuration error that is discovered within the warranty period, at no additional cost to Owner. Updated documentation for each "operation and maintenance" manual and new USB thumb drives of updated software shall be provided for each correction.
3. Program changes made by Owner or under direction of Owner by others shall not relieve or void Contractor of warranty requirements for parts of software programmed under this Contract.

E. Prior to "final acceptance", the Contractor shall furnish to the Engineer a listing of warranty information for all manufacturers of materials, instruments, and equipment used on the project. The listing shall include the following:

1. Manufacturer's name, service contact person, phone number, and address.

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2. Material and equipment description, equipment number, part number, serial number and model number.

3. Manufacturer's warranty expiration date.

F. The Contractor shall provide all labor and material to troubleshoot, program, replace, or repair any hardware or software that fails or operates unpredictably during the warranty period, at no additional cost to the Owner.

3.13 FINAL ACCEPTANCE

A. Final acceptance will be given by the Owner after the equipment has passed the "operational testing" trial period, each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.

B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall:

1. Remove all temporary services, equipment, material, and wiring from the site.

2. Verify Service equipment has been legibly marked in field with the maximum available fault current per NEC 110.24 (A). Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled

3. Submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

4. Verify that as-installed drawings, in reinforced clear plastic pockets, have been placed in all new or modified panels.

5. Resubmit all Electrical System Analysis studies with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

6. Provide the following to the Owner:

a. Listing of warranty information.

b. Two (2) Electrical Systems Analysis DVDs of as-built set of studies, reports, settings, etc. and source files per Section 16605.

c. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.

d. Four (4) USB drives and two (2) DVDs with copies of all final documentation to reflect as-built conditions.

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APPENDIX A
ELECTRICAL & INSTRUMENTATION FORMS

Index of Forms:

Bill of Material

Schedule Test Request Form

TF1	Power and Control Conductor Test Form
TF2	Instrumentation Conductor Test Form
TF3	Grounding System Test Form
TF4	Visual and Mechanical Inspection Form
TF5	Panelboard Test Form
TF6	Operational Device Checks and Tests Form
TF7	Phase Rotation Test Form
TF8	MCC Device Test Form
TF9	Breaker Device Test Form
TF10	Motor Test Form
TF11	Factory Test Checkout Form
TF13	I/O Point Checkout Test Sheet
TF14	Instrument Data Sheet and Calibration Record

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BILL OF MATERIAL

PROJECT: _____ **DATE** / /

LOCATION: _____ **PAGE** _____

SPECIFICATION SECTION	QTY	DESCRIPTION	MFG.	PART NUMBER	TAG No.

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SCHEDULED TEST REQUEST FORM

COMPANY PERFORMING TEST: _____
TESTING PERSONNEL : _____ _____
PHONE NUMBER OF COMPANY: _____
TEST PROCEDURE SUBMITTAL: _____ APPROVED : ___/___/___
SCHEDULED TEST DATE : _____ DATE : ___/___/___

TIME	DESCRIPTION OF TEST
8:00	
9:00	
10:00	
11:00	
12:00	
13:00	
14:00	
15:00	
16:00	

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

POWER AND CONTROL CONDUCTOR TEST FORM

TEST FORM (TF1)

EQUIPMENT

NAME : _____ LOCATION : _____

CALIBRATION EQUIPMENT DATE: _____

DESCRIPTION _____

CONDUCTOR NUMBER	INSULATION TESTS					
	PHASE TO GROUND			PHASE TO PHASE		
	A	B	C	AB	BC	CA

BID SET - NOT FOR CONSTRUCTION

NOTES:

Record insulation test values in meg-ohms.

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

INSTRUMENTATION CONDUCTOR TEST FORM

TEST FORM (TF2)

EQUIPMENT

NAME : _____ LOCATION : _____

CALIBRATION EQUIPMENT DATE: _____

DESCRIPTION : _____

CONDUCTOR PAIR NUMBER	CONTINUITY TESTS		INSULATION TESTS		
	CONDUCTOR TO CONDUCTOR	CONDUCTOR TO SHIELD	CONDUCTOR TO CONDUCTOR	CONDUCTORS TO GROUND*	SHIELD TO GROUND

NOTES:

Record continuity test values in ohms.

record insulation test values in meg-ohms.

* With both conductors tied together

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

GROUNDING SYSTEM TEST FORM

TEST FORM (TF3)

CALIBRATION EQUIPMENT DESCRIPTION : DATE: _____

FALL IN POTENTIAL TEST

MAIN GROUND LOCATION	APPLIED VOLTAGE V	MEASURED POINT 1 VOLTAGE	MEASURED POINT 2 VOLTAGE	MEASURED POINT 3 VOLTAGE	CALCULATED RESISTANCE OHMS

TWO POINTS TESTS

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	APPLIED CURRENT	MEASURED VOLTAGE	CALCULATED RESISTANCE OHMS

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

VISUAL AND MECHANICAL INSPECTION FORM

TEST FORM (TF4)

EQUIPMENT

NAME : _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____		_____
	_____		_____

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK HEATERS AND THERMOSTATS	_____
CHECK VENTILATION AND FILTERS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR NAMEPLATES	_____
CHECK IF DRAWINGS MATCH EQUIPMENT	_____
CHECK ACCURACY OF OPERATION & MAINTENANCE	_____
	_____

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

PANEL-BOARD TEST FORM

TEST FORM (TF5)

PANEL NAME: _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____	MAIN BKR :	_____

CALIBRATION EQUIPMENT DATE: _____
DESCRIPTION :

INSULATION RESISTANCE TESTS - MEGOHMS					
A-GND	B-GND	C-GND			

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR PROPER LEGEND NAMEPLATES	_____
	_____

CALIBRATION TEST EQUIPMENT PART NO.	DATE CALIBRATED:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

SD SET - NOT FOR CONSTRUCTION

OPERATIONAL DEVICE CHECKS AND TESTS FORM

TEST FORM (TF6)

NAME : _____ LOCATION : _____

CUB. #	EQUIPMENT NAME	EQUIP #	LOCAL SITE DEVICE CHECKS AND TESTS							REMOTE SITE DEVICE CHECKS & TESTS		
			SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS	METERING & INDICATORS	OVERLOAD RESET	INTERLOCKS & CONTROL	ALARM & STATUS	SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY : _____

NOTES:

BID SET - NOT FOR CONSTRUCTION

PHASE ROTATION TEST FORM

TEST FORM (TF7)

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	PHYSICAL PHASE LOCATION	PHASE COLOR CODE	MEASURED PHASE ROTATION

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NOTES:
Use phase tester to verify all circuits and equipment have a clockwise A-B-C phase rotation.
Physical phase locations: Left to Right - LR or Top to Bottom - TB
Phase color codes: Brown, Orange, & Yellow -BOY
Black, Red, & Blue -BkRBe

CALIBRATION EQUIPMENT DESCRIPTION: _____ DATE : ____/____/____

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

MCC DEVICE TEST FORM

TEST FORM (TF8)

MCC # : _____ CUBICLE : _____

EQUIP NAME: _____ EQUIP # : _____

MOTOR DATA		CONTACTOR DATA			
H.P. :		MFGR. :		PART # :	
F.L.A. :		NEMA SIZE :		COIL VOLT :	

CALIBRATION EQUIPMENT DATE: _____

DESCRIPTION : _____ _____

OVERLOAD TESTS

MFGR. : _____ HEATER # : _____ RANGE : _____

PART # : _____ FINAL OVERLOAD SETTING: _____

TEST AMPS	MEASURE TRIP TIME @ TEST AMPS			MFGR LISTED TRIP TIME	AMBIENT COMPENSATION
	PHASE A	PHASE B	PHASE C		

BREAKER TESTS

MRGR. : _____ PART # : _____ FRAME # : _____

CONTACT RESISTANCE TESTS - OHMS			INSULATION RESISTANCE TESTS-MEGOHMS		
PHASE A	PHASE B	PHASE C	A-GND	B-GND	C-GND

MFGR TRIP TIME @300% MIN:_____ BREAKER RATING / RANGE: _____

MFGR TRIP TIME @300% MAX:_____ FINAL BREAKER SETTING: _____

MFGR INST. PICKUP AMPS: _____

TIME-CURRENT TEST					
TRIP TIME IN SECONDS @ 300% AMPS			INSTANTANEOUS TRIP TEST - AMPS		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

BREAKER DEVICE TEST FORM

TEST FORM (TF9)

FEEDER : _____ LOCATION : _____
EQUIP NAME: _____ EQUIP # : _____
EQUIP H.P. : _____ EQUIP KVA : _____

MFGR. : _____ PART # : _____ FRAME # : _____
VOLTAGE : _____ INTERRUPT RATING : _____ CHARACTER: _____ CURVE

CALIBRATION EQUIPMENT DATE: _____
DESCRIPTION : _____ _____

CONTACT RESISTANCE TESTS - OHMS INSULATION RESISTANCE TESTS - MEGOHMS

PHASE A	PHASE B	PHASE C	A-GND	B-GND	C-GND

MFGR TRIP TIME @300% MIN : _____ BREAKER RATING / RANGE: _____
MFGR TRIP TIME @300% MAX: _____ FINAL BREAKER SETTING : _____
MFGR INST. PICKUP APMS:

TEST-CURRENT TESTS

TRIP TIME IN SECONDS @ 300% AMPS			INSTANTANEOUS TRIP TEST - AMPS		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C

ADDITIONAL TESTS AND SETTING AS APPLICABLE

	PICKUP		DELAY-TIME		
FUNCTION	RANGE	SETTING	RANGE	SETTING	
LONG TIME					
SHORT TIME					
GROUND FLT.					

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

MOTOR TEST FORM

TEST FORM (TF10)

EQUIPMENT
NUMBER : _____ NAME : _____

CALIBRATION EQUIPMENT DATE: _____
DESCRIPTION : _____ _____

NAMEPLATE DATA - FIELD RECORDED

MANUFACTURER		MODEL #		SERIAL #		FRAME #	
H.P.	R.P.M	F.L.A	VOLTS	PHASE	FREQ.	P.F.	S.F.
CODE	N.E.M.A.	INSUL.	ENCLOSR.	DUTY	DESIGN		

CALIBRATION EQUIPMENT
DESCRIPTION : __ _____ DATE: _____

INSULATION TESTS PHASE TO GROUND MEG-OHMS			MOTOR FRAME GROUNDING SYSTEM TEST			MOTOR HEATER	MOTOR THERMAL
			APPLIED	MEAS.	CALC.	MEAS.	TRIP
A	B	C	VOLTS	AMPS	OHMS	AMPS	TEST

MOTOR TESTS - MEASURED VALUES

AMPERAGE			VOLTAGE			POWER	
A	B	C	AB	BC	CA	FACTOR	WATTAGE

NOTES:
VOLTAGE, AMPERAGE, POWER FACTOR, & WATTAGE SHALL BE RECORDED WITH A TRUE RMS METER.

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

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FACTORY TEST
MCC/CONTROL PANEL CHECKOUT FORM (TF11)

Manufacturer: _____ **Location:** _____

Tel: _____ _____

Test Equipment: Description _____ Calib Date: _____

MCC / Control Panel: _____ **TEST RESULT**

	Pass	Fail
OVERALL PANEL INSPECTION		
1. All front panel and back panel components mounted securely.....	☐	☐
2. All wiring terminated and labeled correctly.....	☐	☐
3. All components, wiring, and labeling accurately reflected on the drawings..	☐	☐
POWER-UP INSPECTION		
1. Voltage levels on load side of circuit breakers.....	☐	☐
2. Voltage levels at the DC terminals of the power supply.....	☐	☐
3. Voltage levels at the DC power distribution terminals.....	☐	☐
POWER DISTRIBUTION AND GENERAL COMPONENT TESTING		
1. Power distribution to the appropriate components.....	☐	☐
2. Operation of the ancillary components such as receptacles, work lights, etc.	☐	☐
CONTROL COMPONENTS CHECKS		
1. Operators (push buttons, selector switches, pilot lights).....	☐	☐
2. Inputs from External Sources.....	☐	☐
3. Outputs to External Sources.....	☐	☐
4. Relay Logic.....	☐	☐
5. PLC I/O and Program Verification.....	☐	☐
6. O/I Display Verification.....	☐	☐

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Notes:

1. For relay logic checks, each rung of the elementary or loop diagram is to be highlighted in yellow as they are verified for correct control functions.
2. For PLC I/O and program verification, the control strategies shall be highlighted in yellow as each logic function is tested.

Tested by: _____ **Witnessed by:** _____

Date: _____

I/O POINT CHECKOUT TEST FORM

TEST FORM (TF13)

I/O TYPE : _____ LOCATION : _____

TEST EQUIPMENT : _____ CAL. DATE : _____

I/O POINT TAGNAME	I/O POINT ADDRESS	TEST INPUT VALUE %			DISPLAY VALUE %			PLC REGISTER VALUE	TEST RESULT FAIL OR PASS COMMENTS	DATE OF CORRECTIVE ACTION
		0	50	100	0	50	100			

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

BID SET - NOT FOR CONSTRUCTION

INSTRUMENT DATA SHEET AND CALIBRATION RECORD
TEST FORM (TF14)

Component Description	Manufacturer	Location
	Name	Site
Component Tag Name	Model	Equip
	Serial #	

	Range	Unit	Test Equipent	
Indicator Range			Description:	
Input Range			Calibration Date:	
Output Range				

General Notes
1) Attach Calibration Curves for dp Flowmeters
2) Include mounting elevations for level Instruments
3) All entries within solid box to be typed in prior to start of test

Designed Calibration			Measured Calibration		
Input Signal	Output	Eng. Value	Input	Output	Comments

Notes

Tested by (Print Name) Witnessed by (Print Name)

Signature Signature

Date / / Date / /

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APPENDIX B
DEVICE INDEX

BID SET - NOT FOR CONSTRUCTION

16010 INSTRUMENTATION DEVICE INDEX

P&ID DWG	E DWG	TAG	NO.	DESCRIPTION	TYPE	SPECS	MINIMUM NEMA RATING	SIZE	VOLT	SP / RANGE	UNITS	DWG REF DET MOUNTING	NOTES AND ACCESSORIES	16010 TEST FORM
I-21	E-20C	PIT	061	Pressure Indicating Xmtr	-	16010-2.07.B	4X	-	-	0-300	PSI	Dwg E-12, Det "F"	Sunshield	-
I-21	-	FE	071	Flow Element	Mag	16010-2.07.A	4X	4"	-	-	-	Dwg E-12, DET "E"		-
I-21	E-20C	FIT	071	Flow Indicating Xmtr	Mag	16010-2.07.A	4X	-	24Vdc	-300 to 300	GPM	Meter	Sunshield	TF-14
I-21	-	FE	171	Flow Element	Mag	16010-2.07.A	4X	4"	-	-	-	Dwg E-12, DET "E"		-
I-21	E-20C	FIT	171	Flow Indicating Xmtr	Mag	16010-2.07.A	4X	-	24Vdc	-300 to 300	GPM	Meter	Sunshield	TF-14
I-21	-	TSH	211	Temperature Switch	N.C.	Div 11	-	-	120Vac	-	-	Motor		TF-7
I-21	-	TSH	212	Temperature Switch	N.C.	Div 11	-	-	120Vac	-	-	Motor		TF-7
I-21	E-20C	FCV	221	Flow Control Valve	-	Div 13	-	-	-	-	-	Per Civil		TF-7
I-21	E-20C	FCV	222	Flow Control Valve	-	Div 13	-	-	-	-	-	Per Civil		TF-7
I-21	E-20C	MOV	231	Motor Operated Valve	-	Div 13	-	-	-	-	-	Per Civil		TF-7
I-21	E-20C	MOV	232	Motor Operated Valve	-	Div 13	-	-	-	-	-	Per Civil		TF-7
I-21	E-20C	MOV	233	Motor Operated Valve	-	Div 13	-	-	-	-	-	Per Civil		TF-7
I-21	E-20C	PIT	261	Pressure Indicating Xmtr	-	16010-2.07.A	4X	-	-	0-200	PSI	Dwg E-12, Det "F"	Sunshield	-
I-21	E-20C	FE	271	Flow Element	Mag	16010-2.07.B	4X	4"	-	-	-	Dwg E-12, DET "E"		-
I-21	E-20C	PIT	461	Pressure Indicating Xmtr	-	16010-2.07.A	4X	-	-	0-100	PSI	Dwg E-12, Det "F"	Sunshield	-
I-21	E-20C	FIT	271	Flow Indicating Xmtr	Mag	16010-2.07.A	4X	-	24Vdc	-300 to 300	GPM	Meter	Sunshield	TF-14
I-41	-	TSH	411	Temperature Switch	N.C.	Div 11	-	-	120Vac	-	-	Motor		TF-7
I-41	E-40	FE	471	Flow Element	Mag	16010-2.07.A	4X	4"	-	-	-	Dwg E-12, DET "E"		-
I-41	E-40	FIT	471	Flow Indicating Xmtr	Mag	16010-2.07.A	4X	-	24Vdc	0-300	GPM	Meter		TF-14
I-41	E-40	PSH	413	Pressure Switch	Gauge	16010-2.07.C	4X	-	-	170	PSI	Dwg E-12, Det "G"		TF-7

BID SET - NOT FOR CONSTRUCTION

END OF SECTION

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SECTION 16605
ELECTRICAL SYSTEM ANALYSIS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Provide the following submittals, per Section 26 05 00, for the entire electrical power system including the 208/120V distribution system for each site:

1. Short Circuit Study.
2. Protective Device Coordination Study.
3. Arc Flash Study.

B. Electrical System Studies shall be prepared, stamped and signed by a professional Electrical Engineer registered in the State of California and in accordance with IEEE 242, IEEE 399 ANSI/IEEE C37.13 and IEEE 519.

C. Exceptions / Clarifications

1. Itemize all exceptions and clarifications to the Contract Documents in a letter (located in the front of the submittal) on company letterhead.
2. Exceptions that are noted in the study, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
3. All exceptions taken from the Drawings and specifications shall be documented with justifications. When noting the exception, list which Drawings or which Specification Subsection number the exception is taken.
4. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.

D. Provide two (2) DVDs at the completion of the project. One DVD will contain the as-built set of studies, reports, settings, etc. The other DVD will contain the original source format of input data used for the PC based computer software, including all SKM files used to create the studies. Provide all setup information used for the computer based study and report.

E. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

F. When submittals are provided in PDF format, utilize the “Bookmark” feature of the Adobe Acrobat and clearly bookmark locations in the report to locations identified in the Report’s Table of Contents. Bookmarks shall not be out of order; the English description shall match that listed in the Report’s Table of Contents.

1.2 SEQUENCING AND SCHEDULING

A. It is the responsibility of those performing the electrical system analysis to collect and field verify all data. This includes verifying existing electrical distribution and obtaining all data from the Utility Company, Generator supplier and vendors necessary for completing the

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requested studies. Utilize proposed load data for the Studies obtained from submittals, Utility Company, Generator manufacturers, field verifications, etc.

B. Contractor shall provide letter certifying the inspection and verification of existing equipment and distances used in study.

C. A complete Protective Device Coordination Study shall be submitted within 60 days after approval of Short Circuit Study.

D. At the completion of the project, all studies shall be resubmitted with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

E. When previous electrical system analysis studies are available and provided to the Contractor, it is the Contractor's responsibility to verify the accuracy of the data used and to update it to match existing conditions.

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PART 2 - MATERIALS

2.1 GENERAL

A. Equipment and component titles and numbers used in the Studies shall be identical to the equipment and component titles and numbers shown on the Drawings.

B. Perform Studies using PC based computer software. State program name and version (e.g. version 2.1) in report.

C. Perform complete fault calculations for Utility and generator sources. Equipment shall not be grouped as a single large load; they shall be treated as individual loads. When generators are incorporated into the system, develop two separate networks: one with utility only (no generator attached) and one with generator only (no utility attached)

D. Complete protective device coordination study listing all device settings shall be utilized during start-up of electrical equipment.

E. Provide unique page numbers for every sheet in all Studies. Unique page numbers to be manually placed by Study Company after printout if study report doesn't assign page numbers.

F. One line diagrams

1. Shall be readable on 11" x 17" paper. One line diagrams shall be redrawn in AutoCAD on multiple sheets if necessary or as requested by Owner.
2. Buses and branches shall have descriptive names matching one line diagram or existing system (i.e. not Bus-0084).
3. Automatic transfer switches (ATSs), Main Switchboards (MSBs), shall not have multiple node buses.
4. Primary and secondary for transformers, Variable Frequency Drives (VFDs), etc. shall be changed to node buses.

G. The following scenarios for the short circuit and arc flash reports shall be provided.

1. Maximum available fault current from utility transformer.
2. Maximum available fault current from generator.
3. Do not combine networks when multiple sites are modeled.
4. All studies shall be repeated with the arc flash reduction switch enabled (where applicable).

2.2 SHORT CIRCUIT STUDY

A. Include the following in the short circuit study:

1. Cable impedances based on copper conductors.
2. Bus impedances based on copper bus bars.
3. Transformer impedances based on tolerances specified in ANSI C57.12.00.
4. Source date (i.e. cable lengths, sizes, and quantity, for all runs in study, listing of bus loads, etc.).

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5. Utility data:
    a. Size of Utility transformer.
    b. Impedance of Utility transformer.
    c. Primary voltage of Utility transformer.
    d. Fault information on primary side of Utility transformer:
        1) Three phase bolted fault.
        2) X/R ratio (positive sequence).
        3) Line to ground fault.
        4) X/R ratio (zero sequence).
    e. Protective relays (type & settings).
6. Voltage drop and current flow at each node and load in system.

B. Calculate Short Circuit interrupting duties for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
1. Power transformer's primary
2. Main Switchboard.
3. All Motor Control Centers (MCCs).
4. All panelboards.
5. All 480V, 3-phase motor and equipment loads.
6. All 3-phase transformer secondaries.
7. All 240/208V equipment.

C. Verify:
1. Equipment and protective devices are applied within their ratings.
2. Adequacy of switchboard, panelboard and MCC bus bars to withstand Short Circuit stresses.
3. Adequacy of transformer windings to withstand Short Circuit stresses and over-current.
4. Cable sizes for ability to withstand normal and fault load currents.

D. Provide the following in the Short Circuit study report:
1. Calculation methods and assumptions.
2. Input data.
3. Short circuit data.
    a. Impedances.
    b. X to R ratios.
    c. Asymmetry factors.
    d. Motor contributions.
    e. Short Circuit kVA.

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f. Symmetrical and asymmetrical line-to-line and line-to-ground fault currents.

g. Device evaluation including rating of equipment.

h. Bus evaluation including rating of equipment.

i. Source data, from Electric Utility Company. Include copy of correspondence with Utility Company indicating values used.

j. Source data from Generator Supplier (where applicable). Include copy of Generator provided values used.

4. Tabulations of calculated quantities.

5. Results, conclusions, and recommendations.

6. One line diagrams of distribution system.

7. Impedance diagram showing the resistances and reactances for all cables of the distribution system.

2.3 PROTECTIVE DEVICE COORDINATION STUDY

A. Provide Protective Device Coordination drawings for each section of distribution system that includes the following:

1. Graphically diagram displaying coordination time-current curves on conventional log-log curve sheets. Each time-current curve shall have a unique identifier label. This identifier shall be used in the tabulated settings spreadsheet and on the associated one-line diagram.

2. Time-current curves shall include the following curves (minimum):

a. Utility relays (phase & ground) and high voltage switchgear relays (phase and ground).

b. All upstream protective devices and breakers.

c. All mechanical overloads.

d. All MCP breaker and associated motor or equipment load. Duplicates of the same sized protective device and motor size may be omitted (i.e., when there are 3 pumps for same application).

e. All transformers and associated primary and secondary protection.

f. Unique identifier for each protective device.

g. Provide separate TCC for phase and ground curves.

h. TCC for Ground curves shall include the transformer magnetizing inrush currents for all transformers downstream of the circuit breaker. Ground shall clear the inrush currents.

3. One-line diagram that applies to specific portion of distribution system associated with time-current curves. One-line diagram shall include the following:

a. Location of each device.

b. Power and voltage ratings, primary and secondary transformers amperages.

c. All significant circuit elements such as transformers, cables, breakers, fuses, relays, etc. with their corresponding amperage ratings.

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d. Tag of each branch and node (shall be the same tags used in short circuit study).

e. Mechanical overload and contactor.

f. English description, equipment name, HP, and full load amp rating of motors and other 3 phase loads.

g. Terminate device characteristic curves at a point reflecting maximum fault current to which device is exposed as calculated in short circuit study.

4. Time current curves shall be provided for all protective devices with adjustable settings.

B. Characteristics plotted on time current curves shall include:

1. Protective current relays.

2. Fuses including manufacturer's minimum melts, total clearing, tolerance, and damage bands.

3. Circuit breaker trip devices, including manufacturer's tolerance bands.

4. Transformer full-load currents at 100% and 600%.

5. Motor and equipment full load currents. Motors fed from VFDs and Soft Starters shall have their starting curves adjusted according to inrush currents on the TCC. Motors on TCC shall show the DC offset for VFD and Soft Starter fed pumps.

6. Transformer magnetizing inrush currents.

7. Transformer damage curves.

8. ANSI transformer withstand parameters.

9. Fault currents.

10. Ground fault protective device settings.

11. Other electronic protective devices.

C. Provide the following recommended settings in spreadsheet format in the Protective Device Coordination study report:

1. Relay settings including CT values.

2. Circuit Breakers adjustments:

a. Long Delay Pickup and Time.

b. Short Time Pickup and Time.

c. Instantaneous Pickup and Time.

d. Ground Pickup and Time.

3. Programmable settings for all electronic devices. Settings for non-current relay settings shall also be provided.

4. Settings shall be given both in amps and seconds as well as the corresponding physical setting (i.e. 30A and setting B on MCP) for device.

5. Identify protective device associated with each curve by manufacturer type, function and part number.

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2.4 ARC FLASH HAZARD STUDY

A. General:

1. Arc flash boundary and incident energy shall be calculated using a PC computer program at all significant locations in the electrical network, including switchgears, switchboards, MCCs, transformers, and other major equipment where work could be performed on energized equipment.
2. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
3. Document method of calculation.
4. Do not include the motor contribution of motors fed by VFDs in the arc flash hazard study.

B. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

C. Study shall include the following:

1. All significant locations in 480 volt, 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.
2. Incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report.
3. Provide the following incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report (values shall be calculated for all electrical equipment in the power distribution system):
    a. Arcing fault magnitude
    b. Device clearing time
    c. Duration of arc
    d. Boundary for:
        1) Arc flash limited shock approach
        2) Limited shock approach
        3) Restricted shock approach
    e. Working distance
    f. Incident energy at 18 inches (in cal/sq.-cm)
    g. Recommendations for arc flash energy reduction for each location having more than 8 cal/sq.-cm. Provide preliminary cost estimate for implementing recommendations.
    h. Provide separate spreadsheets for all scenarios listed in subsection 2.01.G. Do not combine the spreadsheet values nor only provide the worst case scenario. Clearly list on each spreadsheet the English description of the Scenario presented.
4. Provide recommendations for the Personal Protective Equipment (PPE) that the Owner should maintain on site for the level of hazard.

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5. Provide recommendations for safety label design that should be posted on electrical equipment.

6. Spreadsheet summarizing incident energy and flash protection boundary list Arc Flash Boundary in inches on label. No fractional distance in feet.

2.5 STUDY REPORTS

A. Written reports submitted for approval shall contain:

1. Scope of Studies performed.

2. Explanation of bus and branch numbering system.

3. Report calculations, tabulations and spreadsheets.

4. Selected equipment deficiencies.

5. Results of Studies.

6. Comments, recommendations or suggestions regarding:

a. Changes and additions to equipment rating and/or characteristics.

b. Circuit protective devices improperly rated for overload or fault conditions.

c. Arc Flash protective equipment and safety labels.

7. Tabulation spreadsheet for all protective device settings with the following column entries (minimum):

Device Code	Description	MFR	Type	Plug Trip	Frame	KAIC	Long Time		Short Time		Inst	Ground	
							Amps	Time	Amps	Time	Amps	Amps	Time

8. Stamped, signed and dated by Electrical Engineer registered in the State of California who performed the analysis.

B. Reports are to be updated to reflect as-built conditions and placed in O&M manual, per Section 26 05 00 requirements.

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PART 3 - EXECUTION

3.1 GENERAL

A. Make minor modifications to equipment settings as required to accomplish conformance with the Short Circuit and Arc Flash Studies.

B. Notify Engineer in writing of any required major equipment modifications.

3.2 FIELD TESTS

A. Provide field testing of protective equipment.

B. Adjust relay and protective device settings according to values established by Coordination Study.

3.3 ARC FLASH WARNING LABELS

A. All Arc Flash warning labels shall meet NEC requirements, OSHA standards and NFPA recommendations.

B. Provide and install 4 in. x 6 in. thermal transfer type labels of high adhesion polyester for each work location analyzed and as required by the NEC for flash protection on power distribution equipment.

C. Each label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following machine printed information:

1. Location Designation
2. Nominal system voltage
3. Arc Flash boundary
4. Available incident energy and working distance (in inches)
5. Minimum arc rating of clothing
6. Site specific level of PPE
7. Engineering report number, revision number and issue date
8. Company preparing report and contact phone number.

D. Labels shall not be hand labeled.

E. For all areas, Contractor shall post the following:

1. Working distances
2. Shock hazard voltage
3. Shock Approach Boundaries:
    a. Limited
    b. Restricted

F. Provide Arc Flash labels for the each of the following pieces of equipment:

1. 480V and applicable 208V panelboards
2. MCCs

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3. Switchboard

4. Switchgears

5. Control Panels

6. All electrical equipment with an incident energy level greater than 1.2 Cal/cm2.

7. Where Switchgear, Switchboard, MCC, Panelboard, Distribution Panel, etc. feed multiple circuit breakers from the enclosure, provide separate line and load side Arc Flash Labels for the Main Circuit Breaker.

8. Provide separate labels at each circuit breaker that has arc flash reduction switches indicating the appropriate values when the switch is enabled.

G. Labels shall be submitted for approval. No labels shall be installed without prior approval by Owner or Owner representative.

3.4 ARC FLASH TRAINING

A. The Electrical Engineer, who sealed the Electrical System Analysis, shall train Owner personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours) at the Owner's facility. Maintenance procedures shall be in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces and shall be provided in the equipment manuals.

END OF SECTION

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