# SALIDA SANITARY DISTRICT

NOTICE TO BIDDERS INSTRUCTIONS TO BIDDERS BID CONTRACT TECHNICAL SPECIFICATIONS

FOR CONSTRUCTION OF

# **COVERT LIFT STATION UPGRADES - REBID**

CONTRACTOR MUST HAVE A CLASS "A" AND "C-10" LICENSE



# BID OPENS: FRIDAY, AUGUST 11, 2023, 2:00 p.m.

FOR INFORMATION REGARDING THIS PROJECT CALL (209) 545-4987

PLEASE RECYCLE

★ 6200 PIRRONE ROAD • SALIDA, CA 95368 ★

# SALIDA SANITARY DISTRICT

CONTRACT DOCUMENTS

FOR CONSTRUCTION OF:

# **COVERT LIFT STATION UPGRADES - REBID**

APPROVED BY:

DISTRICT MANAGER-ENGINEER

DATE

PREPARED BY:

SALIDA SANITARY DISTRICT 6200 PIRRONE ROAD SALIDA, CA 95368 **INTENTIONALLY LEFT BLANK** 

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\*\*\*END OF SECTION\*\*\*

### **SECTION 00020 - NOTICE INVITING BIDS**

NOTICE IS HEREBY GIVEN that sealed bids are invited by the Salida Sanitary District to provide all labor, materials, equipment, and perform all work necessary for the construction of the Covert Lift Station Upgrades - Rebid (Project) and in accordance with the plans and specifications for the Project.

The work includes various improvements and repairs to the Covert Sewer Lift Station, which includes, but is not limited to, upgrades to instrumentation, controls and electrical equipment; installation of plug valves, check valves, access hatches, and flowmeter; site paving; and other miscellaneous improvements to the sewer lift station site.

The work shall be performed in accordance with the intent of the Contract Documents, including as stated in the Contract, Technical Specifications and Special Provisions, excluding only the work indicated or specified to be provided by the District or others under separate contract or other arrangement. In the event of a conflict between the Project Specifications and the Salida Sanitary District Sewer Standards and Specifications, the Project Specifications shall take precedence.

The Project specifications and plans can be downloaded from the Salida Sanitary District's website at <u>http://www.salidasanitary.net</u>. The completed official sealed bid packet must be delivered to the Salida Sanitary District, Administrative Office, 6200 Pirrone Road, Salida, California 95368, up to, but not later than 2:00 p.m., on Friday, August 11, 2023.

A non-mandatory pre-bid conference will be held at 10:00 a.m., Wednesday, July 12, 2023 at the Covert Lift Station, located on the southeast corner of Covert Road and Toomes Road, Salida, California.

Prospective bidders shall monitor District's website for any Project Addenda or updates.

As prescribed in the Instructions to Bidders for this Project, a bid guaranty in an amount not less than ten percent [10%] of the total base bid price, plus additives, if any, and conforming to the prescribed bidding procedures is required to be submitted with each bid, as a guaranty to be forfeited should the bidder, if awarded the Contract, fail to enter into the same, or fails to furnish in a timely manner the bonds and/or proof of insurance. Each bid shall be accompanied by the required documents and information furnished in the official bidding documents. Each bid shall be enclosed in a sealed envelope clearly marked "BID" and shall indicate the project name, bid opening date, and contractor's name and address. Bidders and the public are invited to be present at the public opening and declaration of said bids. Official bid documents received after the designated time will not be accepted. No bidder may withdraw its bid for a period of sixty (60) days after the date set for the opening of bids.

The Project is to be substantially completed within sixty(60) consecutive calendar days from the date specified in the Notice to Proceed, and final completion will be achieved ten(10) consecutive calendar days thereafter. Time for commencement and completion of the work is consequential, and time is to be of the essence of the Contract. Due to the anticipated manufacturer delays in material and equipment deliveries, the District may issue a preliminary Notice to Proceed to facilitate said delays.

All bidders shall be licensed under the provisions of Chapter 9, Division 3 of the Business and Professions Code of the State of California. The Contractor shall possess a valid Class A and C-10 License at the time the bid is submitted and retain the license through the duration of the Project. Failure to possess the specified license shall render the bid as non-responsive.

All bidders must comply with the State of California Contractor Registration Requirements, which states all Contractors or subcontractors shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5.

In compliance with Senate Bill 854 and the California Labor Code, all bidders shall include with their bid proof of registration from the Department of Industrial Relations that includes the contractor's legal name, registration number, license type/number, registration date and expiration date, for every contractor and subcontractor, regardless of tier. Submittal of subcontractor's registration information regardless of tier is due no later than four business days after bid opening.

Bidders are hereby notified that the successful bidder and any subcontractor under that contract shall pay prevailing wage rates in performing the Contract.

This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Contractors must submit their certified payroll records directly to the Division of Labor Standards Enforcement Compliance Monitoring Unit, as well as the Salida Sanitary District (District).

If the Contract is to be awarded, the Contract will be awarded to the lowest responsive, responsible bidder; provided, however, the Salida Sanitary District Board of Directors reserves the right to reject any and all bids, and to re-advertise for bids or to provide for the work to be done by the District's internal work force.

The successful bidder shall be required to furnish a Labor and Materials Bond and a Faithful Performance Bond, each in the sum of one hundred percent (100%) of the contract bid price. Said bonds shall be furnished by a company authorized to issue surety bonds in the State of California, on official forms approved by the District, and said bonds shall be executed by the surety and contractor before or concurrently with the signing of the Contract. The acceptable surety will meet the minimum standard as set forth in the contract documents.

For further information, contact Antonio Tovar, District Manager-Engineer at (209) 545-4987, email: <u>atovar@salidasanitary.net</u>.

\*\*\*END OF SECTION\*\*\*

## **SECTION 00100 - INSTRUCTIONS TO BIDDERS**

#### 1.0 WORK TO BE DONE

It is the intention of the District to construct improvements as shown and set forth on the plans, specifications, profiles and detailed drawings, exhibits, and in the particular locations shown on the drawings. All of the work is particularly set forth in the plans and specifications, and all of said work, together with all other work incidental thereto, is included. By submitting a bid, the bidder represents that it has the ability, qualifications and experience to perform the proposed work.

The work includes the furnishing of all labor, materials, incidentals and equipment necessary for the Covert Lift Station Upgrades - Rebid. The Contractor shall be required to provide, at its own cost and expense, all necessary insurance, as required by law or these specifications, and shall pay the cost and expense of any and all incidental matters herein required.

#### 2.0 EXAMINATION OF CONTRACT DOCUMENTS

Each bidder shall thoroughly examine and become familiar with the Contract Documents. The submission of a bid shall constitute an acknowledgment upon which the District may rely, and shall constitute conclusive evidence, that the bidder has thoroughly examined and is familiar with the Contract Documents. The failure or neglect of a bidder to receive or examine any of the Contract Documents shall in no way relieve it from any obligation with respect to its proposal or to the Contract. No claim for additional compensation will be allowed which is based upon a lack of knowledge of any Contract Documents.

#### 3.0 INSPECTION OF SITE

Bidders are required to inspect the site of the work to satisfy themselves by personal examination or by such other means as they may prefer, of the location of the proposed work, and of the actual conditions, including subsurface, of and at the site of work. If, during the course of its examination, a bidder finds facts or conditions which appear to be in conflict with the letter or spirit of the bidding documents, the Bidder may apply to the District, in writing, for additional information and explanation before submitting its bid.

Submission of a bid by the bidder shall constitute conclusive evidence that, if awarded the Contract, it has relied and is relying on its own examination of:

- a. The site of the work.
- b. Access to the site.
- c. All other data and matters requisite to the fulfillment of the work and on its own knowledge of existing facilities on and in the vicinity of the site of the work to be constructed under the Contract.
- d. The conditions to be encountered.
- e. The character, quality and scope of the proposed work.
- f. The quality and quantity of the materials to be furnished.
- g. The requirements of the bid, the plans, the specifications, and the other Contract Documents.

The information provided by the District is not intended to be a substitute for, or a supplement to the independent verification by the bidder to the extent such independent investigation of site conditions is deemed necessary or desirable by the bidder.

#### 3.1 PRE-BID CONFERENCE

The District may hold a pre-bid conference prior to the bid opening date. The pre-bid conference is held to answer questions bidders may have, provide bidders with access to the site, discuss important contract considerations, and provide any clarifications that may have come to the District's attention.

Bidders may be required to attend the pre-bid conference on the date indicated on the specifications. If any bidder fails to attend the pre-bid conference when it is indicated as being mandatory on the specifications, then their bid will be deemed non-responsive, which will result in bid rejection.

#### 4.0 INTERPRETATION OF CONTRACT DOCUMENTS

Oral representations or interpretations by the District as to the meaning of the Contract Documents shall have no legal or binding effect. Requests for an interpretation shall be made in writing and delivered at least ten (10) days before the time announced for opening the bids to:

Antonio Tovar District Manager-Engineer Salida Sanitary District 6200 Pirrone Road Salida, CA 95368

The District's response to requests to clarify the source of materials, equipment, suppliers or any other such matter which does not modify, change, increase, or decrease the scope of work requires no action by the District other than a response to the bidder requesting the clarification. The District's response to written requests to clarify possible ambiguous or incomplete statements or designs, or any other such clarification which modifies, changes, increases or decreases the scope of work, requires issuance of an addendum by the District for the interpretation to become effective. It is the District's sole discretion whether or not to issue an addendum in response to a request for clarification.

#### 5.0 POSTPONEMENT OF OPENING

The District reserves the right to postpone the date and time for receiving and/or opening of bids at any time prior to the date and time established in the Notice Inviting Bids. Postponement notices shall be posted to the District's website in the form of addenda. It shall be the bidder's responsibility to periodically check the District's website for any updates, addenda, letters of clarifications, or any other pertinent documents.

#### 6.0 OPENING OF BIDS

All bids except those which do not contain a bid security, irrespective of any other irregularities or informalities, if received on time, will be opened and publicly read aloud at the time and place set forth in the Notice Inviting Bids. Bidders, their representatives and other interested persons may be present at the opening and reading of bids.

Any bids received after the time for receiving and opening bids as set forth in the Notice Inviting Bids or as postponed by addenda will be considered non-responsive and will not be opened. Any such bids will be returned unopened to the Bidder.

The public reading of each bid will include at least the following:

- a. Name of bidder.
- b. The total amount of bid.
- c. The nature and amount of the security furnished with the bid.

#### 7.0 PREPARATION OF BID FORMS

Bids shall be submitted on the official bid documents and must be submitted at the time and place stated in the Notice Inviting Bids. All blanks in the bid forms must be appropriately filled in, either in ink or typed, and all prices must be stated in figures. All bids must be submitted in sealed envelopes bearing on the outside the name of the bidder, its address, the date of the bid opening, and the name of the project for which the bid is submitted for. It is the sole responsibility of the bidder to see that its bid is received in proper time. Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened. District shall not be responsible for errors or omissions in the bid. Bidders shall write their names on each bid form at the space provided.

#### 8.0 BIDDER'S SIGNATURE AND AUTHORITY

If the bid is made by an individual, his/her name, signature, and post office address must be shown; if made by a firm or partnership, the name and post office address of the firm or partnership, a list of the partners, and the signature of at least one of the general partners must be shown; if made by a corporation, the bid shall show the name of the state under the laws of which the corporation is chartered, the name and post office address of the corporation, and the title of the person who signs on behalf of the corporation. If the bid is made by a joint venture, the bid shall be signed by a representative of one of the joint venture firms.

#### 9.0 ERASURES AND CORRECTIONS

The bid submitted must not contain any erasure, interlineations, or other corrections unless each such correction is suitably authenticated by affixing in the margin immediately opposite the correction the initial or initials of the person or persons submitting the bid.

#### 10.0 BID IRREGULARITIES

Changes in or additions to the bid form, recapitulations of the work bid upon, alternative bids, or any other modifications of the bid form which are not specifically called for in the Contract Documents may result in rejection of the bid by the District, as not being responsive to the Notice Inviting Bids. No oral or telephonic modification of any bid submitted will be considered. The District retains the right to waive minor irregularities it determines to have no impact on the Contract.

#### 11.0 MODIFICATION OF BID

On written request filed with the District, a bid already received may be modified or withdrawn at any time prior to the time established for receiving bids. The request must be executed by the bidder or its authorized representative as described in Paragraph 00100-8.0, BIDDER'S SIGNATURE AND AUTHORITY. Modifications shall be made in writing, executed, and submitted in the same form and manner as the original bid. Withdrawal of a bid does not prejudice a bidder's right to submit a new bid within the time designated for the submission of bids. No bid may be withdrawn after the time established for receiving bids except as provided in Paragraph 00100-12.0, WITHDRAWAL OF BIDS.

#### 12.0 WITHDRAWAL OF BIDS

Withdrawal of bids is not allowed after the time noticed for the opening of bids. In case of a materially significant error, a bidder desiring to withdraw shall give written notice to the District, specifying, in detail, how the mistake occurred and how the mistake made the bid materially different than it was intended to be. Withdrawal will not be permitted for mistakes resulting from errors in judgment or carelessness in inspecting the site of the work or in reading the Contract Documents. At the District's sole discretion, the bid may be deemed non-responsive due to the materially significant error.

#### 13.0 ADDENDA

The District Manager-Engineer has the authority to issue any and all Addenda prior to the bid opening date. Addenda issued during the time of bidding shall become a part of the documents furnished to bidders for the preparation of bids, shall be covered in the bids, and shall be made a part of the Contract. Prospective bidders shall monitor District's website for any Project Addenda or updates. Each bid shall include specific acknowledgment in the space provided of receipt of all Addenda issued during the bidding period. Failure to so acknowledge shall result in the bid being rejected as not responsive. Failure of any bidder to receive such Addenda shall not be grounds for non-compliance with the terms of the instructions.

#### 14.0 BID PRICES

Bid prices shall include, whether additive or deductive, everything necessary for the completion of the work, including but not limited to, providing the materials, equipment, tools, fabrication, delivery, installation, plant and other facilities, and the management, superintendence, labor, overhead, profit, and services. Bid prices shall include all taxes required by Paragraph 00700-8.1.3, Payment of Taxes. No tax exemption certificate or any document designed to exempt the Contractor from payment of any tax will be furnished to the Contractor by the District, as to any tax on labor, services, materials, transportation, or any other items furnished pursuant to the Contract. Quote prices for the exact amount for all work required to complete the respective item as described and shown in the Contract Documents.

For unit price bid items, if the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern, and the correct product of the unit price and the estimated quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule does not equal the total amount quoted, the individual item amounts shall govern and the correct total shall be deemed to be the amount bid.

#### 15.0 BID GUARANTY

The bid form shall be accompanied by a bid guaranty bond provided by a surety company licensed and authorized to carry on business in the State of California, by a certified or cashier's check, payable to the District, or cash, in the sum of at least ten (10) percent of the total amount of the base bid price, plus additives, if any. The amount payable to the District under the bid guaranty bond, or the certified or cashier's check and the amount thereof, as the case may be, shall be forfeited to the District as liquidated damages in case of a failure or neglect of the bidder to furnish, execute, and deliver to the District the required Labor and Materials Bond and a Faithful Performance Bond, evidences of insurance; and to enter into, execute, and deliver to the District the Agreement on the form provided herewith, within ten (10) calendar days after receiving written notice from the District that the award has been made and the Agreement is ready for execution.

The bid guarantees of the three lowest bidders will be retained until the Agreement is signed, evidence of insurance provided, and satisfactory bonds furnished or other disposition made thereof. The bid guarantees of all bidders, except the three lowest responsive bids, will be returned within 15 calendar days after the bids are opened.

#### 16.0 QUALIFICATION OF BIDDER

Upon the request of District, any bidder whose bid is under consideration for the award of the Contract shall promptly submit satisfactory evidence showing the bidder's financial resources, its construction experience, and its organization's availability for the performance of the Contract.

The bidder may be required to establish to the satisfaction of the District the reliability and responsibility of the persons or entities proposed to furnish and perform the work described in the Contract Documents.

District Employees and Design Engineers May Not Bid on Construction Contracts. No employee of the District shall be eligible to submit a proposal for, nor to subcontract for any portion of, nor to supply any materials for any contract administered by the District.

No engineering or architectural firm which has provided design services for a project shall be eligible to submit a proposal for the contract to construct the project nor to subcontract for any portion of the work. The ineligible firms include the prime contractor for design, subcontractors of portions of the design, except for surveyors and geotechnical subcontractors and affiliates of either. An affiliate is a firm which is subject to the control of the same persons, through joint ownership or otherwise.

#### 17.0 SUBCONTRACTORS

In accordance with California Public Contract Code Section 4100, et. seq., each bid shall have listed in the official bid documents, the name, portion of work to be performed, and location of the place of business of each subcontractor who will perform work or labor or render service to the bidder in or about the construction of the work or improvement, or of any subcontractor licensed by the State of California who, under subcontract to the bidder, will specially fabricate and install a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the bidder's total bid.

Failure to list subcontractors may render the bid non-responsive and may be grounds for rejection of the bid. Failure to comply with the provisions of the California "Subletting and Subcontracting Fair Practices Act" shall make the Contractor subject to the sanctions as set forth in the Act. All work, in excess of one-half of one percent of the bidder's total bid, for which a subcontractor is not listed in the official bid documents, shall be performed by the Contractor's own organization.

The Contractor shall perform at a minimum the percentage of work specified in Section 01010-11.0, CONTRACTOR'S WORK PERCENTAGE, with its own forces and shall not subcontract out this portion of work. The Contractor shall perform that contract work with his own organization, except that any designated "Specialty Items" may be performed by subcontract and the amount of any such "Specialty Items" so performed may be deducted from the original total contract price before computing the amount of work required to be performed by the Contractor with his own organization. When items of work in the BID SCHEDULE, are preceded by the letter (S), said items are designated "Specialty Items." The District may also determine, on a case by case basis, items to be designated "Specialty Items." Where an entire item is sub-contracted, the value of work subcontracted will be based on the contract item bid price. When a portion of an item is sub-contracted, the value of work subcontracted will be based on the contractor, subject to approval by the District.

#### 18.0 MAJOR EQUIPMENT ITEMS

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#### 19.0 SUBSTITUTIONS DURING BIDDING

Manufacturers or suppliers of materials and equipment may offer an alternative product to the Contractor, except where alternatives or substitutes are specifically excluded, and request that alternatives to specified products be considered equal. Inclusion of such alternatives in the bid is the responsibility of the Contractor. Inclusion should only be considered if the Contractor believes the offered alternative is equal in quality and performance to the specified product. After award of the Contract, such offers of alternative products will be reviewed and processed as a substitution as provided under Section 01600, MATERIAL AND EQUIPMENT. Inclusion or offers of alternative products will not be reviewed or processed during the bidding period.

#### 20.0 BIDDERS INTERESTED IN MORE THAN ONE BID

No person, firm, or corporation, under the same or different name, shall make, file, or be interested in more than one bid for the same work unless alternate bids are called for. A person, firm, or corporation may, however, submit sub proposals or quote prices on materials to more than one bidder.

Reasonable grounds to believe that any individual, partnership, corporation, or combination is interested in more than one bid for the proposed work may cause rejection of all bids in which that individual, partnership, corporation, or combination is interested.

#### 21.0 SHEETING, SHORING AND BRACING

Pursuant to the provisions of California Labor Code Section 6707, each bid submitted shall contain, if the bid item is indicated, the amount included in its bid for adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders. By listing this sum, the bidder warrants that its action does not convey tort liability to the District, the Design Consultant, the Construction Manager, and their employees, agents, and sub consultants.

#### 22.0 WAGE RATES

Pursuant to provisions of the Labor Code Section 1770, et. seq., of the State of California, the Director of the Department of Industrial Relations has ascertained the prevailing rate of per diem wages of the locality in which the Work is to be performed and applicable to the work to be done. Copies of these wage determinations are on file with the District.

Successful bidders shall promptly notify the District, in writing, about all the classifications of labor not listed in the prevailing wage determinations but necessary for the performance of the Work.

#### 23.0 OFFER OF ASSIGNMENT OF ANTITRUST ACTIONS

As provided by Section 4552, et. seq., of the California Government Code, in submitting a bid to the District, the bidder offers and agrees that if the bid is accepted, it will assign to the District 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. Section 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, materials, or services by the bidder for sale to the District pursuant to the bid.

#### 24.0 ASSIGNMENT OF CONTRACT

The Contractor shall not assign any part of this Contract unless it complies with Section 00700-1.5, SUCCESSORS AND ASSIGNS.

#### 25.0 REJECTION OF BIDS

The District reserves the right to reject any and all bids and further reserves the right to reject any bids which are non-responsive, incomplete, obscure, or irregular; any bids which omit a bid on any one or more items on which the bids are required; any bids in which unit prices are unbalanced in the opinion of the District; any bids accompanied by insufficient or irregular bid guaranty; any bids from bidders who have previously failed to perform properly or to complete on time contracts of any nature; and any bidder who fails to provide satisfactory documentation of its qualifications as required by Section 00100-16.0, QUALIFICATION OF BIDDER. The District reserves the right to waive irregularities.

#### 26.0 CONTRACT AND BONDS

The successful bidder will be required to furnish, in duplicate counterpart, a Labor and Material Bond on forms approved by the District, in an amount equal to one hundred percent (100%) of the Contract Price, a Faithful Performance Bond in an amount equal to one hundred (100%) of the Contract Price, and evidence of insurance. Said insurance and bonds shall be secured from a surety company satisfactory to the District.

The form of contract, as provided in Section 00500, in which the successful bidder as Contractor will be required to execute and furnish shall be carefully examined by the bidder. The Faithful Performance Bond is to secure the faithful performance of the Contract, and the Labor and Material Bond is to secure the payment of those to whom the bidder may become legally indebted for labor, materials, tools, equipment, or services of any kind used or employed by the bidder in performing the work.

The Faithful Performance Bond will be retained by the District for twelve (12) months following final acceptance by the District of the improvements to guarantee correction of failure attributable to workmanship and materials. Upon said final acceptance by the District, the amount of the Faithful Performance Bond may be reduced to twenty percent (20%) of the actual improvement construction costs, at the sole discretion of the District.

The bonds required of the Contractor shall be furnished by a company authorized to do a surety business in the State of California said bonds shall be executed by the surety and Contractor before or concurrently with the signing of the contract. The form of said bonds and surety of sureties must be approved by the District.

All alterations, extensions of time, extra or additional work and other changes authorized by these specifications, or any part of the Contract may be made without securing the consent of the surety on the contract bonds.

#### 27.0 AWARD OF CONTRACT

Within sixty (60) days after the time of opening of the bids, the District will act either to accept a bid, to reject all bids or with the consent of the bidders and their sureties to extend the time in which the District may act. Nothing set forth herein shall limit the ability of the District to agree with the lowest responsive, responsible bidder to extend the time for the District to award the Contract to said bidder. The Award of Contract shall obligate the bidder whose bid is accepted to furnish Performance and Labor and Material bonds and evidences of insurance, and to execute the Agreement in the form set forth in the Contract Documents. The Contract will require the completion of the work according to the Contract Documents. If award is made, it will be based on the lowest responsive, responsible bid whose summation of the base bid and District selected alternates yields the lowest total Contract price. Selection of any or all alternates shall be at the sole discretion of the District.

#### 28.0 EXECUTION OF CONTRACT

The Agreement shall be executed by the successful bidder and returned, together with the Contract bonds and evidences of insurance, within ten (10) days after receiving the Contract. Time is of the essence in this regard. After execution by District, one copy of the Agreement shall be returned to Contractor.

The failure to execute the Contract Documents or to furnish the bonds or insurance required by these instructions within ten (10) days after receiving the Contract constitutes a default. In the event of a default, the District may award the Contract to the next lowest bidder or may re-advertise for bids. The District may charge against the defaulting bidder the greater of (1) the amount of the bid bond, or (2) the difference between the amount of the bid and the amount for which a Contract for the work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the bid bond. If a more favorable bid is received by re-advertising, the defaulting bidder shall have no claim against the District for a refund.

#### 29.0 BUSINESS LICENSE

Not Applicable.

#### 30.0 CONSTRUCTION AND DEMOLITION DEBRIS

Not Applicable.

#### 31.0 ESCROW OF BID DOCUMENTS - Removed

#### 32.0 BID PROTESTS

All parties wishing to file a protest shall comply with the procedures set forth below.

All protests regarding the bidding process or the award, or intended award, of any contract must be submitted in writing to the District on or before 5:00 p.m. of the fifth business day following the opening of all bids, unless a different time period is specified in the Notice Inviting Bids or other bid solicitation documents. All protests must be addressed to the District.

The party filing the protest must have actually submitted a bid for the work. A subcontractor of a bidder may not submit a bid protest.

The protest shall contain a full and complete statement specifying in detail the grounds of the protest and the facts in support thereof. The protest must be hand delivered or sent via mail so that it is received by the District within the time period set forth above. The protest document must include the following:

- a. A complete statement of the factual and legal basis for the protest;
- b. The protest must include the name, address and telephone number of the person representing the protesting party; and
- c. The protesting party must concurrently transmit a copy of the written protest document and any attached documentation to all other bidders who may have a reasonable prospect of receiving the award depending upon the outcome of the protest.

The procedure and time limits set forth herein are mandatory and the bidder's sole and exclusive remedy in the event of protest. No bidder may bring an action or proceeding challenging the bidding process or any award, or intent to award, any contract unless the above procedures are followed. The failure of a

> Instructions to Bidders 00100-8

party originating a protest to comply with these procedures shall constitute a waiver of any right to further pursue the protest, including filing a government code claim or legal proceeding. The District reserves the right to modify the bid protest procedures in the Notice Inviting Bids or other bid solicitation documents and to require any protesting party to submit additional or clarifying information or documentation in support of any protest.

\*\*\*END OF SECTION\*\*\*

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# SECTION 00220 - GEOTECHNICAL DATA

Subsoil investigations have not been conducted at the site of the work.

The Contractor should visit the site and acquaint himself with all existing conditions. Prior to bidding, contractors may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Engineer.

\*\*\* END OF SECTION \*\*\*

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# SECTION 00300 - LIST OF BID ITEMS

# **COVERT LIFT STATION UPGRADES - REBID**

ltem No.	Description	Estimated Quantity	Unit
1.	Mobilization, Demobilization, Bonds, Permits, and Insurance of All Work	1	Lump Sum
2.	Sewer Bypass System	1	Lump Sum
3.	12" Magnetic Flow Meter and Vault with H-20 Access Hatch	1	Lump Sum
4.	12" Plug Valve, Valve Extension and Valve Box with Traffic Rated Lid	1	Lump Sum
5.	Replace Existing Valve Vault and Cover	1	Lump Sum
6.	Portable Davit Crane	1	Lump Sum
7.	Pump Pit Improvements	1	Lump Sum
8.	Wet Well Improvements	1	Lump Sum
9.	(S) New Power Pedestal	1	Lump Sum
10.	(S) New Control Pedestal	1	Lump Sum
11.	(S) Basic Electrical Materials	1	Lump Sum
12.	(S) Labor Cost for New Pedestals	1	Lump Sum
13.	(S) Labor Cost to Transition from Old Electrical	1	Lump Sum
14.	(S) Labor Cost for All Electrical Connections	1	Lump Sum
15.	Site Grading, Drainage and Paving Improvements	475	Square Feet
16.	Instruction and Training	1	Lump Sum
17.	Instructional Operations and Maintenance Manuals	1	Lump Sum
18.	Record Drawings	1	Lump Sum

\*\*\*END OF SECTION\*\*\*

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# SECTION 00500 - CONSTRUCTION CONTRACT

This contract is made and entered into on \_\_\_\_\_2023, by and between \_\_\_\_\_\_with a business address at \_\_\_\_\_\_\_, hereinafter called "CONTRACTOR", and SALIDA SANITARY DISTRICT, a special district, hereinafter called "DISTRICT".

#### WITNESSETH:

WHEREAS, plans and specifications for the construction of Covert Lift Station Upgrades - Rebid, located at the southeast corner of Covert Road and Toomes Road, Salida, CA (APN 135-011-058), hereinafter called "PROJECT," were regularly adopted by SALIDA SANITARY DISTRICT; and

WHEREAS, the contract for said work was regularly awarded to CONTRACTOR, by SALIDA SANITARY DISTRICT on \_\_\_\_\_.

**NOW, THEREFORE**, in consideration of the promises and of the mutual covenants herein contained, the parties hereto expressly agree as follows:

#### CONTRACTOR agrees:

1. <u>SCOPE OF SERVICES.</u> To do the work and furnish all the labor, materials, tools, equipment, and insurance required for the construction of PROJECT, in accordance with the plans and specifications by SALIDA SANITARY DISTRICT. The "contract documents," which include the bid documents, project plans and specifications, and the SALIDA SANITARY DISTRICT's Sewer Standards and Specifications, are incorporated into and made a part of this contract by this reference to the same extent as if fully set forth.

2. <u>COMPENSATION.</u> To do and perform the work contemplated hereby in a good and workmanlike manner and to furnish all labor, materials, tools, and equipment necessary therefore at the prices specified in Exhibit A, attached hereto and by reference made a part hereof, under the direction of and to the complete satisfaction of the DISTRICT Manager-Engineer of the SALIDA SANITARY DISTRICT. Total compensation for services and reimbursement for costs shall not exceed \$\_\_\_\_\_\_, or as otherwise mutually agreed to in a Contract Change Order.

3. **INSURANCE.** CONTRACTOR shall not commence any work before obtaining and shall maintain in force at all times during the duration and performance of this contract, the policies of insurance specified in Exhibit B, which is attached to this contract and incorporated by this reference.

It shall be a requirement under this agreement that any available insurance proceeds broader than or in excess of the specified minimum insurance coverage requirements and/or limits shall be available to the Additional Insured.

Furthermore, the requirements for coverage and limits shall be (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policy or proceeds available to the named Insured; whichever is greater.

The Additional Insured coverage under the CONTRACTOR's policy shall be "primary and noncontributory" and will not seek contribution from the DISTRICT's insurance and shall be at least as broad as ISO CG 20 01 04 13. The limits of insurance required in this agreement may be satisfied by a combination of primary and umbrella or excess insurance. Any umbrella or excess insurance shall contain or be endorsed to contain a provision that such coverage shall also apply on a primary and non-contributory basis for the benefit of the DISTRICT (if agreed to in a written contract or agreement) before the DISTRICT's own insurance shall be called upon to protect it as a named insured.

All self-insured retentions (SIR) must be disclosed to the DISTRICT for approval and shall not reduce the limits of liability. Payment Bond in the amount of the self-insured retention (SIR) may be required.

Policies containing any SIR provision shall provide or be endorsed to provide that the SIR may be satisfied by either the named insured or the DISTRICT.

The DISTRICT reserves the right to obtain a full certified copy of any insurance policy and endorsements.

Failure to exercise this right shall not constitute a waiver of right to exercise later.

CONTRACTOR shall maintain insurance as required by this contract to the fullest amount allowed by law and shall maintain insurance for a minimum of five years following the completion of this project. In the event contractor fails to obtain or maintain completed operations coverage as required by this agreement, the DISTRICT at its sole discretion may purchase the coverage required and the cost will be paid by CONTRACTOR.

CONTRACTOR agrees to include with all Subcontractors in their subcontract the same requirements and provisions of this agreement including the indemnity and insurance requirements to the extent they apply to the scope of the Subcontractor's work. Subcontractors hired by CONTRACTOR agree to be bound to CONTRACTOR and the DISTRICT in the same manner and to the same extent as CONTRACTOR is bound to the DISTRICT under the Contract Documents. Subcontractor further agrees to include these same provisions with any Subcontractor. A copy of the DISTRICT Contract Document Indemnity and Insurance provisions will be furnished to the Subcontractor upon request. The CONTRACTOR shall require all Subcontractors to provide a valid certificate of insurance and the required endorsements included in the agreement prior to commencement of any work and CONTRACTOR will provide proof of compliance to the DISTRICT.

- 4. **BONDS.** Contractor shall provide the following Surety Bonds:
  - a. Bid bond
  - b. Faithful Performance Bond
  - c. Labor and Materials Bond

The Performance Bond, and Labor and Material Bond shall be in a sum equal to one-hundred percent (100%) of the contract price. The Faithful Performance Bond shall be retained by the DISTRICT for twelve (12) months following final acceptance by the District of the PROJECT to guarantee correction of failure attributable to workmanship and materials. Bonds shall be duly executed by a responsible corporate surety, authorized to issue such bonds in the State of California and secured through an authorized agent with an office in California. The form of said bonds and the surety of sureties must be approved by the District.

5. **INDEMNITY AND HOLD HARMLESS.** With the exception that this section shall in no event be construed to require indemnification by Contractor to a greater extent than permitted under the public policy of the State of California, CONTRACTOR shall indemnify, protect, defend with counsel

approved by DISTRICT and at CONTRACTOR's sole cost and expense, and hold harmless DISTRICT, its Board of Directors, officials, representatives, agents, employees, and volunteers from and against any and all claims, causes of action, liabilities, judgments, awards, losses, liens, claims, stop notices, damages, expenses, and costs (including without limitation attorneys' fees, expert and consultant fees, and other expenses of litigation) of every nature, including, but not limited to, death or injury to persons, or damage to property, which arise out of or are in any way connected with the work performed, materials furnished, or services provided under this Agreement, or from any violation of any Federal, State, or local law or ordinance, or DISTRICT Policy, by CONTRACTOR or CONTRACTOR's officers, agents, employees, volunteers or subcontractors. CONTRACTOR shall not be obligated to indemnify or defend DISTRICT for claims finally determined by a court of law or arbitrator to arise from the active negligence or willful misconduct of the DISTRICT. It is the intent of the Parties that this indemnity obligation is at least as broad as is permitted under California law. To the extent California Civil Code sections 2782, et seq., limit the defense or indemnity obligations of CONTRACTOR to DISTRICT, the intent hereunder is to provide the maximum defense and indemnity obligations allowed by CONTRACTOR under the law. The indemnity set forth in this section shall not be limited by insurance requirements or by any other provision of this Agreement.

With exception that this section shall in no event be construed to require indemnification, including the duty to defend, by CONTRACTOR to a greater extent than permitted under the public policy of the State of California, the parties agree that CONTRACTOR's duty to defend DISTRICT is immediate and arises upon the filing of any claim against the DISTRICT for damages which arise out of or are in any way connected with the work performed, materials furnished, or services provided under this Agreement by CONTRACTOR or CONTRACTOR's officers, agents, employees, volunteers or subcontractors. CONTRACTOR's duties and obligations to defend the DISTRICT shall apply regardless of whether or not the issue of the DISTRICT's liability, breach of this Agreement, or other obligation or fault has been determined. CONTRACTOR shall be immediately obligated to pay for DISTRICT's defense costs of the claim, including, but not limited to, court costs, attorney's fees and costs, expert consultant and witness fees and costs, other witness fees, document reproduction costs, arbitration fees, and, if after final judgment an appeal is pursued, all of such costs for the appeal. At the conclusion of the claim, if there is any determination or finding of sole active negligence or willful misconduct on the part of the DISTRICT, DISTRICT will then reimburse CONTRACTOR for amounts paid in excess of CONTRACTOR's proportionate share of responsibility for the damages within 30 days after CONTRACTOR provides DISTRICT with copies of all bills and expenses incurred in the defense of the claim(s). It is agreed between the parties that this reimbursement provision assures CONTRACTOR is not obligated to defend or indemnify DISTRICT in an amount greater than provided for under California law, including, without limitation, California Civil Code sections 2782, 2782.6, and 2782.8.

With the exception that this section shall in no event be construed to require indemnification by Contractor to a greater extent than permitted under the public policy of the State of California, and in addition to the other indemnity obligations in this Agreement, CONTRACTOR shall indemnify, defend, and hold harmless DISTRICT, its Board of Directors, officials, representatives, agents, employees, and volunteers from and against all claims, losses, expenses, and costs including, but not limited to, attorneys' fees, arising out of any claim brought against the DISTRICT by an employee, officer, agent, or volunteer of CONTRACTOR, regardless of whether such claim may be covered by any applicable workers compensation insurance. CONTRACTOR's indemnification obligation is not limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability acts, or other employee benefit acts.

The DISTRICT's acceptance of the insurance certificates required under this Agreement does not relieve the CONTRACTOR from its obligation under this paragraph. The indemnification obligations of this section shall survive the termination of this agreement. Any exceptions to this language may result in a proposal being deemed non-responsive. CONTRACTOR/Subcontractor's responsibility for such defense and indemnity obligations shall survive the termination or completion of this agreement for the full period of time allowed by law.

The defense and indemnification obligations of this agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this agreement. If any section, subsection, sentence, clause or phrase of this indemnification is for any reason held to be invalid or unconstitutional, such decision shall not affect the validity of the remaining portions of this indemnification.

6. <u>WEEKLY STATEMENT</u>. The DISTRICT Manager-Engineer will furnish CONTRACTOR a weekly statement showing the number of days charged to the contract for the preceding week, the number of days specified for completion of the contract, and the number of days remaining to complete the contract. CONTRACTOR will be allowed one (1) week in which to file a written protest setting forth in what respects said weekly statement is incorrect, otherwise the statement shall be deemed to have been accepted by CONTRACTOR as correct.

7. WORKING DAYS. It is agreed by the parties to the contract that in case all the work called for under the contract in all parts and requirements, is not finished or completed within the number of days as set forth, damage will be sustained by the DISTRICT, and that it is and will be impracticable and extremely difficult to ascertain the actual damage which DISTRICT will sustain in the event of and by reason of such delay; and it is therefore agreed that CONTRACTOR will pay to DISTRICT the sum of ONE-HUNDRED AND NO/100 DOLLARS (\$100.00) per day for each and every calendar day's delay in finishing the work in excess of the number of days prescribed; and CONTRACTOR agrees to pay said liquidated damages as herein provided, and in case the same are not paid, agrees that DISTRICT, may deduct the amount thereof from any monies due or that may become due CONTRACTOR under the contract.

It is further agreed that in case the work called for under the contract is not finished and completed in all parts and requirements within the number of days as specified, the DISTRICT shall have the right to increase the number of days or not, as may seem best to serve the interest of DISTRICT, and if the DISTRICT decides to increase the said number of days, the DISTRICT shall further have the right to charge to CONTRACTOR, CONTRACTOR's heirs, assigns or sureties, and to deduct from the final payment for the work, all or any part, as may be deemed proper, the liquidated damages as specified or the actual cost of engineering, inspection, superintendence, and other overhead expenses which are directly chargeable to the contract, and which accrue during the period of such extension, whichever is greater, except the cost of final surveys and preparation of final estimate shall not be included in such charges.

A working day shall not include, nor shall CONTRACTOR be assessed with liquidated damages nor the additional cost of engineering and inspection during any delay beyond the time named for the completion of the work caused by acts of God or of the public enemy, acts of DISTRICT, fire, floods, epidemics, quarantine restrictions, strikes, and freight embargoes and subject to approval by the DISTRICT Manager-Engineer, inability to get materials ordered by CONTRACTOR or subcontractor due to such causes provided that CONTRACTOR shall notify the DISTRICT Manager-Engineer in writing of the causes of delay within five (5) working days from the beginning of any such delay, and the DISTRICT Manager-Engineer shall ascertain the facts and the extent of the delay, and DISTRICT Manager-Engineer's findings of the facts thereon shall be final and conclusive.

If CONTRACTOR is delayed by reason of alterations made in these specifications, or by any act of the DISTRICT Manager-Engineer or of the DISTRICT, not contemplated by the contract, the time of completion shall be extended proportionately and CONTRACTOR shall be relieved during the period of
such extension of any claim for liquidated damages, engineering or inspection charges or other penalties. CONTRACTOR shall have no claim for any other compensation for any such delay.

8. <u>CONFORMANCE TO APPLICABLE LAWS.</u> CONTRACTOR shall comply with all applicable Federal, State, and local laws, rules, and ordinances. CONTRACTOR shall not discriminate in the employment of persons or in the provision of services under this Contract on the basis of any legally protected classification, including, but not limited to, race, color, national origin, ancestry, sex or religion of such person.

# a. <u>TITLE VI</u>

Title VI of the Civil Rights Act of 1964 requires that "no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." (42 USC Section 2000d) http://www.dol.gov/oasam/regs/statutes/titlevi.htm.

The DISTRICT requires compliance with the requirements of Title VI in all of its programs and activities regardless of funding source.

# b. LABOR STANDARDS PROVISIONS/CALIFORNIA LABOR CODE

The bidder shall understand that conditions set forth in Division 2, Part 7, Chapter 1, Article 2, Wages of the California Labor Code shall be considered part of the contract agreement.

# c. <u>PREVAILING WAGE</u>

CONTRACTOR and any subcontractor shall pay each employee engaged in the trade or occupation not less than the prevailing hourly wage rate. In accordance with the provisions of Section 1770 of the Labor Code, the Director of Department of Industrial Relations of the State of California has determined the general prevailing wage and employer payments for health and welfare, pension, vacation, travel time, and subsistence pay as provided for in Section 1773.1, apprenticeship or other training programs authorized by Section 3093 and similar purposes applicable to the work to be done. CONTRACTOR performing the work under this contract shall obtain a copy of the wage rate determination and shall distribute copies to each subcontractor. As the wage determination for each craft reflects an expiration date, it shall be the prime CONTRACTOR and each subcontractor's responsibility to ensure that the prevailing wage rates of concern is current and paid to the employee.

i. The CONTRACTOR performing the work shall be responsible for obtaining a copy of the State wage rate determination. State wage rates may be obtained at <a href="http://www.dir.ca.gov/OPRL/pwd/Determinations/Northern/Northern.pdf">http://www.dir.ca.gov/OPRL/pwd/Determinations/Northern/Northern.pdf</a>. The CONTRACTOR shall be responsible for posting said wage rates at a prominent location at the work site and shall maintain same in a good readable condition for the duration of the work.

ii. Should the CONTRACTOR choose to work on a Saturday, Sunday or on a holiday recognized by the Labor Unions, the CONTRACTOR shall reimburse the DISTRICT the actual cost of engineering, inspection, superintendence, and or other overhead expenses which are directly chargeable to the contract. Should such work be undertaken at the request of the DISTRICT, reimbursement will not be required. To conform strictly with the provisions of Division 2, Part 7, Chapter 1, Article 2, of the Labor

Code of the State of California. To forfeit as a penalty to DISTRICT the sum of TWENTY-FIVE AND NO/100 DOLLARS (\$25.00) for each laborer, worker, or mechanic employed by CONTRACTOR, or by any subcontractor under CONTRACTOR, in the execution of this contract, for each calendar day during which any laborer, worker, or mechanic is required or permitted to work more than eight (8) hours and who is not paid the general prevailing rate of per diem wages for holiday and overtime work in violation of the provisions of Sections 1770 to 1781 of the Labor Code of the State of California. That all sums forfeited under the provisions of the foregoing sections shall be deducted from the payments to be made under the terms of this contract.

iii. The CONTRACTOR to whom the contract is awarded shall insure that the prime and each subcontractor will in accordance with Section 1776 of the Labor Code, maintain certified payroll records. A copy of said records shall be provided with each invoice to the DISTRICT. It shall be the CONTRACTOR'S responsibility to obtain copies of the current prevailing wage rate determination for all subcontractors. Additionally, certified payroll records must be uploaded to the DIR website as required by labor code.

iv. The CONTRACTOR shall comply with the provisions established in Section 1777.5 of the Labor Code concerning the 1) certified approval by local joint apprenticeship committees for the employment and training of apprentices, and 2) contribution of funds to administer and conduct apprenticeship programs, if applicable to the job.

# **DISTRICT** agrees:

9. <u>COMPENSATION.</u> To pay CONTRACTOR for the work herein contemplated in the following manner: Progress payments will be made on or about the first day of each calendar month, in such sum as shall make the aggregate of payment up to such day equal to ninety-five percent (95%) of the proportional contract price, upon the basis of the progress certificate of the DISTRICT as to the amount of work done and the proportional amount of the contract price represented therefore; and all of the remaining part of the contract price not as aforesaid paid, shall be paid at the expiration of thirty-five (35) days from the completion of said work of construction and the certification by the DISTRICT of such completion.

**10.** <u>**CHANGE ORDERS.**</u> DISTRICT reserves the right to make such alterations, deviations, additions to or omissions from the plans and specifications, including the right to increase or decrease the quantity of any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated.

Any such changes will be set forth in a contract change order which will specify, in addition to the work done in connection with the change made, adjustment of contract time, if any, and the basis of compensation for such work. A contract change order will not become effective until approved by the DISTRICT Manager-Engineer and/or the DISTRICT Board of Directors.

CONTRACTOR shall, upon request, promptly furnish the DISTRICT Manager-Engineer with adequate detailed cost data for such item of work.

**11.** <u>AUDITS.</u> DISTRICT reserves the right to periodically audit all charges made by CONTRACTOR to DISTRICT for services under the contract. Upon request, CONTRACTOR agrees to furnish DISTRICT, or a designated representative, with necessary information and assistance.

CONTRACTOR agrees that DISTRICT or its delegate will have the right to review, obtain and copy all records pertaining to performance of the contract. CONTRACTOR agrees to provide DISTRICT or its delegate with any relevant information requested and shall permit DISTRICT or its delegate access to its premises, upon reasonable notice, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts, and other material that may be relevant to a matter under investigation for the purpose of determining compliance with this requirement. CONTRACTOR further agrees to maintain such records for a period of three (3) years after final payment under the contract.

12. <u>WAIVER.</u> It is expressly understood and agreed by and between the parties hereto that a waiver of any of the conditions of this contract shall not be considered a waiver of any of the other conditions thereof.

It is further understood and agreed by and between the parties hereto that time is of the essence of this contract in all respects.

IN WITNESS WHEREOF, the parties hereto have hereunto affixed their hands and seals the day and year first above written.

By:

CONTRACTOR

SALIDA SANITARY DISTRICT

By:\_

(CONTRACTOR'S SIGNATURE)

ANTONIO TOVAR DISTRICT MANAGER-ENGINEER

# EXHIBIT A

# COVERT LIFT STATION UPGRADES - REBID

ltem #	Description	Est. Quantity	Unit	Unit Price	Total Price
1.	Mobilization, Demobilization, Bonds, Permits, and Insurance of All Work	1	Lump Sum		
2.	Sewer Bypass System	1	Lump Sum		
3.	12" Magnetic Flow Meter and Vault with H-20 Access Hatch	1	Lump Sum		
4.	12" Plug Valve, Valve Extension and Valve Box with Traffic Rated Lid	1	Lump Sum		
5.	Replace Existing Valve Vault and Cover	1	Lump Sum		
6.	Portable Davit Crane	1	Lump Sum		
7.	Pump Pit Improvements	1	Lump Sum		
8.	Wet Well Improvements	1	Lump Sum		
9.	(S) New Power Pedestal	1	Lump Sum		
10.	(S) New Control Pedestal	1	Lump Sum		
11.	(S) Basic Electrical Materials	1	Lump Sum		
12.	(S) Labor Cost for New Pedestals	1	Lump Sum		
13.	(S) Labor Cost to Transition from Old Electrical	1	Lump Sum		
14.	(S) Labor Cost for All Electrical Connections	1	Lump Sum		
15.	Site Grading, Drainage and Paving Improvements	475	Square Feet		
16.	Instruction and Training	1	Lump Sum		
17.	Instructional Operations and Maintenance Manuals	1	Lump Sum		
18.	Record Drawings	1	Lump Sum		
TOTAL BID: The sum of Items 1 through 18					

# EXHIBIT B

# **REFER TO SECTION 00820 – LIABILITY AND INSURANCE REQUIREMENTS**

\*\*\*END OF SECTION\*\*\*

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# **SECTION 00700 - GENERAL CONDITIONS**

# 1.0 GENERAL

### 1.1 Intent of Contract Documents

The intent of the Contract Documents is to include all necessary criteria to establish the scope and quality for completion of the Work by Contractor. The Contract Documents are complementary and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to the extent consistent with, and reasonably inferable from, the Contract Documents.

Where the Plans or Specifications describe portions of the Work in general terms but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the Contractor shall furnish tools, equipment, and incidentals, and do all the work involved in executing the Contract in a satisfactory and workmanlike manner.

In the event the materials and/or equipment are to be furnished by the District, as designated in the General Requirements or as agreed on, this shall not relieve the Contractor of the above requirements to furnish all other labor, materials, and equipment to complete the Contract.

It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to the District.

# 1.2 Discrepancies and Omissions

Any discrepancies or omissions found in the Contract Documents shall be reported to the Construction Manager immediately. The Construction Manager will clarify discrepancies or omissions, in writing, within a reasonable time.

In the case of conflict or inconsistencies between terms of the Contract Documents, the following order of precedence shall apply:

- a. The Contract and Exhibits, including change orders and permits;
- b. Supplementary Conditions and their Exhibits;
- c. Instructions to Bidders;
- d. General Conditions and their Exhibits;
- e. The Project Specifications;
- f. The Project Drawings;
- g. Salida Sanitary District Sewer Standards and Specifications;

h. Where no order of precedence is stated, or if conflict or inconsistency cannot be resolved by a careful review of the Contract Documents, the more stringent of the requirements shown or specified shall be controlling.

Organization of the Specifications into various subdivisions and the arrangement of the Drawings shall not control Contractor in dividing the Work among subcontractors, in trades, or into design packages, or in establishing the extent of work to be performed by any trade.

Unless otherwise stated in the Contract Documents, technical words and abbreviations contained in the Contract Documents are used in accordance with commonly understood design professional and construction industry meanings; and non-technical words and abbreviations are used in accordance with their commonly understood meanings.

The Contract Documents may omit modifying words such as "all" and "any," and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement. The use of the word "including," when following any general statement, shall not be construed to limit such statement to specific items or matters set forth immediately following such word or to similar items or matters, whether or not non-limiting language (such as "without limitation," "but not limited to," or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement.

Whenever the context so requires, the use of the singular number shall be deemed to include the plural and vice versa. Each gender shall be deemed to include any other gender, and each shall include corporation, partnership, trust, or other legal entity, whenever the context so requires. The captions and headings of the various subdivisions of the Contract Documents are intended only for reference and convenience and in no way define, limit, or prescribe the scope or intent of the Contract Documents or any subdivision thereof.

#### 1.3 Headings

Headings to parts, divisions, sections, articles, paragraphs, subparagraphs, and forms are inserted for convenience of reference only and shall not affect the interpretation of the Contract Documents.

#### 1.4 Penalty for Collusion

If, at any time, it is found that the person, firm, or corporation to whom the Contract has been awarded has, in presenting any bid or bids, colluded with any other party or parties, then the Contract shall be null and void, and the Contractor and its sureties shall be liable for loss or damage which the District may suffer thereby, and the District may advertise for new bids for said Work.

#### 1.5 Successors and Assigns

The District and the Contractor, respectively, bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to the partners, successors, assigns, and legal representatives of such other party with respect to all covenants, agreements, and obligation contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other and consent of Surety.

# 1.6 Assignment to District

Pursuant to Public Contract Code 7103.5, in entering into the Contract and all subcontracts, to supply goods, services, or materials pursuant to the Contract, the Contractor and its subcontractors offer and agree to assign to the District 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 Contract and subcontracts. This assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties. Reference Paragraph 00100-23.

### 1.7 Rights and Remedies

The duties and obligations imposed by the Contract Documents and the rights and remedies available there under shall be in addition to, and not a limitation of, any duties, obligations, rights, and remedies otherwise imposed or available by law.

No action or failure to act by the District, the Design Consultant, or the Construction Manager shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach there under, except as may be specifically agreed in writing.

### 2.0 ADMINISTRATION

#### 2.1 Administration of the Contract

The District's Representative, the Construction Manager, and the Design Consultant will provide administration of the Contract as hereinafter discussed. The duties, responsibilities and limitations of authority of the Design Consultant and the Construction Manager as the representatives of the District during the construction, as set forth in the Contract Documents, will not be modified or extended without written consent of the District.

In case of the termination of the employment of the Design Consultant or the Construction Manager, the District shall appoint a Design Consultant or a Construction Manager whose status under the Contract Documents shall be that of the former Design Consultant or Construction Manager, respectively.

#### 2.2 District's Representative

- 2.2.1 General The District's Representative has the authority to act on behalf of the District to implement change orders, progress payments, contract performance decisions, acceptability of the Contractor's work, and early possession.
- 2.2.2 Change Orders The District's Representative has the authority to review and recommend or reject change orders and cost proposals submitted by the Contractor or as recommended by the Construction Manager.

- 2.2.3 Progress Payments The District's Representative has the authority to accept or reject requests for progress payments which have been submitted by the Contractor and recommended by the Construction Manager.
- 2.2.4 Contract Performance Decisions Should the Contractor disagree with the Construction Manager's decision with respect to the contract performance, the Contractor may appeal to the District's Representative in accordance with the provisions herein.
- 2.2.5 Acceptability of Work The District's Representative has the authority to make the final determination of the acceptability of the Work. The District's Representative also has the authority to accept or reject the Design Consultant's recommendations regarding retention of defective work as provided.

#### 2.3 Construction Management

2.3.1 General - The Construction Manager is a representative of the District employed to act as advisor and consultant to the District in construction matters related to the Contract.

All instructions to the Contractor and all communications from the Contractor to the District or the Design Consultant shall be forwarded through the Construction Manager. The Construction Manager will have authority to act on behalf of the District only to the extent provided in the Contract Documents. The District has delegated its authority to the Construction Manager to make initial decisions regarding questions which may arise as to the quality or acceptability of materials furnished and work performed, and as to the manner of performance and rate of progress of the work under the Contract. The Construction Manager shall interpret the intent and meaning of the Contract and shall make initial decisions with respect to the Contractor's fulfillment of the Contract and the Contractor's entitlement to compensation. The Contractor shall look initially to the Construction Manager in matters relating to the Contract.

The Construction Manager's authority to act under Paragraph 00700-2.1, <u>Administration of the</u> <u>Contract</u>, and any decision made by it in good faith either to exercise or not to exercise such authority shall not give rise to any duty or responsibility of the District or Construction Manager to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

2.3.2 Representative - The Construction Manager will be represented at the Site by a resident construction manager or resident engineer who will observe the progress, quality, and quantity of the Work to determine, in general, if the Work is proceeding in accordance with the intent of the Contract Documents. The Construction Manager shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work.

In accordance with the provisions detailed elsewhere in these General Conditions, the Construction Manager will make decisions relative to all matters of interpretation or execution of the Contract Documents.

2.3.3 Inspection of Construction - The Construction Manager shall have the authority to reject work and materials which do not conform to the Contract Documents, and to require special inspection or testing in accordance with Paragraph 00700-5.3, <u>Defective and Unauthorized Work</u>.

In addition to the resident construction manager or resident engineer, the Construction Manager may employ one or more inspectors to observe the Work and to act in matters of construction under this Contract. An inspector is not authorized to revoke, alter, or waive any requirements of the

Specifications. The inspector is authorized to call the attention of the Contractor to any failure of the Work, materials or workmanship to conform to the Contract Documents. The inspector shall have the authority to reject materials or, in any emergency, suspend the Work. The Contractor may appeal any such issue which it disagrees with to the Construction Manager for decision.

- 2.3.4 Acceptability of the Work The Construction Manager has the authority to make a recommendation as to the acceptability of the Work.
- 2.3.5 Change Orders The Construction Manager has the authority to initiate change orders; to reject change orders proposed by the Contractor or Design Consultant; to negotiate and recommend acceptance of change orders; or to order minor changes in the Work at no cost to the District.
- 2.3.6 Construction Schedule The Construction Manager has the authority to review and recommend acceptance of the progress schedule submitted by the Contractor at the start of the Work and subsequent significant revisions for conformance to the specified sequence of work and logic.
- 2.3.7 Progress Payments The Construction Manager has the authority to recommend acceptance or rejection of requests for progress payments which have been submitted by the Contractor.
- 2.3.8 Final Payment The Construction Manager, with the assistance of the Design Consultant will conduct inspections to determine the dates of substantial completion of the Work and final completion of the Work, and will receive and forward to the District, for the District's review, written warranties, and related documents required by the Contract and assembled by the Contractor.
- 2.3.9 Early Possession The Construction Manager has the authority to recommend early possession.

#### 2.4 Design Consultant

- 2.4.1 General The Design Consultant will have the authority to act on behalf of the District only to the extent provided in the Contract Documents.
- 2.4.2 Interpretations The Design Consultant has the authority to be the initial interpreter of the technical requirements of the Contract Documents. Either party to the Contract may make written request to the Construction Manager for interpretations necessary for the proper execution or progress of the Work. The Construction Manager shall refer such written requests to the Design Consultant, who will render such interpretations. Where the Contractor has requested an interpretation from the Construction Manager, or been notified by the Construction Manager that such interpretation has been requested by the District, any work done before receipt of such interpretations, if not in accordance with same, shall be removed and replaced or adjusted as directed by the Construction Manager without additional expense to the District.
- 2.4.3 Acceptability of the Work The Design Consultant has the authority to make a recommendation as to the acceptability of the Work. The Design Consultant has the authority to recommend acceptance regarding the retention of defective work.
- 2.4.4 Site Observations The Design Consultant may visit the Site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Design Consultant will not be required to make extensive or continuous on-site inspections to check the quality or quantity of the Work.
- 2.4.5 Submittal The Contractor shall submit, through the Construction Manager, all shop drawings, product data and samples for review.

The Design Consultant has the authority to review and take other appropriate action upon the Contractor's submittals such as shop drawings, product data and samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents.

#### 3.0 DISTRICT

#### 3.1 General

The District, acting through the District's Representative or the Construction Manager, shall have the authority to act as the sole judge of the Work and materials with respect to both quantity and quality as set forth in the Contract.

#### 3.2 Attention to Work

The District shall notify the Contractor in writing of the name of the individual designated as the District's Representative and the name of the individual designated by the Construction Manager to act as resident construction manager or resident engineer. The Construction Manager's designated representative normally will be at the Site of the Work. During the representative's absences, the Contractor may contact a previously designated representative of the Construction Manager.

#### 3.3 Inspection

In addition to the resident construction manager or resident manager or resident engineer, the District may employ one or more inspectors to observe the Work and to act in matters of construction under this Contract. An inspector is not authorized to revoke, alter, or waive any requirements of the specifications. The inspector is authorized to call the attention of the Contractor to any failure of the Work or materials to conform to the Contract Documents. The inspector shall have the authority to reject material or, in any emergency, suspend the Work. The Contractor may appeal any such issue with which it disagrees to the Construction Manager for decision by the Construction Manager.

Separate and independent from the inspection above, the project may be inspected by Building Officials for code compliance. Such inspectors shall have the authority provided to them by local jurisdiction.

Construction Manager will have authority to disapprove or reject Work which Construction Manager believes to be defective, or that Construction Manager believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Construction Manager will also have authority to require special inspection or testing of the Work as provided in this section, whether or not the Work is fabricated, installed, or completed

Contractor shall give Construction Manager timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such

public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Construction Manager the required certificates of inspection or approval.

Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for District's and Construction Manager's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to the District and Construction Manager.

If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Construction Manager, it must, if requested by Construction Manager, be uncovered for observation.

Uncovering Work shall be at Contractor's expense unless Contractor has given Construction Manager timely notice of Contractor's intention to cover the same and Construction Manager has not acted with reasonable promptness in response to such notice.

If any Work is covered contrary to the written request of Construction Manager, it must, if requested by Construction Manager, be uncovered for Construction Manager's observation and replaced at Contractor's expense without adjustment of Contract Time or Contract Price.

If Construction Manager considers it necessary or advisable that covered Work be observed by Construction Manager or inspected or tested by others, Contractor, at Construction Manager's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Construction Manager may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and the District shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, the District may make a Claim therefore as provided in these documents. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefore as provided in these documents.

# 3.4 District's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within 48 hours after receipt of written notice from the District to commence and continue correction of such default or neglect with diligence and promptness, the District may, after 48 hours following receipt by the Contractor of an additional written notice and without prejudice to any other remedy make good such deficiencies.

The District also reserves the right to perform any portion of the Work due to an emergency threatening the safety of the Work, public, District, and any property or equipment.

The Contractor is forewarned that in exercising the rights and remedies under this paragraph, the District shall proceed expeditiously. In connection with such corrective and remedial action, the

District may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which District has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow the District, District's representatives, agents and employees, District's other contractors, and Construction Manager and Construction Manager's Consultants access to the Site to enable District to exercise the rights and remedies under this paragraph.

All Claims, costs, losses, and damages incurred or sustained by the District in exercising the rights and remedies under this paragraph 3.4 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and District shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, District may make a claim therefor as provided in paragraph 7.5.2. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by District of District's rights and remedies under this paragraph 3.4.

### 3.5 District's Right to Use or Occupy

The District reserves the right, prior to Substantial Completion, to occupy, or use, any completed part or parts of the Work, providing these areas have been approved for occupancy by the District. The exercise of this right shall in no way constitute an acceptance of such parts, or any part of the Work, nor shall it in any way affect the dates and times when progress payments shall become due from the District to the Contractor or in any way prejudice the District's rights in the Contract, or any bonds guaranteeing the same. The Contract shall be deemed completed only when all the Work contracted has been duly and properly performed and accepted by the District.

Prior to such occupancy or use, the District and Contractor shall agree in writing regarding the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents.

In exercising the right to occupy or use completed parts of the Work prior to the Substantial Completion thereof, the District shall not make any use which will materially increase the cost to the Contractor, without increasing the Contract Amount, nor materially delay the completion of the Contract, without extending the time for completion.

The part or parts of the Work, if any, which the District anticipates the use or occupancy of prior to Substantial Completion, are noted in Paragraph 01010-7.0, <u>OCCUPANCY REQUIREMENTS</u>. Failure to include a part of the Work in the above section, shall not limit the District's right to use or occupy parts of the Work not listed.

#### 3.6 District's Right to Perform Work and to Award Separate Contracts

The District reserves the right to perform the work related to the Project with the District's own forces, and to award separate contracts in connection with the Project or other work on the Site under these or similar General Conditions. If the Contractor claims that delay, damage, or additional cost is involved because of such action by the District, the Contractor shall make such claim as provided elsewhere in the Contract Documents.

When separate contracts are awarded for different portions of the Project or other work on the Site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Agreement.

The District will provide for the coordination of the work of the District's own forces and of each separate Contractor with the Work of the Contractor, who shall cooperate therewith as provided in Paragraph 00700-4.8.3, Cooperation.

### 4.0 CONTRACTOR

#### 4.1 Office

The Contractor's office at the Project Site is hereby designated as the legal address of the Contractor for the receipt of documents, samples, notices, letters, and other articles of communication.

### 4.2 Contractor's Representative

The Contractor shall notify the District in writing of the names of the persons who will act as the Contractor's representative and his or her designated alternate, and who shall have the authority to act in matters relating to this Contract. The Contractor, acting through its representative, shall give personal attention to, and shall manage the Work, so that it shall be prosecuted faithfully. The Contractor's representative shall be an employee of the Contractor. Upon written request of the Contractor, this employment requirement may be waived by the District. The District's waiver, if granted, will be in writing. There is no obligation by the District to waive this provision regardless of the effect on the Contractor's operations. Such waiver may be rescinded by District upon reasonable written notice thereof.

At all times during the progress of the Work, the Contractor's representative shall be personally present at the Project site, or a designated alternate shall be at the Project site who has the authority to act in matters relating to the Contract. The Contractor's representative or designated alternate shall have the authority to carry out the provisions of the Contract and to supply materials, equipment, tools, and labor without delay for the performance of the Work. If neither the Contractor's representative nor a designated alternate is at the Project site, the District acting through the Construction Manager shall have the authority as provided in Paragraph 00700-6.6, <u>Temporary Suspension of Work</u>, to suspend the work until such a representative is at the Project site.

Before initial work is begun on the Contract, the Contractor shall file, with the Construction Manager, addresses and telephone numbers where the Contractor's and all subcontractors' representatives can be reached during all hours, including nights and weekends when work is not in progress.

#### 4.3 Construction Procedures

The Contractor will supervise and direct the work. The Contractor has the authority to determine the means, methods, techniques, sequences, and procedures of construction, except in those instances where the District, to define the quality of an item of work, specifies in the Contract, a means, method, technique, sequence, or procedure for construction of that item of Work.

#### 4.4 Contractor's Employees

The Contractor shall be responsible for the adequacy, efficiency, and sufficiency of its employees. Workers shall have sufficient knowledge, skill, and experience to perform properly the work assigned to them.

The Contractor shall employ only competent, skillful workers to perform the Work. If any subcontractor or person employed by the Contractor or its subcontractors, appear to the Construction Manager or District's Representative to be incompetent or act in a disorderly or improper manner, such person or subcontractor shall be discharged from the site immediately by the Contractor upon written direction of the Construction Manager or District's Representative, and such person shall not again be employed on the Project.

#### 4.5 Subcontractors

The Contractor shall give their personal attention to the fulfillment of the contract and shall keep the work under his control.

Subcontractors will not be recognized as having a direct relationship with the District. The persons engaged in the Work, including employees of subcontractors and suppliers, will be considered employees of the Contractor. The Contractor will be responsible for their work and their work shall be subject to the provisions of the Contract. The Contractor is as fully responsible to the District for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by them as the Contractor is for the acts and omissions of persons directly employed by the Contractor. Nothing contained in the Contract Documents shall create any contractual relation between any subcontractors, manufacturers, suppliers, or any party other than the Contractor, the District, the Construction Manager, or the Design Consultant shall be interpreted as requiring that the Contractor shall require such subcontractor, manufacturer, supplier, utility company, or party to perform the specified action, unless the Contract Documents specifically state that the Work is not included in the Contract.

The Contractor shall not employ any subcontractors that are not properly licensed in accordance with State law. Prior to commencement of any work by a subcontractor, the Contractor shall submit verification to the Construction Manager that the subcontractor is properly licensed for the work it will perform. Changes to subcontractors listed in the Bid in accordance with Public Contract Code 4100 et. seq., shall be made only with the approval of the District.

#### 4.6 Contractor's Equipment and Facilities

The Contractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work. Such equipment and facilities shall meet all requirements of applicable ordinances and laws.

#### 4.7 Public Safety and Convenience

The Contractor shall conduct its work so as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the Work and to insure the protection of persons and property at no extra cost to the District. The Contractor shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights of the public.

#### 4.8 District-Contractor Coordination

- 4.8.1 Service of Notice Notice, order, direction, request, or other communication given by the Construction Manager or District to the Contractor shall be deemed to be well and sufficiently given to the Contractor if delivered to the Contractor's Representative designated in Paragraph 00700-4.2, <u>Contractor's Representative</u>, to the Contractor's office designated in Paragraph 00700-4.1, <u>Office</u>, or to the Contractor's address provided in the Bid Proposal.
- 4.8.2 Suggestions to Contractor Plans or methods of work suggested by the District, the Construction Manager, or the Design Consultant to the Contractor, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The District, and Construction Manager, or the Design Consultant assume no responsibility therefore, and in no way will be held liable for any defects in the Work which may result from or be caused by use of such plan or method of work.
- 4.8.3 Cooperation The Contractor shall afford the District, the Construction Manager and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate the Work with theirs as required by the Contract Documents.

If any part of the Contractor's Work depends for proper execution or results upon the work of the District or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Construction Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the District's or separate contractor's work as fit and proper to receive the Work, except as to latent defects which subsequently become apparent in such work by others.

If requested by the Contractor, the District shall arrange meetings with other contractors performing work on behalf of the District to plan coordination of construction activities. The District shall keep the Contractor informed of the planned activities of other contractors.

Differences and conflicts arising between the Contractor and other contractors employed by the District or between the Contractor and the workers of the District with regard to their work, shall be submitted to the District for its decision in the matter. If such separate contractor sues the District on account of any delay or damage alleged to have been caused by the Contractor, the District shall notify the Contractor who shall, at the District's election, defend such proceedings at the Contractor's expense. If any judgment or award against the District arises from any such litigation whether defended by District or by Contractor, the Contractor shall pay or satisfy said judgment or award and shall reimburse the District for all attorney's fees and court costs which the District has incurred or for which it is liable.

# 4.9 Permits

Unless specifically stated to be provided by the District, Contractor shall apply for, obtain, and comply with all the terms, conditions and requirements attached to all permits, bonds and licenses required by local, state, or federal agencies to perform work, construct, erect, test and start up of any equipment or facility for this Contract. Permits shall be kept on-site. Where operating permits are required, the Contractor shall apply for and obtain such operating permits in the name of the District and provide the permit in an appropriate frame or file holder when the District accepts substantial completion of the equipment or facility. The Contractor shall give all notices necessary or incidental to the due and lawful prosecution of the work.

Any permits, bonds, licenses and fees therefore required for the performance of work under this Contract and not specifically mentioned herein as having been obtained and paid by the District shall be included in the Contractor's bid price.

The Contractor shall be responsible for satisfying all code requirements. Any code inspections will be coordinated by the Construction Manager. The Contractor shall comply with all construction conditions stipulated in the permits.

The Contractor shall apply for and obtain all safety permits for excavations, tunneling, trenches, construction (building structure, scaffolding, or false work) and demolition required by CAL/OSHA including but not limited to, the permits required by Labor Code Section 6500.

The Environmental Quality Act of 1970 (Public Resources Code, Sections 21000 to 21176 incl.) may be applicable to permits, licenses and other authorizations which the Contractor must obtain from local agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations and they shall be obtained in sufficient time to prevent delays to the work.

In the event that the District has obtained permits, licenses or other authorizations, applicable to the work, in conformance with the requirements in said Environmental Quality Act of 1970, the Contractor shall comply with the provisions of said permits, licenses and other authorizations.

### 4.10 Contractor's Responsibility for the Work and Materials

Until acceptance of the Work, the Contractor shall have the charge and care of the Work and of the materials to be used therein and shall bear the risk of injury, loss, or damage, to any part thereof (regardless of whether partial payments have been made on such damaged portions of the Work) by the action of the elements or from any other cause, whether or not arising from the non-execution of the Work. The Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work or the materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof, except for such injuries, losses, or damages as are directly and proximately caused by acts of the District.

#### 4.11 Laws to be Observed

The Contractor shall keep fully informed of all existing and future County, State, County, local, and National laws and regulations and all District ordinances and regulations of the District which in any manner affect those engaged or employed in the Work and of all such orders and decrees of bodies having any jurisdiction or authority over the same; and shall protect and indemnify the District and all of its officers, agents, and servants against any claim or liability arising from or based on the violation of any such laws, ordinances, regulations, orders, or decrees whether by the Contractor or its employees. If any discrepancy or inconsistency is discovered in the plans, drawings, specifications or Contract for the Work in relation to any such law, ordinance, regulations, order or decree, the Contractor shall immediately report the same to the Construction Manager in writing.

4.11.1 Prevailing Wage - The Contractor shall comply with Labor Code Sections 1774 and 1775. In accordance with said Section 1775, the Contractor shall forfeit, as a penalty to the District, \$25 for each calendar day or portion thereof, for each workman paid less than the prevailing rates as determined by the Director of Industrial Relations for such work or craft in which such workman is employed for any work done under the contract by him or by any subcontractor under him violation of the provisions of the Labor Code and, in particular, Labor Code Section 1770 and 1780, inclusive.

In addition to said penalty and pursuant to said Section 1775, the difference between such stipulated prevailing wage rates and the amount paid to each workman for each calendar day or

portion thereof for which each workman was paid less that the stipulated prevailing wage rate shall be paid to each workman by the Contractor.

Pursuant to provisions of Section 1773 of the Labor Code of the State of California, the District has obtained the general prevailing rate of wages (which rate includes employer payments for health and welfare, vacation, pension, travel time, and subsistence pay as provided for in Section 1773.8 of said Code, apprenticeship or other training programs authorized by Section 3093 of said code and similar purposes) applicable to the work to be done, for straight time, overtime, Saturday, Sunday and holiday work. The holiday wage rate listed shall be applicable to all holidays recognized in the collective bargaining agreement of the particular craft, classification or type of workman concerned. These wage rates are set forth in the Division of Industrial Relations publication entitled "General Prevailing Wage Rates", which is part of the Contract.

Pursuant to the provisions of Section 1773.2 of the Labor Code (as amended) the general prevailing wage rates for each craft, classification or type of workman are on file at the Salida Sanitary District. A copy of said wage rates shall be posted by the Contractor in a prominent place at the site of the work.

The District will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the prevailing wage rate set forth in the Contract. The possibility of wage increases is one of the elements to be considered by the Contractor in determining his bid, and will not under any circumstances be considered as the basis of a claim against the District on the Contract.

- 4.11.2 Travel and Subsistence Payments Attention is directed to the requirements of Section 1773.8 of the Labor Code. The Contractor shall make travel and subsistence payment to each workman, needed to execute the work, in accordance with the requirements in said Section 1773.8.
- 4.11.3 Certified Payrolls In accordance with Section 1776 of the Labor Code, each Contractor and subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the project.

The payroll records shall be certified and submitted to the District, and shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

- a. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.
- b. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of the District, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.
- c. A certified copy of all payroll records shall be made available upon request by the public in accordance with Section 1776 of the Labor Code.

The Contractor is responsible for its and its subcontractors' compliance with the provisions of Section 1776 of the Labor Code.

- 4.11.4 Overtime Requirements The Contractor shall forfeit, as a penalty to the District, the penalty as provided in the Labor Code for each worker employed in the execution of the Contract by the Contractor, or any subcontractor under the Contractor, for each day during which such worker is required or permitted to work more than eight (8) hours in any one day and forty (40) hours in any one week, in violation of the provisions of the Labor Code, and in particular, Section 1810 to Section 1815 thereof, inclusive, except that work performed by employees of Contractors in excess of eight (8) hours a day and forty (40) hours during one week, shall be permitted upon compensation for all hours worked in excess of eight (8) hours per day, at not less than one and a half (1½) times the basic rate of pay as provided for in the Labor Code.
- 4.11.5 Apprentice and Trainee Attention is directed to the provisions in Section 1777.5 of the Labor Code and in accordance with the regulations of the California Apprenticeship Council concerning the employment of apprentices by the Contractor or any subcontractor under the Contractor.

Section 1777.5 requires the Contractor or subcontractors employing tradespersons in any apprenticeable occupation to apply to the joint apprenticeship committee nearest the site of the project which administers the apprenticeship program in that trade for a certificate of approval. The Contractor and subcontractors are required to submit contract award information to the applicable joint apprenticeship committee. As provided for in Section 1777.5 of the Labor Code, the Contractor is required to make contributions to funds established for the administration of apprenticeship programs.

It shall be the responsibility of the Contractor to abide by the provisions of Section 1777.5 of the Labor Code and to require all subcontractors employed by or contracting with the Contractor to abide by said provisions. The Contractor shall furnish the District any and all evidence of compliance with this code section when requested by the District.

It is District policy to encourage the employment and training of apprentices on public works contracts as may be permitted under local apprenticeship standards.

For failure to comply with Section 1777.5 of the Labor Code, the Contractor shall be subject to the penalties in Section 1777.7 of the Labor Code.

- 4.11.6 Workers' Compensation Insurance The Contractor is required to secure the payment of compensation to its employees in accordance with the provisions of Sections 1860 and 3700 of the Labor Code and Paragraph 00820-2.4, <u>Workers' Compensation Insurance</u>.
- 4.11.7 Labor Discrimination Attention is directed to Section 1735 of the Labor Code, which reads as follows:

No discrimination shall be made in the employment of persons upon public works because of race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons, except as provided in Section 12940 of the Government Code, and every Contractor for public works violating this section is subject to all the penalties imposed for a violation of this chapter.

Attention is also directed to the requirement in Section 1431 of the Labor Code and Sections 300 and 317 through 323 of Title 8 of the California Administrative Code that the Contractor shall submit his Equal Employment Opportunity Program and certification fee to the Fair Employment Practice Commission, in the event that the bid price for the contract exceeds \$200,000.

4.11.8 Vehicle Code - Pursuant to the authority contained in Vehicle Code Section 591, the District has determined that within such areas as are within the limits of the project and are open to public traffic, the following requirements of the Vehicle Code will apply: The lighting requirements in Section 25803; the brake requirements in Division 12, Chapter 3; the splash apron requirements in Section 27600; and, when operated on completed or existing treated base, surfacing, pavement or structures, except as otherwise provided in Section 7-1.02, "Weight Limitations," the weight limitation requirements contained in Division 15.

Attention is directed to the statement in said Section 591 that this section shall not relieve him or any person from duty of exercising due care. The Contractor shall take all necessary precautions for safe operations of his equipment and the protection of the public from injury and damage from such equipment.

Any other requirements set forth in Division 11, 12, 13, 14 and 15 of the Vehicle Code which the Department, pursuant to the authority contained in Vehicle Code Section 591, will require compliance with, will be set forth in the special provisions.

#### 4.11.9 Not Applicable

### 4.12 Safety

4.12.1 Contractor's Safety Responsibility - The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act, and all other applicable Federal, State, County, and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Contract Documents. Where any of these are in conflict, the more stringent requirement shall be followed.

No provision of the Contract Documents shall act to make the District, the Construction Manager or any other party than the Contractor responsible for safety. The Construction Manager shall not have authority for safety on the project. The Contractor shall indemnify, defend and hold harmless the District, Construction Manager, or other authorized representatives of the District, from and against any and all actions, damages, fines, suits, and losses arising from the Contractor's failure to meet all safety requirements and/or provide a safe work site.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Construction Manager and the District. In addition, the Contractor must promptly report in writing to the Construction Manager all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the Site, giving full details and statements of witnesses. The Contractor shall make all reports as are, or may be, required by any authority having jurisdiction, and permit all safety inspections of the work being performed under this Contract.

If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Construction Manager, giving full details of the claim.

4.12.2 Safety Program - The Contractor shall establish, implement, and maintain a written injury prevention program as required by Labor Code Section 6401.7. Before beginning the Work the Contractor shall prepare and submit to the Construction Manager a Contractor Safety Program that

provides for the implementation of all of the Contractor's safety responsibilities in connection with the Work at the site and the coordination of that program and its associated procedures and precautions with safety programs, precautions and procedures of each of its subcontractors and other prime Contractors performing work at the site. The Contractor shall be solely responsible for initiating, maintaining, monitoring, coordinating, and supervising all safety program, precautions, and procedures of the other prime contractors and subcontractors performing the Work at the site. The Safety Program should contain all the necessary elements for the Contractor to administer its program on site. At a minimum, this written Safety Program shall address the elements required by Labor Code Section 6401.7. The Contractor shall obtain a copy of the District's Injury and Illness Prevention Program and the Safety Manual and incorporate appropriate safety procedures into their Safety Program. The Contractor shall also comply with the "Contractor's Safety Rules" found in Section 01500-10.

The program shall also address the following:

- a. Compliance with Laws, Rules, and Regulations
- b. Infractions of Safety Rules
  - 1. Reported to Contractor's designated Safety Supervisor
  - 2. Time correction
  - 3. Contractor to enforce safety requirements on its subcontractors
  - 4. Non-complying employees to be removed from the Project
- c. Housekeeping
  - 1. Continuous cleaning required
  - 2. Final clean up required
- d. Means of Implementing the Program
  - 1. All new employees to receive training on the Contractor's Safety Program prior to starting work.
  - 2. Periodic tool box meetings with agenda recorded.
  - 3. Documented safety inspections by Safety Supervisor.
  - 4. Establish emergency procedures and telephone numbers including the procedure for the immediate removal to a hospital or a doctor's care of persons who may be injured on the jobsite. The Contractor shall maintain at its office or other well-known place at the Site safety equipment applicable to the Work as prescribed by the aforementioned authorities, and all items necessary for giving first aid to the injured.
  - 5. Project bulletin board with required policies.
  - 6. At least two employees on each shift should have First Aid training and maintain a current First Aid card issued by an agency such as the American Red Cross.
  - 7. Completion of a job hazard analysis for specific construction activities.

- 8. Establish a hazard communication program for informing the Contractor's and subcontractor's personnel, Construction Manager, District, and other affected parties of specific hazards on the project.
- 9. Establish a confined space entry program in accordance with Cal OSHA requirements.
- e. Define the duties and responsibilities of Contractor management personnel for safety.
  - 1. Project Manager
  - 2. General Superintendent
  - 3. Foreman
  - 4. Safety Supervisor
- f. Accident Investigation
  - 1. Investigate all accidents and near misses.
  - 2. Develop steps to prevent a reoccurrence.
  - 3. Completion of all reporting paperwork.

The Contractor's compliance with requirements for safety and/or the Construction Manager's review of the Contractor's Safety Program shall not relieve or decrease the liability of the Contractor for safety. The Construction Manager's review of the Contractor's Safety Program is only to determine if the above listed elements are included in the program.

4.12.3 Safety Supervisor - The Contractor shall appoint an employee as safety supervisor who is qualified and authorized to supervise and enforce compliance with the Safety Program. The Contractor shall notify the Construction Manager in writing prior to the commencement of work of the name of the person who will act as the Contractor's safety supervisor and furnish the safety supervisor's resume to the Construction Manager.

The Contractor will, through and with his Safety Supervisor, ensure that all of its employees and its subcontractors of any tier, fully comply with the Project Safety Policies. The Safety Supervisor shall be a full-time employee of the Contractor whose responsibility shall include supervising compliance with applicable safety requirements on the work site and for developing and implementing safety training classes for all job personnel. The District shall have the authority to require removal of the Contractor's Safety Supervisor if the representative is judged to be improperly or inadequately performing the duties; however, this authority shall not in any way affect the Contractor's sole responsibility for performing this work safely, nor shall it impose any obligation upon the District to ensure the Contractor perform its work safely.

The Safety Supervisor shall attend the Pre-Construction Meeting and ensure all safety provisions are in-place on the Contractor's first day of work.

4.12.4 Safety Coordination Meetings - The Contractor and its affected subcontractors shall attend safety coordination meetings with the Construction Manager and any other affected parties. The meeting shall be held at least monthly and prior to the start of new construction activities.

Construction activities will be reviewed prior to the start of work in the various areas to determine potential hazards. The Contractor will be responsible for preparing job hazard analyses to breakdown the activities to be performed in a step-by-step procedure and provide safety guidelines for each step and any special equipment necessary to protect workers. The Contractor will act as facilitator for the meeting. The Construction Manager will participate in the safety coordination meetings but will not direct the Contractor on how to perform its safety operations.

- 4.12.5 Safety and Protection The Contractor shall take all necessary protection to prevent damage, injury, and loss to:
  - a. All employees on the Project, employees of all subcontractors, and other persons and organizations who may be affected thereby;
  - b. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
  - c. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.

The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground facilities and utility owners when prosecution of the Work may affect them and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

4.12.6 Excavation Safety - In accordance with the provisions of Section 6705 of the Labor Code, the Contractor shall submit, in advance of excavation five feet or more in depth, detailed plans showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during such excavation. If such plans vary from the shoring system standards set forth in the Construction Safety Orders in Title 8, California Code of Regulations, the plans shall be prepared and signed by a registered civil or structural engineer. Shoring, bracing, sloping, or other protective system shall not be less effective than required by the California Construction Safety Orders. The District's review of the Contractor's excavation plan is only for general conformance to the California Construction Safety Orders.

Prior to commencing any excavation, the Contractor shall designate in writing to the Construction Manager the "competent person(s)" with the authority and responsibilities designated in the Construction Safety Orders.

4.12.7 Safety Emergencies - In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Construction Manager, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Construction Manager prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby.

4.12.8 Safety Violations - Should the Contractor fail to correct an unsafe condition, the Construction Manager shall immediately notify the District of the Contractor's failure to correct the unsafe condition. The District shall then notify the Contractor through the Construction Manager that the unsafe condition must be corrected or the work in question will be stopped in accordance with Paragraph 00700-6.6, <u>Temporary Suspension of Work</u> until the condition is corrected to the satisfaction of the District. No extension of time or additional compensation will be granted as a result of any stop order so issued. The notification and suspension of such work or the failure to provide such notification and suspension by the Construction Manager and District shall not relieve the Contractor of its sole responsibility and liability for safety.

The District shall have the authority to require the removal from the project of the foreman and/or superintendent in responsible charge of the work where safety violations occur.

- 4.12.9 Equipment Safety Provisions The completed Work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items, required by the State and Federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the Work, including District-selected equipment, subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. All equipment furnished shall be grounded and provided guards and protection as required by safety codes. Where vapor-tight or explosion-proof electrical installation is required by safety codes, this shall be provided. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. The Contractor shall notify all equipment suppliers and subcontractors of the provisions of this paragraph.
- 4.12.10 Hazard Communication Programs- Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- 4.13 Review of Contract Documents and Field Conditions by Contractor; Single Point Responsibility of Contractor In addition to the examination and reviews performed, and obligations assumed, incidental to making the representations set forth in the Contract, Contractor shall carefully study and compare each of the Contract Documents with the others and with information furnished by District, and shall promptly report in writing to District's Representative any errors, inconsistencies, or omissions in the Contract Documents or inconsistencies with applicable code requirements observed by Contractor. Contractor shall determine the most desirable method of achieving District's requirements in terms of cost, technology, quality and speed of delivery.

Contractor is responsible for the construction of the Project and shall provide all services pursuant to this Contract in a manner consistent with the standard of care under California law applicable to those who specialize in providing such services for projects of the type, scope, and complexity of the Project (including its contracting mode). Contractor shall perform its construction services in accordance with the best practices applicable to Contractor's field ordinarily used by member of construction industry in the location where the services are to be performed. Contractor shall take field measurements, verify field conditions, and carefully compare with the Contract Documents such field measurements, conditions, and other information known to Contractor before commencing the Work. Errors, inconsistencies, or omissions discovered at any time shall be promptly reported in writing to District's Representative.

If Contractor performs any construction activity which it knows, or should know, involves an error, inconsistency, or omission in relation to the Contract Documents, without notifying and obtaining the written consent of District, Contractor shall be responsible for the resultant losses, including, without limitation, the costs of correcting Defective Work.

Contractor agrees that it has single point responsibility for the construction of this Project.

4.14 Supervision and Construction Procedures - Contractor shall supervise, coordinate, and direct the Work using Contractor's best skill and attention. Contractor shall be solely responsible for, and have control over construction means, methods, techniques, sequences, procedures, and the coordination of all portions of the Work, including, but without limitation, landscape and site work, utilities, and building systems.

Contractor shall be responsible to District for acts and omissions of Contractor's agents, employees, and subcontractors, of all tiers, and their respective agents and employees.

Contractor shall not be relieved of its obligation to perform the Work in accordance with the Contract Documents either by acts or omissions of District or District's Representative in the administration of the Contract, or by tests, inspections, or approvals required, or performed, by persons or firms other than Contractor.

Contractor shall be responsible for inspection of all portions of the Work, including those portions already performed under this Contract, to determine that such portions conform to the requirements of the Contract Documents and are ready to receive subsequent Work.

Contractor shall at all times participate in, and implement, the CEQA and NEPA mitigation processes and ensure performance as required in the Contract Documents.

Contractor shall at all times maintain good discipline and order among its employees and subcontractors. Contractor shall provide competent, fully qualified personnel to perform the Work.

4.15 Labor And Materials - Unless otherwise provided in the Contract Documents, Contractor shall provide and pay for all services, other services, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other things necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

# 5.0 CONTROL OF WORK AND MATERIALS

#### 5.1 Means and Methods

It is expressly stipulated that the drawings, specifications and other Contract Documents set forth the requirements as to the nature of the completed Work and do not purport to control the method of performing work except in those instances where the nature of the completed Work is dependent on the method of performance.

Except as provided elsewhere in the Contract Documents, neither the District, Design Consultant nor the Construction Manager will be responsible for or have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work. Except as provided elsewhere in the Contract Documents, neither the District, Design Consultant nor the Construction Manager will be responsible for or have control or charge over the acts or omissions of the Contractor, or any of their subcontractors, agents or employees, or any other persons performing any of the Work. Any general control of the Work exercised by the District or its authorized representatives shall not make the Contractor an agent of the District, and the liability of the Contractor for all damages to persons and/or to public or private property arising from the Contractor's execution of the Work shall not be lessened because of such general control.

Neither the inspection by the District, Design Consultant, or Construction Manager, nor any order, measurement, approved modification, or payment of monies, nor acceptance of any part or whole

of the Work by the District, Design Consultants, Construction Manager, or their agents shall operate as a waiver of any provision of the Contract.

Acceptance by the Construction Manager, District and/or Design Consultant of any drawings, or any information regarding materials and equipment the Contractor proposes to furnish or method of work shall not be regarded as an assumption of risks or liability by the Construction Manager, Design Consultant, or the District, or any officer or employee thereof, and the Contractor shall have no claim under the Contract on account of the failure or partial failure or inefficiency or insufficiency of any plan or method of work or material and equipment so accepted. Such acceptance shall be considered to mean merely that the Construction Manager, District, and/or Design Consultant has no objection to the Contractor using, upon its own full responsibility, the plan or method of work proposed, or furnishing the materials and equipment proposed.

#### 5.2 District-Furnished Materials

Materials, if furnished by the District, will be made available as designated in the General Requirements. The cost of loading, unloading, hauling and handling, and placing District-furnished materials shall be considered as included in the price bid for the Contract item involving such District-furnished material.

Contractor shall inspect and assure itself of the amount and soundness of such materials.

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

#### 5.3 Defective and Unauthorized Work

Materials and workmanship not conforming to the requirements of the Contract Documents shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the Site by the Contractor, at its expense, when so directed by the Construction Manager.

Any work done beyond the limits of work, lines, and grades shown on any approved plans or established by the Construction Manager, or any extra work done without written authority, will be considered as unauthorized and will not be paid for.

Upon failure on the part of the Contractor to comply with any order of the Construction Manager made under the provisions of this paragraph, the Construction Manager shall have authority to require special inspection and testing to verify if work is defective. Confirmed defective work shall be remedied, or removed and replaced, and unauthorized work be removed. The costs thereof will be deducted from any monies due or to become due the Contractor. The time, cost and compliance requirements stipulated in Paragraph 00700-3.4, <u>District's Right to Carry Out the Work</u>, shall apply for this paragraph also.

#### 5.4 Unnoticed Defects

Any defective work or material that may be discovered by the District, Construction Manager, or Design Consultant before the final acceptance of the Work, or before final payment has been made, or during the warranty period, shall be removed and replaced by work and materials which shall conform to the provisions of the Contract Documents. Failure on the part of the District,

Construction Manager, or Design Consultant to condemn or reject bad or inferior work or materials shall not be construed to imply acceptance of such work or materials.

#### 5.5 Right to Retain Imperfect Work

If any part or portion of the work performed or material furnished under this Contract shall prove defective and not in accordance with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, the District shall have the right and authority to retain such work but shall make such deductions in the final payment therefore as may be just and reasonable.

### 6.0 PROGRESS OF THE WORK

#### 6.1 Beginning of Work

The Contractor shall begin work within ten (10) days of the effective date of the Notice to Proceed and shall diligently prosecute the same to completion within the time limit.

Should the Contractor begin work in advance of receiving Notice to Proceed, any work performed in advance of the said date of approval shall be considered as having been done by the Contractor at its own risk and as a volunteer.

#### 6.2 Time of Completion

Time shall be of the essence of the Contract. The Contractor shall prosecute the work so that the various portions of the project shall be complete and ready for use within the time specified in Paragraph 01010-3.0, <u>TIME ALLOWED FOR COMPLETION</u>. It is expressly understood and agreed by and between the Contractor and the District that the Contract time for completion of the work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the locality and the nature of the work.

#### 6.3 Delays

- 6.3.1 Notice of Delays When the Contractor foresees a delay in the prosecution of the Work and, in any event, immediately upon the occurrence of a delay, the Contractor shall notify the Construction Manager in writing of the probability of the occurrence and the estimated extent of the delay, and its cause. The Contractor shall take immediate steps to prevent, if possible the occurrence or continuance of the delay. The Contractor agrees that no claim shall be made for delays which are not called to the attention of the Construction Manager at the time of their occurrence.
- 6.3.2 Non-excusable Delays Non-excusable delays in the prosecution of the Work shall include delays which could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.
- 6.3.3 Excusable Delays Excusable delays in the prosecution or completion of the Work shall include delays which result from causes beyond the control of the Contractor and District and which could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.
- 6.3.3.1 Abnormal Delays Delays caused by acts of god, fire, unusual storms, floods, tidal waves, earthquakes, strikes, labor disputes, and freight embargoes, shall be considered as excusable delays insofar as they prevent the Contractor from proceeding with at least seventy-five (75)

percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule.

- 6.3.3.2 Weather Delays Should inclement weather conditions or the conditions resulting from weather prevent the Contractor from proceeding with seventy-five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day. The Contractor may be granted a time extension pursuant to Paragraph 00700-6.4.2.c, Weather Delays.
- 6.3.3.3 Material Shortages Upon the submission of satisfactory proof to the Construction Manager by the Contractor, shortages of material may be acceptable as grounds for granting a time extension. In order that such proof may be satisfactory and acceptable to the Construction Manager, it must be demonstrated by the Contractor that the Contractor has made every effort to obtain such materials, or obtain acceptable substitute materials, from all known sources within reasonable reach of the proposed Work. Only the physical shortage of material, caused by unusual circumstances, will be considered under these provisions as a cause for extension of time, and no consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Construction Manager that such material could have been obtained only at exorbitant prices entirely out of line with current rates, taking into account the quantities involved and usual practices in obtaining such quantities. A time extension for shortage of material will not be considered for material ordered or delivered late or whose availability is affected by virtue of the mishandling of procurement. The above provisions apply equally to equipment to be installed in the work.
- 6.3.4 Compensable Delays Compensable delays in the prosecution or completion of the Work shall include delays that occur through no fault of the Contractor and prevent the Contractor from proceeding with at least seventy-five (75) percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule due to the following cause(s):
  - a. Delays due solely to the actions and/or inactions of the District.
  - b. Delays due to differing site conditions as defined in Paragraph 00700-7.3, <u>Differing Site</u> <u>Conditions</u>.
  - c. Delays due to other Contractors employed by the District who interfere with the Contractor's prosecution of the Work as defined above.

No delay shall be compensable unless the claimed event or occurrence delays completion of the work beyond the contractual completion date or the completion date shown in the accepted initial or updated schedules, and the delay affects a critical activity while such activity is on the critical path.

6.3.5 Concurrent Delays - Concurrent delays are those delay periods when the prosecution of the Work is delayed during the same period of time due to causes from a combination of the delays defined in Paragraphs 00700-6.3.2, Non-Excusable Delays, 00700-6.3.3, Excusable Delays, or 00700-6.3.4, Compensable Delays. During such concurrent delay periods, time extensions will be granted in accordance with Paragraph 00700-6.4, <u>Time Extensions</u>; however, the Contractor shall not be compensated for its delay damages as defined in Paragraph 00700-6.4.3, or for any other damages, and the District shall not assess its actual costs as defined in Paragraph 00700-6.4.1, Non-excusable Delays.

### 6.4 Time Extensions

- 6.4.1 Non-excusable Delays The District may grant an extension of time for non-excusable delays if the District deems it is in its best interest. If the District grants an extension of time for non-excusable delays, the Contractor agrees to pay the District's actual costs, including charges for engineering, inspection and administration incurred during the extension.
- 6.4.2 Excusable or Compensable Delays If the Contractor is delayed in the performance of its work as defined in Paragraphs 00700-6.3.3, Excusable Delays, or 00700-6.3.4, Compensable Delays, then the Contract completion date may be extended by the District for such time that, in the District's and Construction Manager's determination, the Contractor's completion date will be delayed, provided that the Contractor strictly fulfills the following:
  - a. The Contractor shall provide notification, in accordance with Paragraph 00700-6.3.1, Notice of Delays, and submit in writing a request for an extension of time to the Construction Manager stating at a minimum the probable cause of the delay and the number of days being requested. The time extension request shall be submitted in accordance with the requirements of Paragraph 01310-4.0, <u>TIME IMPACT ANALYSES</u>.
  - b. If requested by the Construction Manager, the Contractor shall promptly provide sufficient information to the Construction Manager to assess the cause or effect of the alleged delay, or to determine if other concurrent delays affected the work.
  - c. Weather Delays. The Contractor will be granted a non-compensable time extension for weather caused delays, pursuant to Paragraph 00700-6.3.3.2, Weather Delays, over and above an allowance as provided for in Paragraph 01010-5.0, <u>WEATHER DAYS</u>. No time extensions for weather delays will be granted until the total number of weather days exceeds this allowance.

Should the Contractor fail to fulfill any of the foregoing, which are conditions precedent to the right to receive a time extension, the Contractor waives the right to receive a time extension.

During such extension of time, neither extra compensation for engineering, inspection and administration nor damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and District that time extensions due to excusable or compensable delays will be granted only if such delays involve controlling operations which would prevent completion of the whole Work within the specified Contract time.

Should the Contractor fail to complete the work within the time specified in the contract, as extended in accordance with this clause if appropriate, the Contractor shall pay to the District liquidated damages in accordance with Paragraph 00700-6.5, <u>Liquidated Damages</u>.

#### 6.4.3 Delay Damages

6.4.3.1 Indirect Overhead - The Contractor shall be reimbursed for indirect overhead expenses for periods of time when the Work is delayed as defined in Paragraph 00700-6.3.4, Compensable Delays. However, no reimbursement for indirect overhead or any other costs or damages shall be made for compensable delays which occur during a concurrent delay as defined in Paragraph 00700-6.3.5, Concurrent Delays. No reimbursement for indirect overhead as covered in this section shall be made for any time extensions granted for Contract change orders as provided in Section 01035, <u>MODIFICATION PROCEDURES</u>. As a condition precedent to any reimbursement, the Contractor must fulfill all conditions as provided in Paragraph 00700-6.4.2, Excusable or Compensable Delays. No additional markup for overhead or profit shall be provided for such indirect overhead expenses.

Payment to the Contractor for indirect overhead expenses will be made only if the extended Contract period granted for the compensable delay(s) is required to complete the work following the depletion of the original contract period and any time extensions granted other than compensable time extensions. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay including not limited to extended field costs, extended home office overhead costs, impact, inefficiency, unabsorbed home office overhead, underabsorbed home office overhead, hindrance, disruption, or any other damage arising from delay, no matter how characterized, including delay claims of its subcontractors/suppliers of every tier.

- 6.4.3.1.1 Indirect Field Overhead For those allowable delay periods as defined in Paragraph 00700-6.4.3, Indirect Overhead, the Contractor shall be reimbursed for its indirect field overhead based on:
  - a. Invoices for all field office equipment.
  - b. Actual salary for field office staff.
  - c. Fair rental values acceptable to the Construction Manager as described in Paragraph 01035-3.0, <u>FORCE ACCOUNT PAYMENT</u> for construction equipment idled due to the delay.
- 6.4.3.1.2 Indirect Home Office Overhead For those allowable delay periods as defined in Paragraph 00700 6.4.3, Indirect Overhead, the Contractor shall be reimbursed for its daily home office overhead based on the following formula:

<u>Contract Bid Price (\$)</u> X (0.04) = Daily Home Office Overhead (\$/Day) Contract Period (Days)

As it is impractical to determine the actual home office overhead, such reimbursement shall be mutually agreed between the District and Contractor to encompass full payment for any home office overhead expenses for such periods of time for the Contractor and all subcontractors. The Contractor agrees to indemnify, defend and hold the District harmless for any indirect overhead claims from its subcontractors.

#### 6.5 Liquidated Damages

It is agreed by the parties to the Contract that time is of the essence in the completion of this Work, and that in case all the Work called for under the Contract is not completed before or upon the expiration of the time limit as set forth in these Contract Documents, as modified by extensions of time granted by the District, damage will be sustained by the District. As it is impracticable to determine the actual delay damage; it is, therefore, agreed that the Contractor shall pay liquidated damages to the District in the amount set forth in Paragraph 01010-4.0, <u>DAMAGES FOR DELAYS</u>, per day for each and every day's delay beyond the time prescribed to complete the Work. The Contractor agrees to pay such liquidated damages and in case the same are not paid, agrees that the District may deduct the amount thereof from any monies due or that may become due the Contractor under the Contract.

#### 6.6 Termination By District For Cause

Subject to prior notice from District and Contractor's cure rights set forth in this Section, District will have the right to terminate the Contract for cause after the occurrence of any of the following events:

a. Contractor becomes insolvent or files for relief under the bankruptcy laws of the United States.

- b. Contractor makes a general assignment for the benefit of its creditors or fails to pay its debts as the same become due.
- c. A receiver is appointed to take charge of Contractor's property.
- d. The Work is not completed with the applicable Contract Time, as such Contract Time may be adjusted in accordance with this Contract, and Contractor is not diligently prosecuting the completion or correction of the Work.
- e. Contractor persistently or repeatedly refuses or fails to supply skilled supervisory personnel, an adequate number of properly skilled workers, proper materials, or necessary equipment to prosecute the Work in accordance with the Contract Documents.
- f. Contractor fails to make prompt payment of amounts properly due subcontractors after receiving payment from District.
- g. Contractor disregards Applicable Code Requirements.
- h. Contractor persistently or materially fails to execute the Work in accordance with the Contract Documents.
- i. Contractor persistently or materially fails to comply with applicable safety requirements.
- j. Contractor abandons the Work.
- k. Contractor is in default of any other material obligation under the Contract Documents.

Upon the occurrence of any of the preceding events, District will have the right to terminate the Contract for cause if Contractor fails to promptly commence to cure such default and diligently prosecute such cure within 5 days after notice from District, or within such longer period of time as is reasonably necessary to complete such cure.

Upon any of the occurrences referred to above, District may, at its election and by notice to Contractor, terminate the Contract and take possession of the Project site and all materials, supplies, equipment, tools, and construction equipment and machinery thereon owned by Contractor; accept the assignment of any or all of the subcontracts; and then complete the Work by any method District may deem expedient. If requested by District, Contractor shall remove any part or all of Contractor's materials, supplies, equipment, tools, and construction equipment and machinery from the Project site within 7 days of such request; and if Contractor fails to do so, District may remove or store, and after 90 days sell, any of the same at Contractor's expense.

If the Contract is terminated by District as provided in this Section, Contractor shall not be entitled to receive any further payment until the expiration of 35 days after Final Completion and acceptance of all Work by District.

If the unpaid balance of the Contract Sum exceeds the cost of completing the Work, including all additional costs and expenses made necessary thereby, including costs for District staff time, plus all losses sustained, including any liquidated damages provided under the Contract Documents and subject to provisions of this Contract that survive termination, such excess shall be paid to Contractor. If such costs, expenses, losses, and liquidated damages exceed the unpaid balance of the Contract Sum, Contractor shall pay such excess to District.

No termination or action taken by District after termination shall prejudice any other rights or remedies of District provided by law or by the Contract Documents upon such termination; and District may proceed against Contractor to recover all losses suffered by District.

# 6.7 Suspension By District For Convenience

District may, at any time and from time to time, without cause, order Contractor, in writing, to suspend, delay, or interrupt the Work in whole or in part for such period of time, up to 90 days, as District may determine, with such period of suspension to be computed from the date of delivery of the written order. Such order shall be specifically identified as a "Suspension Order" under this Section. The Work may be stopped for such further period as the parties may agree. Upon receipt of a Suspension Order, Contractor shall, at District's expense, comply with its terms and take all reasonable steps to minimize costs allocable to the Work covered by the Suspension Order, or such extension to that period as is agreed upon by Contractor and District, District shall either cancel the Suspension Order or delete the Work covered by such Suspension Order by issuing a Change Order.

If a Suspension Order is canceled or expires, Contractor shall continue with the Work. A Change Order will be issued to cover any adjustments of the Contract Sum or the Contract Time necessarily caused by such suspension. Any Claim by Contractor for an adjustment of the Contract Sum or the Contract Time shall be made within 21 days after the end of the Work suspension. Contractor agrees that submission of its claim within said 21 days is an express condition precedent to its right to recover on such a claim.

The provisions of this Section shall not apply if a Suspension Order is not issued by District. A Suspension Order shall not be required to stop the Work as permitted or required under any other provision of the Contract Documents.

# 6.8 Termination By District For Convenience

District may, at its option, terminate this Contract, in whole or from time to time in part, at any time by giving notice to Contractor. Upon such termination, Contractor agrees to waive any claims for damages, including loss of anticipated profits, on account thereof; and, as the sole right and remedy of Contractor, District shall pay Contractor in accordance with this Section.

Upon receipt of notice of termination under this Section, Contractor shall, unless the notice directs otherwise, do the following:

- a. Immediately discontinue the Work to the extent specified in the notice.
- b. Place no further orders or subcontracts for materials, equipment, services, or facilities, except as may be necessary for completion of such portion of the Work as is not discontinued.
- c. Promptly cancel, on the most favorable terms reasonably possible, all orders and subcontracts to the extent they relate to the performance of the discontinued portion of the Work.
- d. Thereafter do only such Work as may be necessary to preserve and protect Work already in progress and to protect materials, plants, and equipment on the Project site or in transit thereto.

Upon such termination, the obligations of the Contract shall continue as to portions of the Work already performed and, subject to Contractor's obligations under this Section above, as to bona fide obligations assumed by Contractor prior to the date of termination.

Upon such termination, District shall pay to Contractor the sum of the following:

- a. The amount of the Contract Sum allocable to the portion of the Work properly performed by Contractor as of the date of termination, less sums previously paid to Contractor.
- b. Plus previously unpaid costs of any items delivered to the Project site which were fabricated for subsequent incorporation in the Work.
- c. Plus any proven losses with respect to materials and equipment directly resulting from such termination.
- d. Plus reasonable demobilization costs.
- e. Plus reasonable costs of preparing a statement of the aforesaid costs, expenses, and losses in connection with such termination. The above payment shall be the sole and exclusive remedy to which Contractor is entitled in the event of termination of the Contract by District pursuant to this Section; and Contractor will be entitled to no other compensation or damages and expressly waives same.

### 6.9 Temporary Suspension of Work

- 6.9.1 If the Contractor fails to correct defective work as required by Paragraph 00700-5.3, <u>Defective and</u> <u>Unauthorized Work</u>, or fails to carry out the Work in accordance with the Contract Documents or any other applicable rules and regulations, the District, by a written order of the District's representative or signed personally by an agent specifically so empowered by the District, in writing, may order the Contractor to stop the work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the District to stop the Work shall not give rise to any duty on the part of the District to exercise this right for the benefit of the Contractor or any other person or entity. All delays in the Work or serve to extend the time for its completion. Any and all necessary corrective work done in order to comply with the Contract Documents shall be performed at no cost to the District.
- 6.9.2 In the event that a suspension of Work is ordered, as provided in this paragraph, the Contractor, at its expense, shall perform all work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public, pedestrian, and vehicular traffic, during the period of such use by suspension. Should the Contractor fail to perform the Work as specified, the District may perform such work and the cost thereof may be deducted from monies due the Contractor under the Contract.
- 6.9.3 The District shall also have authority to suspend the Work wholly or in part, for such period as the District may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the Work. Such temporary suspension of the Work will be considered justification for time extensions to the Contract in an amount equal to the period of such suspension if such suspended work includes the current critical activity on the latest favorably reviewed progress schedule. The Contractor as directed by the District shall provide the provisions as stipulated in Paragraph 00700-6.6.2 above. Such additional work shall be compensated as provided for in Paragraph 00700-7.0, <u>CHANGES IN THE WORK</u>.

# 7.0 SCOPE OF WORK - CHANGES IN THE WORK

7.1 Changes

The District reserves the right to make such alterations, deviations, additions to, deletions or omissions from the plans and specifications, including the right to increase or decrease the quantity of any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated. Such changes, no matter how many, shall be within the contemplation of this Contract and shall not be the basis for a compensable delay or a claim for lost profits.

Any such changes will be set forth in a contract change order which will specify, in addition to the work to be done in connection with the change made, adjustment of contract time, if any, and the basis of compensation for such work. A contract change order will not become effective until approved by the District Manager-Engineer and/or the Salida Sanitary District Board of Directors.

In emergency situations, the District Manager-Engineer may issue a change order beyond the authority limits described above in order to:

- a. Prevent interruption of the work which would result in a substantial increase in the costs to, or liability of, District; or
- b. Protect the work, equipment, materials to be used in the work, human safety, or the environment at or near the work from substantial and immediate danger or injury; or
- c. Protect, where damage or injury has occurred, the work, equipment or materials to be used in the work, human safety, or the environment at or near the site of the work from further or additional damage or injury or deterioration.

The District Manager-Engineer shall have the authority to issue change orders in such sums as is reasonably necessary for such emergency purposes. After issuing a change order in an emergency situation described above, the District Manager-Engineer shall report such action and the reasons therefore to the Salida Sanitary District Board of Directors, no later than its next regularly scheduled meeting or as soon thereafter as is practicable.

Upon receipt of an approved contract change order, the Contractor shall proceed with the ordered work. If ordered in writing by the Engineer, the Contractor shall proceed with the work so ordered prior to actual receipt of an approved contract change order therefore. In such cases, the Engineer will, as soon as practicable, issue an approved contract change order for such work and the provisions in Paragraph 7.1.1, Procedure and Protest, shall be fully applicable to such subsequently issued contract change order.

When the compensation for an item of work is subject to adjustment under the provisions of Paragraph 00700-7.1, Changes, the Contractor shall, upon request, promptly furnish the Engineer with adequate detailed cost data for such item of work.

7.1.1 Procedure and Protest - A contract change order approved by the Engineer may be issued to the Contractor at any time. Should the Contractor disagree with any terms or conditions set forth in an approved contract change order which he has not executed, he shall submit a written protest to the Engineer within 15 days after the receipt of such approved contract change order. The protest shall state the points of disagreement, and if possible, the contract specification references, quantities, and costs involved. If a written protest is not submitted, payment will be made as set forth in the approved contract change order and such payment shall constitute full compensation for all work included therein or required thereby. Such unprotested approved contract change orders will be considered as executed contract change orders as that term is used in Paragraphs 00700-7.1.2 to 7.1.4, inclusive.

Where the protest concerning an approved contract change order relates to compensation, the compensation payable for all work specified or required by said contract change order to which such protest relates will be determined as provided in Paragraphs 00700-7.1.2 to 7.1.4, inclusive. The Contractor shall keep full and complete records of the cost of such work and shall permit the Engineer to have such access thereto as may be necessary to assist in the determination of the compensation payable for such work.

Where the protest concerning an approved contract change order relates, to the adjustment of contract time for the completion of the work, the time to be allowed therefore will be determined as provided in Paragraph 00700-6.5, <u>Liquidated Damages</u>.

Proposed contract change orders may be presented to the Contractor for his consideration prior to approval by the Engineer. If the Contractor signifies his acceptance of the terms and conditions of such proposed contract change order by executing such documents and if such change order is approved by the District Manager-Engineer and/or District Board of Directors and issued to the Contractor, payment in accordance with the provisions as to compensation therein set forth shall constitute full compensation for all work included therein or required thereby. A contract change order executed by the District Manager-Engineer and/or District Board of Directors is an executed contract change order as that term is used in Paragraph 00700-7.1.2 to 7.1.4, inclusive. An approved contract change order shall supersede a proposed, but unapproved, contract change order covering the same work.

7.1.2 Eliminated Items - The District reserves the right to eliminate any contract item of work prior to the award of the contract without incurring any obligation to pay therefore. Should any contract item of the work be eliminated in its entirety following the award of the contract and in the absence of an executed contract change order covering such elimination, payment will be made to the Contractor for actual costs incurred in connection with such eliminated contract item if incurred prior to the date of notification in writing by the Engineer of such elimination.

If acceptable material is ordered by the Contractor for the eliminated item prior to the date of notification of such elimination by the Engineer, and if orders for such material cannot be canceled, it will be paid for at the actual cost to the Contractor. In such case, the material paid for shall become the property of the District and the actual cost of any further handling will be paid for by the District. If the material is returnable to the vendor and if the Engineer so directs, the material shall be returned and the Contractor will be paid for the actual cost of charges made by the vendor for returning the material. The actual cost of handling returned material will be paid for.

The actual costs or charges to be paid by the District to the Contractor as provided in this Paragraph 00700-7.1.2 will be computed in the same manner as if the work were to be paid for on a force account basis as provided in Paragraph 01035-3.0.

7.1.3 Changes in Character of Work - If an ordered change in the plans or specification materially changes the character of the work of a contract item from that on which the Contractor based his bid price, and if the change increases or decrease the actual unit cost of such changed item as compared to the actual or estimated actual cost of performing the work of said item in accordance with the plans and specification originally applicable thereto, an adjustment in compensation therefore will be made by executed contract change order specifying the compensation payable, in accordance with the following:

The basis of such adjustment in compensation will be the difference between the actual unit cost to perform the work of said item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of said item or portion thereof involved in the change,
as changed. Actual unit costs will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in Paragraph 01035-3.0; or such adjustment will be as agreed to by the Contractor and the Engineer. Any such adjustment will apply only to the portion of the work of said item actually changed in character. At the option of the Engineer, the work of said item or portion of item which is changed in character will be paid for by force account as provided in Paragraph 01035-3.0.

Failure of the Engineer to recognize a change in character of the work shall not be construed as relieving the Contractor of his duty and responsibility of filing a written notice in accordance with Paragraph 00700-7.5.2.1, Notice.

7.1.4 Extra Work - New, unforeseen work will be classed as extra work when determined by the Engineer that such work is not covered by any of the various items for which there is a bid price or by combinations of such items. In the event portions of such work are determined by the Engineer to be covered by some of the various items for which there is a bid price or combinations of such items, the remaining portion of such work will be classed as extra work. Extra work also includes work specifically designated as extra work in the plans and specifications.

The Contractor shall do such extra work and furnish labor, material, and equipment therefore upon receipt of an approved contract change order or written emergency order of the Engineer, and in the absence of such approved contract change order or written emergency order of the Engineer he shall not be entitled to payment of such extra work.

## 7.2 Change Orders

- Without invalidating the Contract and without notice to sureties or insurers, the District through the 7.2.1 Construction Manager, may at any time or from time to time, order additions, deletions, or revisions in the Work; these will be authorized by Field Directive, Field Order, or Change Order. A Change Order will not be issued for a Field Directive unless the Construction Manager concurs with an appeal by the Contractor that such Field Directive is a change in the scope of the Contract. The Contractor shall comply promptly with the requirements for all Change Orders, Field Orders, or Field Directives. The work involved in Change Orders shall be executed under the applicable conditions and requirements of the Contract Documents. If any Field Order causes an increase or decrease in the Contract Amount or an extension or shortening of the Contract Time, an equitable adjustment will be made by issuing a Change Order. If the Contractor accepts a Change Order that does not include a time extension, the Contractor waives any claim for additional time for the work covered by that Change Order. Additional or extra work performed by the Contractor without written authorization of a Field Order or Change Order will not entitle the Contractor to an increase in the Contract Amount or an extension of the Contract Time. A reservation of rights, non-waiver of claims, or similar exceptions or reservations by the Contractor on a Change Order for additional time, money, or anything else shall not be permitted and are of no force or effect. It is the intent of the District to have all Change Orders issued comprehensively to address all issues known and unknown relating to time and/or costs.
- 7.2.2 Extra work shall be that work not shown or detailed on the Contract Drawings and not specified. Such work shall be governed by all applicable provisions of the Contract Documents. In giving instructions, the Construction Manager shall have authority to make minor changes in the work, not involving extra cost, and not inconsistent with the purposes of the work; but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the District through the Construction Manager, and no claim for an addition to the total amount of the Contract shall be valid unless so ordered.

- 7.2.3 In case any change increases or decreases the work shown, the Contractor shall be paid for the work actually done at a mutually agreed upon adjustment to the Contract price, based upon the provisions of Section 01035 <u>MODIFICATION PROCEDURES</u>
- 7.2.4 If the Contractor refuses to accept a Change Order, the District may issue it unilaterally. The Contractor shall comply with the requirements of the Change Order. The District shall provide for an equitable adjustment to the Contract, and compensate the Contractor accordingly. If the Contractor does not agree that the adjustment is equitable, it may submit a claim in accordance with Paragraph 00700-7.5.2, Potential Claims/Change Orders.
- 7.2.5 Elimination Of Work In accordance with section 7.1.2 above, the District shall be allowed and authorized to eliminate portions of work from the Contract Work at its discretion, and in the best interests of the public, during the course of action of the Project, and not only prior to award of contract. Said elimination of work shall not be determined to be a Termination for Convenience even if said elimination brings the Contract Work to a close. Upon elimination of work under this provision, the payment provisions of 7.1.2 shall apply.

#### 7.3 Differing Site Conditions

Pursuant to Public Contract Code Section 7104, the Contractor shall promptly, and before such conditions are disturbed, notify the Construction Manager 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, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The District shall promptly, investigate the conditions, and if it finds that the conditions do materially 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 the District shall cause to be issued a change order under the procedures provided in Paragraph 00700-7.2, <u>Change Orders</u>.

In the event that a dispute arises between the District 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, 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 contracting parties, Paragraph 00700-7.5, <u>Resolution of Disputes</u>.

No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required.

## 7.4 Value Engineering Change Proposals (VECP)

REMOVED.

## 7.5 Contract Interpretation

7.5.1 Contract Interpretation by the Construction Manager - Questions regarding the meaning and intent of the Contract Documents shall be referred in writing by the Contractor to the Construction Manager. Where practical, the Construction Manager shall respond to the Contractor in writing with a decision within ten (10) days of receipt of the request.

At the District's discretion, the District may deduct from monies due the Contractor, time and expense costs incurred by the District, Construction Manager, and Design Consultant for reviewing and responding to unnecessary RFIs. This may include RFIs submitted to inquire about means, methods, or potential modifications for the Contractor's convenience.

- 7.5.2 Potential Claims/Change Orders
- 7.5.2.1 Notice Inclusive of the provisions in paragraph 00700-7.7, Dispute Resolution, if the Contractor disagrees with the Construction Manager's decision in Paragraph 00700-7.5.1, Contract Interpretation by the Construction Manager, or in any case where the Contractor deems additional compensation or a time extension to the Contract period is due the Contractor for work or materials not covered in the Contract or which the Construction Manager has not recognized as extra work, the Contractor shall notify the Construction Manager, in writing, of its intention to make a claim or request a change order. Potential claims or change orders pertaining to decisions provided in Paragraph 00700-7.5.1 or such other determinations by the Construction Manager shall be filed in writing to the Construction Manager prior to Contractor performing the work giving rise to the potential claim or change order, if based on an act or failure to act by the District, or in all other cases, within five (5) days after the event or occurrence giving rise to the potential claim or change order shall use the words "Notice of Potential Claim/Change Order." Such Notice of Potential Claim/Change Order shall state the circumstances and the reasons for the claim, but need not state the amount.

Additionally, no claim for additional compensation or extension of time for a delay will be considered unless the provisions of Paragraphs 00700-6.3, <u>Delays</u>, 6.4, <u>Time Extensions</u>, 7.7, <u>Dispute</u> <u>Resolution</u>, are complied with. No claim filed after the date of final payment will be considered.

It is agreed that unless notice as required by the Contract Documents is properly given, the Contractor shall have waived all rights to recover, and shall not recover, costs incurred by it as a result of the alleged extra work, changed work or other situation which had proper notice been given would have given rise to a right for additional compensation. The Contractor should understand that timely notice of potential claims and change orders is of great importance to the Construction Manager and District, and is not merely a formality. Such notice allows the District to consider preventative action, to monitor the Contractor's increased costs resulting from the situation, to marshall facts, and to plan its affairs. Such notice by the Contractor, and the fact that the Construction Manager has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim.

7.5.2.2 Records of Disputed Work - In proceeding with a disputed portion of the Work, the Contractor shall keep accurate records of its costs and shall make available each day, to the Construction Manager or his designated representative, a daily summary of the hours and classification of equipment and labor utilized on the disputed work, as well as a summary of any materials or any specialized services used. Such information shall be submitted to the Construction Manager on a weekly basis, receipt of which shall not be construed as an authorization for or acceptance of the disputed work.

It is the intent of this section that these records be provided such that the Construction Manager and Contractor can determine and agree upon the Contractor's daily effort expended on the disputed work and determine accurate costs for the disputed work. Such determination shall not be construed as authorization for or acceptance of the disputed work.

- 7.5.2.3 Meetings From time to time the Construction Manager may call a special meeting to discuss outstanding claims and potential change orders should it deem this of possible help. The Contractor shall cooperate and attend prepared to discuss its claims, making available the personnel necessary for resolution, and all documents which may reasonably be requested by the Construction Manager.
- 7.5.3 Claims The term "Claim" means a written demand or assertion by Contractor seeking an adjustment or interpretation of the terms of the Contract Documents, payment of money, extension of time, or other relief with respect to the Contract Documents, including a determination of disputes or matters in question between District and Contractor arising out of or related to the Contract Documents or the performance of the Work. The term "Claim" shall not include, and the Claims procedures provided under this Section, including but not limited to arbitration, shall not apply to the following:
  - a. Claims respecting penalties for forfeitures prescribed by statute or regulation that a government agency is specifically authorized to administer, settle, or determine.
  - b. Claims respecting personal injury, death, reimbursement, or other compensation arising out of or resulting from liability for personal injury or death.
  - c. Claims respecting stop notices.

Inclusive of the provisions in paragraph 00700-7.7, Claim must include the following:

- a. A statement that it is a Claim and a request for a decision.
- b. A detailed factual narrative of events fully describing the nature and circumstances giving rise to the Claim, including but not limited to, necessary dates, locations, and items of work affected.
- c. A certification, executed by Contractor, that the claim is filed in good faith. The certification language is identified below. The language of the Claim Certification form may not be modified.
- d. A certification, executed by each subcontractor claiming not less than 5% of the total monetary amount sought by the claim, that the subcontractor's portion of the claim is filed in good faith. The certification language is identified below. The language of the Claim Certification form may not be modified.
- e. A statement demonstrating that a Change Order Request was timely submitted as required by Section 7 of the General Conditions and Section 01035.
- f. If a Cost Proposal or declaration was required by Section 7 of the General Conditions and Section 01035, a statement demonstrating that the Cost Proposal or the declaration was timely submitted as required by Section 7 of the General Conditions.
- g. A detailed justification for any remedy or relief sought by the Claim, including to the extent applicable, the following:

If the Claim involves Extra Work, a detailed cost breakdown of the amounts claimed, including the items specified in Section 7 of the General Conditions and Section 01035. The cost breakdown must be provided even if the costs claimed have not been incurred when the Claim is submitted. To the extent costs have been incurred when the Claim is submitted, the Claim must include actual cost records (including without limitation, payroll records, material and rental invoices and the like)

demonstrating that costs claimed have actually been incurred. To the extent costs have not yet been incurred at the time the Claim is submitted, actual cost records must be submitted on a current basis not less than once a week during any periods costs are incurred. A cost record will be considered current if submitted within 7 days of the date the cost reflected in the record is incurred. At the request of the Construction Manager or District's Representative, claimed extra costs may be subject to further verification procedures (such as having an inspector verify the performance of alleged Extra Work on a daily basis). The cost breakdown must include an itemization of costs for i) labor including names, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information; ii) materials stored or incorporated in the work including invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information; and iii) itemization of machinery and equipment including make, model, serial number, hours of use, dates of use and equipment rental rates of any rented equipment.

If the Claim involves an extension of the Contract Time, written documentation demonstrating the Contractor's entitlement to a time extension under Section 6 of the General Conditions and Section 01310, including the specific dates for which a time extension is sought and the specific reasons for entitlement of a time extension. The Contract Schedule must demonstrate Contractor's entitlement to an adjustment of Contract Time under Section 6 of the General Conditions and Section 01310.

If the Claim involves an adjustment of the Contract Sum for delay, written documentation demonstrating the Contractor's entitlement to such an adjustment under Section 6 of the General Conditions and Section 01310, including but not limited to, a detailed time impact analysis of the Contract Schedule. The Contract Schedule must demonstrate Contractor's entitlement to such an adjustment under Section 6 of the General Conditions and Section 01310.

For each claim submitted or filed by Contractor, including, but not limited to, any claim on behalf of Contractor and/or any claim by or on behalf of any subcontractor or supplier, of any tier, Contractor shall include the following certification, signed in the same manner as the Contract was signed:

I, being the (must be an officer) of (general contractor or subcontractor), declare under penalty of perjury under the laws of the State of California, and do personally certify and attest that: I have thoroughly reviewed the attached claim for additional compensation and/or extension of time, and know its contents and said claim is made in good faith; the supporting data is truthful and accurate; that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the District is liable; and, further, that I am familiar with California Penal Code Section 72 and California Government Code Section 12650, et. seq., pertaining to false claims, and further know and understand that submission or certification of a false claims many lead to fines, imprisonment and/or severe legal consequences."

#### 7.6. Assertion of Claims

Claims by Contractor shall be first submitted to the Construction Manager for decision.

Notwithstanding the making of any Claim or the existence of any dispute regarding any Claim, unless otherwise directed by Construction Manager, Contractor shall not cause any delay, cessation, or termination in or of Contractor's performance of the Work, but shall diligently proceed with performance of the Work in accordance with the Contract Documents.

Contractor shall submit a Claim in writing, together with all supporting data specified in Section 7.5 above, to Construction Manager as soon as possible but not later than 30 days after the date the Claim arises under Sections 6 and 7 of the General and Supplemental Conditions.

# 7.7 Dispute Resolution

All claims by Contractor for a time extension, payment of money or damages arising from work done by, or on behalf of, Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or as to the amount of payment which is disputed by the District of Three Hundred Seventy-Five Thousand Dollars (\$375,000) or less shall be subject to the provisions set forth in Public Contract Code Section 20104, et. seq. Those sections require that the claim be in writing, include the documents necessary to substantiate the claim, and be filed on or before the final date of payment, subject to all time limits and notice requirements for filing claims under the Contract.

## Arbitration

## Claims Subject to Public Contract Code Section 9204; Procedure

<u>Application</u>. This Section applies solely to the handling and resolution of a claim(s) sent to the District by registered mail or certified mail with return receipt requested in accordance with Public Contract Code section 9204(c)(1). With respect to such claim(s), the provisions of Public Contract Code section 9204 shall apply, and are hereby incorporated by reference into these documents and set forth in full at the end of this Section.

<u>Mediation Procedures</u>. Mediation conducted pursuant to Public Contract Code Section 9204 shall be in accordance with the following procedures:

- <u>Request for Mediation</u>: A request for mediation must be in writing and set forth a brief statement that identifies the claim(s), the asserted damages, the names, addresses, and contact information of the parties, and identify their authorized representative, if any, that will participate in the mediation. Contractor hereby expressly waives all claims not timely submitted to mediation in accordance with this Section.
- <u>Selection of Mediator</u>: The parties agree that any neutral selected or appointed to preside over the mediation shall be an attorney admitted to practice law in the State of California or a retired judge, and he or she shall possess at least 10 years' experience practicing law in the substantive areas of public contracting, public construction contracts and construction litigation.
- <u>Time and Place of Mediation</u>: The mediator, using advice and input from the parties, shall set the time of each mediation session, as well as the mediation protocol (*i.e.*, submission of briefs, statement of damages, etc.). The mediation will be held at any convenient location agreeable to the mediator and the parties, as the mediator determines. All reasonable efforts will be made by the parties and the mediator to schedule the first session within thirty (30) calendar days after selection of the mediator.
- The mediation may be terminated: (a) by the execution of a settlement agreement by the parties; (b) by a written declaration of the mediator to the effect that further efforts at mediation are no longer worthwhile; or (c) by a writing on behalf of a party or parties to the effect that the mediation proceedings are terminated.
- All meetings, communications and correspondence relative to the mediation procedures set forth in this Section shall be subject to any applicable mediation or settlement-related privilege afforded under California law, including, without limitation, California Evidence Code §§1115, *et seq.* and 1152.

- If, at the termination of the mediation proceedings pursuant to this Section, the claim(s), or any portion thereof, remain(s) in dispute, and as a condition precedent to the commencement by Contractor of any litigation or arbitration, the provisions of California law applicable to the presentation of claims and prosecution of disputes by the Contractor shall apply to claims asserted by the Contractor, including, without limitation, Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. Contractor shall be responsible to fully satisfy and comply with all such requirements as may be applicable to any claim(s) presented by Contractor, and nothing in this Section is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government code. Contractor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government Code. Contractor expressly waives the removal provisions of California Code of Civil Procedure Section 394.
- In the event of any dispute between the District and Contractor, or during the pendency of any claim(s) or associated proceedings under this Section, Contractor shall not stop, or delay performance of, the Work, but shall prosecute the Work diligently to completion in the manner directed by the Engineer.

<u>Other Claims.</u> The procedures and remedies provided herein do not apply to: (1) any claim(s) made by or on behalf of the District, unless the District consents to the application of these procedures and remedies; (2) any claim or dispute relating to stop payment notices; (3) any claim related to the approval, refusal to approve, or substitution of subcontractors, regardless of tier, and suppliers.

# Public Contract Code - §9204 - Legislative findings and declarations regarding timely and complete payment of contractors for public works projects; claims process:

- (a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.
- (b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.
- (c) For purposes of this section:
- (1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:
- (A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.
- (B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.
- (C) Payment of an amount that is disputed by the public entity.
- (2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

- (3)(A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.
- (B) "Public entity" shall not include the following:
- (i) The Department of Water Resources as to any project under the jurisdiction of that department.
- (ii) The Department of Transportation as to any project under the jurisdiction of that department.
- (iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.
- (iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.
- (v) The Military Department as to any project under the jurisdiction of that department.
- (vi) The Department of General Services as to all other projects.
- (vii) The High-Speed Rail Authority.
- (4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.
- (5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.
- (d)(1)(A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.
- (B) The claimant shall furnish reasonable documentation to support the claim.
- (C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.
- (D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.
- (2)(A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of

a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

- (B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.
- (C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.
- (D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.
- (E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.
- (3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.
- (4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.
- (5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.
- (e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

- (f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.
- (g) This section applies to contracts entered into on or after January 1, 2017.
- (h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.
- (i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

#### 8.0 PAYMENT

#### 8.1 Scope of Payment

- 8.1.1 General The Contractor shall accept the compensation, as herein provided, as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary for completing the Work according to the Contract Documents, and no additional compensation will be allowed therefore. Neither the payment of any partial payment estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.
- 8.1.2 Payment for Patents and Patent Infringement All fees or claims for any patented invention, article, or arrangement that may be used upon, or in any manner connected with, the performance of the work or any part thereof shall be included in the price bid for doing the work, and the Contractor and its sureties shall defend, protect, and hold the District, the Construction Manager, and Design Consultants, together with all their officers, agents, and employees harmless against liability of any nature or kind for any and all costs, legal expenses, and damages made for such fees or claims and against any and all suits and claims brought or made by the holder of any invention or patent, or on account of any patented or unpatented invention, process, article, or appliance manufactured for or used in the performance of the Contract, including its use by the District, unless otherwise specifically stipulated in the Contract. Before final payment is made on the Contract, the Contractor shall furnish an affidavit to the District regarding patent rights for the project. The affidavit shall state that all fees and payments due as a result of the work incorporated into the project or methods utilized during construction have been paid in full. The Contractor shall certify in the affidavit that no other fees or claims exist for work in this project.
- 8.1.3 Payment of Taxes The Contractor shall pay and shall assume exclusive liability for all taxes levied or assessed on or in connection with the Contractor's performance of this Contract, including, but not limited to, State and local sales and use taxes, Federal and State payroll taxes or assessments, and excise taxes, and no separate allowance will be made therefore, and all costs in connection therewith shall be included in the total amount of the Contract price.
- 8.1.4 Payment for Labor and Materials The Contractor shall pay and require its subcontractors to pay any and all accounts for labor including worker's compensation premiums, state unemployment and federal social security payments and other wage and salary deductions required by law. The Contractor also shall pay and cause its subcontractors to pay any and all accounts for services, equipment, and materials used by the Contractor and its subcontractors during the performance of work under this Contract. Such accounts shall be paid as they become due and payable. If requested by the District, the Contractor shall furnish proof of payment of such accounts to the District.

#### 8.2 Partial Payments

In consideration of the faithful performance of the work prosecuted in accordance with the provisions of these Specifications and the Contract, the District will pay the Contractor for all such work installed on the basis of percentage completion. Amounts earned will be based on accepted Cost Breakdown (Section 01025, MEASUREMENT AND PAYMENT).

Payments will be made by the District to the Contractor on estimates duly certified and approved by the Construction Manager, based on the value of equipment installed and tested, labor and materials incorporated into said permanent work by the Contractor during the preceding month, and acceptable materials and equipment on hand (materials and equipment furnished and delivered to the site by the Contractor and not yet incorporated into the work accompanied by an approved invoice). Payments will not be made for temporary construction or material submittals unless specifically provided for in the Contract Documents.

Partial payments will be made monthly based on work accomplished as of a day mutually agreed between the District and the Contractor. Prior to submitting its payment estimate, the Contractor shall meet with the Construction Manager to reach agreement on the percent completion and materials on hand for that payment period.

The Contractor shall submit its estimate of the work completed during the prior month and the work completed to date in a format acceptable to the Construction Manager and corresponding to the accepted cost breakdown. Additionally, the Contractor shall submit a detailed statement of the Contractor's request for payment of acceptable materials and equipment on hand in compliance with Paragraph 00700-8.3, <u>Partial Payments - Inclusion of Materials on Hand</u>. Upon receipt of Contractor's requests for payment, the District shall act in accordance with the following:

- a. The Construction Manager shall review the submitted estimates, as soon as practical after receipt, for the purpose of determining that the estimates are a proper request for payment, and shall prepare a certified estimate of the total amount of work done and acceptable materials and equipment on hand.
- Any request for payment 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 (7) days after receipt. A request for payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the request for payment is not proper.
- c. The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds the seven (7) day return requirement set forth in subdivision (b) above.

Payment will be made by the District to the Contractor in accordance with District's normal accounts payable procedures; the District shall retain amounts in accordance with Paragraph 00700-8.4, <u>Right to Withhold Amounts</u>.

No such estimate or payment shall be required to be made, when in the judgment of the Construction Manager, the Work is not proceeding in accordance with the provisions of the Contract, or when in the Construction Manager's judgment the total value of the Work done since the last estimate amounts to less than One Thousand Dollars (\$1,000.00). Additionally, no payments shall be made until the Construction Manager has received an acceptable monthly schedule update covering the latest required period, certified payrolls and other required pay records, and a conditional waiver and release upon progress payment for Contractor for the current pay period and an unconditional waiver and release upon progress payment for the prior

progress payment period. The District reserves the right to require, as a condition precedent to payment, that Contractor provide conditional and unconditional waivers and releases from Contractor's subcontractors and suppliers.

Subject to the provisions of this section, the District shall pay the Contractor within thirty (30) days after receipt of undisputed and properly submitted requests for payment from the Contractor. In accordance with Public Contract Code, if the District fails to pay an undisputed request for payment within the allotted thirty (30) days, the District shall pay interest to the Contractor equivalent to the legal rate set forth in the Code of Civil Procedure.

#### 8.3 Partial Payments - Inclusion of Materials on Hand

Materials, as used herein, shall be considered to be those items which are fabricated and manufactured goods and equipment. Only those materials for which the Contractor can transfer clear title to the District will be qualified for partial payment. The Contractor may request payment of seventy-five (75) percent of the actual net cost of these materials.

To receive partial payment for materials and equipment delivered to the Site, but not incorporated in the Work, it shall be necessary for the Contractor to submit to the Construction Manager a list of such materials, at least seven (7) days prior to submitting the monthly estimate of amount earned for work completed. At the Construction Manager's sole discretion, the Construction Manager will approve items for which partial payment is to be made subject to the following:

- a. Only equipment or materials which have received favorable review of shop drawings will qualify.
- b. Eligible equipment or materials must be delivered and properly stored, protected, and maintained in a manner favorably reviewed by the Construction Manager, at the job site or at a bonded warehouse.
- c. The Contractor's actual net cost for the materials must be supported by paid invoices of suppliers, or other documentation requested by the Construction Manager.
- d. Materials or equipment delivered to the Site less than thirty (30) days prior to their scheduled incorporation in the Work shall not qualify.
- e. Final payment shall be made only for materials actually incorporated in the Work. Upon acceptance of the Work, all materials remaining for which advance payments had been made shall revert to the Contractor, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the Work.
- f. Partial payments for materials and equipment on hand shall not be deemed to be final payment for the material nor relieve the Contractor of its obligations under the Contract.
- g. Partial payments for materials and equipment on hand shall be subject to retention in accordance with Paragraph 00700-8.4., <u>Right to Withhold Amounts</u>.

#### 8.4 Right to Withhold Amounts

8.4.1 Retention - The District will deduct from each partial payment and retain as part security, five (5) percent of the amount earned until the final payment.

Pursuant to Public Contract Code, for monies earned by the Contractor and withheld by the District to ensure the performance of the Contract, the Contractor, may, at his or her option, choose to substitute securities meeting the requirements of said Code. In the event the Contractor wishes to choose this option, the Contractor shall enter into an escrow agreement with the District, and the escrow agent, a qualified bank to be chosen by District, in the form of the agreement included in the project specifications. The costs of such escrow shall be paid by the Contractor. The securities to be deposited in said escrow account shall be equivalent, in fair market value, to the amount to be withheld as performance retention. The securities shall be held in accordance with the provisions of the Public Contract Code, and the implementing agreement.

Contractor shall have the obligation of ensuring that such securities deposited are sufficient so as to maintain, in total fair market value, an amount equal to the cash amount of the sums to be withheld under the Contract. If, upon written notice from the District, or from the appropriate escrow agent, indicating that the fair market value of the securities has dropped below the dollar amount of monies to be withheld by the District to ensure performance, Contractor shall, within five days of the date of such notice, post additional securities as necessary to ensure that the total fair market value of all such securities held by the District, or in escrow, is equivalent to the amount of money to be withheld by the District under the Contract.

Any Contractor wishing to exercise this option shall give notice in writing to District, and shall thereafter execute an escrow agreement in the following form:

## ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between;

whose address is
hereinafter called "District", and
whose address is
hereinafter called "Contractor", and
whose address is
hereinafter called "Escrow Agent."

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

- 1. Pursuant to the Public Contract Code of the State of California, Contractor has the option to deposit securities which meet the requirements set forth in said Code, with Escrow Agent, as a substitute for retention earnings required to be withheld by District pursuant to the Construction Contract entered into between District and Contractor for \_\_\_\_\_\_\_ in the amount of dated \_\_\_\_\_\_\_ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the District shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the District within 10 days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the District and Contractor. Securities shall be held in the name of District, and shall designate the Contractor as the beneficial owner.
- 2. District shall make progress payments to Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.
- 3. When the District makes payment of retention earned directly to the Escrow Agent the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this Contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the District pays the Escrow Agent directly.
- 4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of the District. These expenses and payment terms shall be determined by the District, Contractor, and Escrow Agent.
- 5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the District.
  - 6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from District to the

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

- 7. The District shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days' written notice to the Escrow Agent from the District of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the District.
- 8. Upon receipt of written notification from the District certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.
- Escrow Agent shall rely on the written notifications from the District and the Contractor pursuant to Sections (4) to (6), inclusive, of this Agreement, and District and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.
- 10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the District and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On Behalf of District:	On Behalf of Contractor:
Title	Title
Name	Name
Signature	Signature
Address	Address

On Behalf of Escrow Agent:

Title

Name

Signature

Address

At the time the Escrow Account is opened, District and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

DISTRICT:

CONTRACTOR:

Title

Title

Name

Name

Signature

Signature

- 8.4.2 Other Withholds In addition to the amount which the District may otherwise retain under the Contract, the District may withhold a sufficient amount or amounts of any payment or payments otherwise due the Contractor, as in its judgment may be necessary to cover:
  - a. Payments which may be past due and payable for just claims against the Contractor or any subcontractor for labor or materials furnished for the performance of this Contract.
  - b. Defective work not remedied.
  - c. Failure of the Contractor to make proper payments to its subcontractors or suppliers.
  - d. A reasonable doubt that the Contract can be completed for the balance then unpaid.
  - e. Damage to another Contractor or third party, or to property.
  - f. Failure of the Contractor to keep its work progressing in accordance with its progress schedule or maintaining current "As-Built" record drawings.
  - g. The District's costs for the Contractor's failure to complete within the allowed time.
  - h. Cost of insurance arranged by the District due to cancellation or reduction of the Contractor's insurance.
  - i. Failure of the Contractor to make proper submissions, as herein specified.
  - j. Failure to submit, revise, resubmit, or otherwise conform to the requirements herein for preparing and maintaining a construction schedule.
  - k. Payments due the District from the Contractor.
  - I. Reduction of Contract Amount because of modifications.
  - m. The Contractor's neglect or unsatisfactory prosecution of the work including failure to clean up.
  - n. Provisions of law that enable or require the District to withhold such payments in whole or in part.

When the above reasons for withhold amounts are removed, payment may be made to the Contractor for amounts withheld.

The District in its discretion may apply any withheld amount or amounts to the payment of valid claims. In so doing, the District shall be deemed the agent of the Contractor, and any payment so made by the District shall be considered as a payment made under the Contract by the District to the Contractor, and the District shall not be liable to the Contractor for such payment made in good faith. Such payments may be made without prior judicial determination of the claim or claims. The District will render to the Contractor a proper accounting of such funds disbursed in behalf of the Contractor.

## 8.5 Substantial Completion

When the Contractor considers that the Work is substantially complete, the Contractor shall notify the Construction Manager in writing. Upon receipt of the notification, the Construction Manager, the District and/or their authorized representatives will make inspection, to determine if the Work is sufficiently complete in accordance with the Contract Documents so the District can occupy or utilize the Work for its intended use. If items are found which prevent such use or occupancy, the Construction Manager shall notify the Contractor in writing of such items.

Upon the completion of such corrective work, the Contractor shall so notify the Construction Manager in writing. The Construction Manager shall inspect the Work to determine its acceptability for Substantial Completion and for determination of other items which do not meet the terms of the Contract. Upon verification that the project is substantially complete the Construction Manager shall prepare a Certificate of Substantial Completion. The Certificate shall establish the date of Substantial Completion and the responsibilities of the District and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, commencement of warranties required by the Contract Documents, and shall fix the time, not to exceed 60 days, within which the Contractor shall finish all items on the punch list accompanying the Certificate. When the preceding provisions have been approved by both the District and the Contractor, they shall sign the Certificate. By such acknowledgement, the Contractor agrees to pay the District's actual costs including, but not limited to, charges for engineering, inspection and administration incurred due to the failure to complete the punch list within the time period provided in the Certificate of Substantial Completion.

District shall have the right to exclude Contractor from the Site after the date of Substantial Completion, but District will allow Contractor reasonable access to complete the Work or correct items on any deficiency list or punch lists at times and in areas designated by the District in its sole discretion and without additional compensation to Contractor.

#### 8.6 Final Inspection and Payment

Upon completion of the Work, and upon completion of final cleaning, the Contractor shall so notify the Construction Manager in writing. Upon receipt of the notification, the Construction Manager, the District and/or their authorized representatives will make the final inspection, to determine the actual status of the Work in accordance with the terms of the Contract. If materials, equipment, or workmanship are found which do not meet the terms of the Contractor. Following completion of the corrective work by the Contractor, the Construction Manager shall notify the District that the Work, has been completed in accordance with the Contract. Final determination of the acceptability of the Work shall be made by the District. After completion of the work, but prior to its acceptance by the District, the last partial payment will be made to the Contractor in accordance with Paragraph 00700-8.2, Partial Payments.

After receipt of the last partial payment, but prior to acceptance of the Work by the District, the Contractor shall send a letter to the Construction Manager. The letter shall state that acceptance of the final payment described below shall operate as and shall be, a release to the District, the Construction Manager, the Design Consultant, and their duly authorized agents, from all claims of and/or liability to the Contract arising by virtue of the Contract related to those amounts. Disputed Contract claims in stated amounts previously filed, as provided in Paragraph 00700-7.5, may be specifically excluded by the Contractor from the operation of the release.

Neither final payment nor any retention shall become due until Contractor submits the following items to Construction Manager:

a. The final Application For Payment and all submittals required in accordance with the General Conditions.

b. All guarantees and warranties procured by Contractor from subcontractors, all operation and maintenance manuals for equipment installed in the Project, as-built documents, and all other submittals required by the Contract Documents.

c. Unconditional waivers and releases upon final payment from all subcontractors and suppliers and a conditional waiver and release upon final payment from Contractor.

d. Certified payroll records and all other pay records as determined by the District.

Following receipt of all required submittals and the Construction Manager's written statement that construction is complete and recommendation that the District accept the project, the District will take formal action on acceptance.

Within ten (10) days of the acceptance by the District of the completed work embraced in the Contract, the District will cause to be recorded in the office of the County Recorder a Notice of Completion.

Thirty-five (35) days after recording the Notice of Completion of the work involved in the Contract, the District will pay the Contractor in lawful money such sums of money as may be due the Contractor including all sums retained but excluding such sums as have previously been paid the Contractor. This payment will constitute the final payment to the Contractor under this Contract.

#### 8.7 Warranty of Title

No material, supplies, or equipment for the work under this Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants good title to all material, supplies, and equipment installed or incorporated in the work and agrees upon completion of all work to deliver the premises, together with all improvements and appurtenances constructed or placed thereon by the Contractor, to the District free from any claim, liens, security interest, or charges, and further agrees that neither the Contractor nor any person, firm, or corporation furnishing any materials or labor for any work covered by this Contract shall have any right to a lien upon the premises or any improvement or appurtenances thereon.

#### 9.0 EXISTING UTILITIES

#### 9.1 General

Pursuant to Government Code Section 4216, <u>et. seq.</u>, the Contractor shall notify the appropriate notification center, U.S.A., 1-800-642-2444.

## 9.2 Notification and Location

At least three (3) working days before performing any excavation work, the Contractor shall request the utility owners to mark or otherwise indicate the location of their service.

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

#### 9.3 Damage and Protection

The Contractor shall immediately notify the Construction Manager and utility owner of any damage to a utility.

For work within a public right of way or utility easement, the party responsible for the cost of repairing and/or relocating damaged utilities shall be as follows:

Description		Responsible Party
a.	Utility mains delineated incorrectly on District's plans	District/Utility Company
b.	Utility mains delineated correctly on District's plans but information provided incorrectly by utility company	Utility Company
C.	Utility mains not shown on District's plan	Utility Company
d.	Utility mains incorrectly marked in the field by utility company	Utility Company
e.	Utility mains incorrectly marked and/or delineated on District's plans	Contractor
f.	Utility service laterals whether indicated or not indicated on plans and whether correctly or incorrectly shown on District's plans	Contractor

#### 9.4 Utility Relocation and Rearrangement

The right is reserved to the District and the owners of utilities or their authorized agents to enter upon the Work area for the purpose of making such changes as are necessary for the rearrangement of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with forces engaged in such work and shall conduct its operations in such a manner as to avoid any unnecessary delay or hindrance to the work being performed by such forces and shall allow the respective utilities time to relocate their facility.

The Contractor assumes responsibility for the removal, relocation, or protection of existing facilities wherein said facilities are identified by the Plans, field located by a utility company, or as provided for in the General Requirements. The Contractor shall coordinate with the owner of utility facilities for the rearrangement of said facilities.

In the event that underground utilities are found that are not shown in the Contract Documents or are found to exist in a different location than shown in the Contract Documents, the Contractor shall: (1) notify the Construction Manager of the existence of said facilities immediately; and (2) take steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities.

Requests for extensions of time arising out of utility rearrangement delays shall be determined by Construction Manager. In accordance with Government Code Section 4215 the Contractor shall not be assessed liquidated damages for delay in completion of the project, when such delay is caused by the failure of the District or utility company to provide for the removal or relocation of facilities for which they are the responsible party as defined in Paragraph 00700-9.3, <u>Damage and Protection</u>.

Where it is determined by the Construction Manager that the rearrangement of an underground main, the existence of which is not shown on the Plans, Specifications, or in the General Requirements, is essential in order to accommodate the contemplated improvement, the Construction Manager will provide for the rearrangement of such facility by other forces or by the Contractor in accordance with the provisions of Paragraph 00700-7.2, Change Orders.

When the General Requirements, Specifications, or Plans indicate that a utility is to be relocated, altered or constructed by others, the District will conduct all negotiations with the utility company and the work will be done at no cost to the Contractor.

Temporary or permanent relocation or alteration of utilities desired by the Contractor for its own convenience shall be the Contractor's responsibility and it shall make arrangements and bear all costs.

## 10.0 APPLICABLE LAW/CODE REQUIREMENTS

Contractor shall perform the Work in accordance with the following Applicable Law/Code Requirements and all code requirements listed in the Scope of Work:

- a. All laws, statutes, the most recent building codes, ordinances, rules, regulations, and lawful orders of all public authorities having jurisdiction over District, Contractor, any subcontractor, the Project, the Project site, the Work, or the prosecution of the Work, including, but not limited to:
  - (1) any federal, state or local law, code, regulation or consent order or agreement having the force of law;
  - (2) any formally adopted and generally applicable rule, requirement, determination, standard, policy, implementation schedule or order of any governmental or regulatory agency having appropriate jurisdiction;
  - (3) any established interpretation of law or regulation utilized by an appropriate governmental or regulatory agency if such interpretation is documented by such governmental or regulatory agency and generally applicable; and,
  - (4) any governmental or regulatory agency approval, in each case applicable from time to time to the siting, permitting, design, acquisition, construction, equipping, financing, ownership, possession, start-up, testing, operation, maintenance, repair, replacement or management of the Facilities
- b. Applicable sections in the State of California Labor Code.

c. All Applicable Code Requirements relating to nondiscrimination, payment of prevailing wages, payroll records, apprentices, and work day.

Contractor shall comply with and give notices required by all Applicable Code Requirements, including all environmental laws and all notice requirements under the State of California Safe Drinking Water and Enforcement Act of 1986 (State of California Health and Safety Code Section 25249.5, and applicable sections that follow). Contractor shall promptly notify District's Representative in writing if Contractor becomes aware during the performance of the Work that the Contract Documents are at variance with Applicable Code Requirements.

If Contractor performs Work which it knows or should know is contrary to Applicable Code Requirements, without prior notice to District and District's Representative, Contractor shall be responsible for such Work and any resulting damages including, without limitation, the costs of correcting Defective Work.

The Applicable Code Requirements under this section shall be those in existence at the time the Contract is approved by the District. Any significant change in the Applicable Code Requirements that occurs after approval of the Contract by the District, and that significantly changes the scope or cost of work in the respective stages, shall be addressed through the change order and modifications procedures established in the Contract Documents.

#### 11.0 USE OF SITE AND CLEAN UP

Contractor shall confine operations at the Project site to areas permitted by law, ordinances, permits, and the Contract Documents. Contractor shall not unreasonably encumber the Project site with materials or equipment.

Contractor shall, during performance of the Work, keep the Project site and surrounding area free from the accumulation of excess dirt, waste materials, and rubbish caused by Contractor. Contractor shall remove all excess dirt, waste material, and rubbish caused by the Contractor; tools; equipment; machinery; and surplus materials from the Project site and surrounding area at the completion of the Work.

Personnel of Contractor and subcontractors shall not occupy, live upon, or otherwise make use of the Project site during any time that Work is not being performed at the Project site, except as otherwise provided in the Contract Documents.

Contractor shall conduct and cause all working forces at the site to maintain the site in a neat orderly manner throughout the construction operations. The work shall be conducted in a manner that will control the dust. When ordered to provide dust control, the Contractor shall use water or turn soil to reduce the dusty conditions, all to the satisfaction of the District's Representative and in accordance with the Salida Sanitary District Sewer Standards and Specifications. During construction, Contractor shall remove all rubbish and debris as it is generated to the satisfaction of the Engineer.

#### 12.0 CORRECTION OF DEFECTIVE WORK AND GUARANTEE TO REPAIR PERIOD

The term "Guarantee To Repair Period" means a period of 1 year from Final Completion, unless a longer period of time is specified.

Contractor shall (1) correct Defective Work that becomes apparent during the progress of the Work or during the Guarantee To Repair Period, and (2) replace, repair, or restore to District's satisfaction any other parts of the Work and any other real or personal property which is damaged or destroyed as a result of Defective Work or the correction of Defective Work. Contractor shall promptly commence such correction, replacement, repair, or restoration upon notice from District's Representative or District, but in no case later than 10 days after receipt of such notice; and Contractor shall diligently and continuously prosecute such correction, and all losses resulting from such Defective Work, including additional testing, inspection, and compensation for District's Representative's services and expenses. Contractor shall perform corrective Work at such times that are acceptable to District and in such a manner as to avoid, to the extent practicable, disruption to District's activities.

If immediate correction of Defective Work is required for life safety or the protection of property and is performed by District or Separate Contractors, Contractor shall pay to District all reasonable costs of correcting such Defective Work. Contractor shall replace, repair, or restore to District's satisfaction any other parts of the Construction Work and any other real or personal property which is damaged or destroyed as a result of such Defective Work or the correction of such Defective Work.

Contractor shall remove from the Project site portions of the Construction Work and materials which are not in accordance with the Contract Documents and which are neither corrected by Contractor nor accepted by District.

If Contractor fails to commence correction of Defective Work within 10 days after notice from District or District's Representative or fails to diligently prosecute such correction to completion, District may correct the Defective Work; and, in addition, District may remove the Defective Work and store salvageable materials and equipment at Contractor's expense.

If Contractor fails to pay the costs of such removal and storage as required by the Contract Documents within 10 days after written demand, District may, without prejudice to other remedies, sell such materials at auction or at private sale, or otherwise dispose of such material. Contractor shall be entitled to the proceeds of such sale, if any, in excess of the costs and damages for which Contractor is liable to District, including compensation for District's Representative's services and expenses. If such proceeds of sale do not cover costs and damages for which Contractor is liable to District, the Contract Sum shall be reduced by such deficiency. If there are no remaining payments due Contractor or the remaining payments are insufficient to cover such deficiency, Contractor shall promptly pay the difference to District.

Contractor's obligations under this Section are in addition to, and not in limitation of, its warranty under Section 01015 or any other obligation of Contractor under the Contract Documents. Enforcement of Contractor's express warranties and guarantees to repair contained in the Contract Documents shall be in addition to and not in limitation of any other rights or remedies District may have under the Contract Documents or at law or in equity for Defective Work, including, but not limited to, under CCP sections 337.1 and 337.15. Nothing contained in this Section shall be construed to establish a period of limitation with respect to other obligations of Contractor under the Contract or to correct the Work and in no way limits either Contractor's liability for Defective Work or the time within which proceedings may be commenced to enforce Contractor's obligations under the Contract Documents.

\*\*\*END OF SECTION\*\*\*

General Conditions 00700-54

# **SECTION 00800 - SUPPLEMENTARY CONDITIONS**

- 1.0 Not Applicable
- 2.0 Not Applicable
- 3.0 Labor, Working Hours
- 3.1. No Work shall be done between 4:00 p.m. and 7:00 a.m. without permission of the District. However, emergency work may be done without prior permission.
- 3.2. Night Work may be undertaken as a regular procedure with the permission of the District; such permission, however, may be revoked at any time by the District if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the Work at night.

#### 4.0 Services, Materials and Equipment:

- A. Interfaces to Equipment, Instruments, and Other Components:
  - 1. The drawings, specifications, and overall design are based on preliminary information furnished by various equipment manufacturers which identify a minimum scope of supply from the manufacturers. This information pertains to, but is not limited to, instruments, control devices, electrical equipment, packaged mechanical systems, and control equipment provided with mechanical systems.
  - 2. Provide all material and labor needed to install the actual equipment furnished, and include all costs to add any additional conduit, wiring, terminals, or other electrical hardware to the work, which may be necessary to make a complete, functional installation based on the actual equipment furnished. Make all changes necessary to meet the manufacturer's wiring requirements.
  - 3. Submit all such changes and additions to the Construction Manager for acceptance in accordance with the General Conditions.
  - 4. Review the complete set of drawings and specifications in order to ensure that all items related to the electrical power and control systems are completely accounted for. Include any such items that appear on drawings or in specifications from another discipline in the scope of Work.
- B. Until Substantial Completion of the Work is acknowledged by the District, Contractor shall have the responsible charge and care of the Work and of materials to be used herein, including materials for which Contractor has received partial payment or materials which have been furnished by the District, and shall bear the risk of injury, loss, or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the Work.
- C. Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work or the materials occasioned by any cause before the Work's completion and acceptance and shall bear the expense thereof. Where necessary to protect the Work or materials from damage, Contractor shall, at Contractor's own expense, provide suitable drainage and erect such temporary structures or rent such structures as are necessary to protect the Work or materials from damage. The suspension of the Work or the granting of an extension of time

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from any cause whatever shall not relieve Contractor of Contractor's responsibility for the Work and materials as specified herein.

- D. When the quality of a material, process, or article is not specifically set forth in the Contract Documents, the best available quality of the material, process, or article shall be provided.
- E. Delivery and Inspection:
  - 1. Deliver products in undamaged condition, in manufacturer's original container or packaging with identifying labels intact and legible. Include date of manufacture on label.

\*\*\*END OF SECTION\*\*\*

# SECTION 00810 - MODIFICATIONS TO GENERAL CONDITIONS

NONE

\*\*\*END OF SECTION\*\*\*

INTENTIONALLY LEFT BLANK

# SECTION 00820 - LIABILITY AND INSURANCE REQUIREMENTS

# 1.0 INDEMNIFICATION

Indemnity and Hold Harmless. With the exception that this section shall in no event be construed to require indemnification by CONTRACTOR to a greater extent than permitted under the public policy of the State of California, CONTRACTOR shall, indemnify, protect, defend with counsel approved by DISTRICT and at CONTRACTOR'S sole cost and expense, and hold harmless DISTRICT, its Board of Directors, officials, representatives, agents, employees, and volunteers from and against any and all claims, causes of action, liabilities, judgments, awards, losses, liens, claims, stop notices, damages, expenses, and costs (including without limitation attorneys' fees, expert and contractor fees, and other expenses of litigation) of every nature, including, but not limited to, death or injury to persons, or damage to property, which arise out of or are in any way connected with the work performed, materials furnished, or services provided under this Agreement, or from any violation of any federal, state, or municipal law or ordinance, or DISTRICT Policy, by CONTRACTOR or CONTRACTOR'S officers, agents, employees, volunteers or subcontractors. CONTRACTOR shall not be obligated to indemnify or defend DISTRICT for claims finally determined by a court of law or arbitrator to arise from the active negligence or willful misconduct of the DISTRICT. It is the intent of the Parties that this indemnity obligation is at least as broad as is permitted under California law. To the extent California Civil Code sections 2782, et seq., limit the defense or indemnity obligations of CONTRACTOR to DISTRICT, the intent hereunder is to provide the maximum defense and indemnity obligations allowed by CONTRACTOR under the law. The indemnity set forth in this section shall not be limited by insurance requirements or by any other provision of this Agreement.

With the exception that this section shall in no event be construed to require indemnification, including the duty to defend, by CONTRACTOR to a greater extent than permitted under the public policy of the State of California, the parties agree that CONTRACTOR'S duty to defend DISTRICT is immediate and arises upon the filing of any claim against the DISTRICT for damages which arise out of or are in any way connected with the work performed, materials furnished, or services provided under this Agreement by CONTRACTOR or CONTRACTOR'S officers, agents, employees, volunteers or subcontractors. CONTRACTOR'S duties and obligations to defend the DISTRICT shall apply regardless of whether or not the issue of the DISTRICT'S liability, breach of this Agreement, or other obligation or fault has been determined. CONTRACTOR shall be immediately obligated to pay for DISTRICT'S defense costs of the claim, including, but not limited to, court costs, attorney's fees and costs, expert contractor and witness fees and costs, other witness fees, document reproduction costs, arbitration fees, and, if after final judgment an appeal is pursued, all of such costs for the appeal. At the conclusion of the claim, if there is any determination or finding of sole active negligence or willful misconduct on the part of the DISTRICT, DISTRICT will then reimburse CONTRACTOR for amounts paid in excess of CONTRACTOR'S proportionate share of responsibility for the damages within 30 days after CONTRACTOR provides DISTRICT with copies of all bills and expenses incurred in the defense of the claim(s). It is agreed between the parties that this reimbursement provision assures CONTRACTOR is not obligated to defend or indemnify DISTRICT in an amount greater than provided for under California law, including, without limitation, California Civil Code sections 2782, 2782.6, and 2782.8.

With the exception that this section shall in no event be construed to require indemnification by CONTRACTOR to a greater extent than permitted under the public policy of the State of California, and in addition to the other indemnity obligations in this Agreement, CONTRACTOR shall indemnify, defend, and hold harmless DISTRICT its Board of Directors, officials, representatives, agents employees and volunteers from and against all claims, losses, expenses, and costs including but not limited to attorneys' fees, arising out of any claim brought against the DISTRICT by an employee,

office, agent, or volunteer of CONTRACTOR, regardless of whether such claim may be covered by any applicable workers compensation insurance. CONTRACTOR'S indemnification obligation is not limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability acts, or other employee benefit acts.

# 2.0 INSURANCE REQUIREMENTS

# Exhibit B: Insurance Requirements (Services & Products)

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 and the results of that work by the Contractor, their agents, representatives, employees or subcontractors.

# MINIMUM SCOPE AND LIMIT OF INSURANCE

Coverage shall be at least as broad as:

- Commercial General Liability (CGL): Insurance Services Office Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than \$1,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
- 2. Automobile Liability (AL): ISO Form Number CA 00 01 covering any auto (Code 1), or if Contractor has no owned autos, hired, (Code 8) and non-owned autos (Code 9), with limit no less than \$1,000,000 per accident for bodily injury and property damage.
- 3. Workers' Compensation: As required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than **\$1,000,000** per accident for bodily injury or disease.
- 4. **Umbrella Liability (UMB):** ISO Form Number CA 00 01 covering UMB on an each occurrence and aggregate basis with limits no less than **\$2,000,000** per occurrence and aggregate.

If the contractor maintains higher limits than the minimums shown above, the District requires and shall be entitled to coverage for the higher limits maintained by the contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the District.

## **Other Insurance Provisions**

The insurance policies are to contain, or be endorsed to contain, the following provisions:

## • Additional Insured Status

The Salida Sanitary District, its Board of Directors, officers, representatives, agents, employees and volunteers are to be covered as additional insureds on the CGL and AL policy with respect to liability arising out of work or operations performed by or on behalf of the

Contractor including materials, parts, or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (**at least as broad as** ISO Form CG 20 10 11 85 or if not available, through the addition of both CG 20 10 and CG 20 37 if a later edition is used).

## • Primary Coverage

For any claims related to this contract, the Contractor's insurance coverage shall be endorsed as primary insurance as respects the Salida Sanitary District, its Board of Directors, officers, representatives, agents, employees and volunteers. Any insurance or self-insurance maintained by the Salida Sanitary District, its Board of Directors, officers, representatives, agents, employees and volunteers shall be excess of the Contractor's insurance and shall not contribute with it. The District does not accept endorsements limiting the Contractor's insurance coverage to the sole negligence of the Named Insured.

# • Notice of Cancellation

Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the District.

# • Waiver of Subrogation

Contractor hereby grants to the District a waiver of any right to subrogation which any insurer of said Contractor may acquire against the District by virtue of the payment of any loss under such insurance. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation, but this provision applies regardless of whether or not the District has received a waiver of subrogation endorsement from the insurer.

## • Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the District. The District may require the Contractor to purchase coverage with a lower deductible or retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention.

## • Acceptability of Insurers

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII if admitted to do business in the State of California; If not admitted to do business in the State of California, insurance is to be placed with insurers with a current A.M. Best's rating of no less than A+:X.

## • Claims Made Policies

If any of the required policies provide claims-made coverage:

- The Retroactive Date must be shown, and must be before the date of the contract or the beginning of contract work.
- If Claims Made policy form is used, a three (3) year discovery and reporting tail period of coverage is required after completion of work.

# • Verification of Coverage

Contractor shall furnish the District with original certificates and amendatory endorsements required by this clause. All certificates and endorsements are to be received and approved by the District before work commences. Failure to obtain the required documents prior to the

work beginning shall not waive the Contractor's obligation to provide them. The District reserves the right to require complete, certified copies of all required insurance policies, including endorsements required by these specifications, at any time, for any reason or no reason.

Contractor shall, prior to the commencement of work under this Agreement, provide the District with a copy of its Declarations Page and Endorsement Page for each of the required policies.

## • Special Risks or Circumstances

The District reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other circumstances.

#### Certificate holder address

Proper address for mailing certificates, endorsements and notices shall be:

- Salida Sanitary District
- P.O. Box 445
- > Salida, CA 95368

#### • Maintenance of Insurance

If at any time during the life of the Contract or any extension, the Contractor fails to maintain the required insurance in full force and effect, all work under the Contract shall be discontinued immediately. Any failure to maintain the required insurance shall be sufficient cause for the DISTRICT to terminate this Contract.

#### • Subcontractors

If the Contractor should subcontract all or any portion of the work to be performed in this contract, the Contractor shall cover the sub-contractor, and/or require each sub-contractor to adhere to all subparagraphs of these Insurance Requirements section. Similarly, any cancellation, lapse, reduction or change of sub-contractor's insurance shall have the same impact as described above.

\*\*\*END OF SECTION\*\*\*

# **SECTION 01010 - SUMMARY OF WORK**

## 1.0 WORK COVERED BY CONTRACT DOCUMENTS

The work shall be performed in accordance with the intent of the Contract Documents as stated in the Contract Documents, excluding only the Work indicated or specified to be provided by the District or others under separate contract or other arrangement.

#### 2.0 CONTRACT ADMINISTRATION

The following are designated.

#### 2.1 Name of Construction Manager

Antonio Tovar District Manager-Engineer Salida Sanitary District Salida, CA 95368

## 2.2 Name of Design Consultant

Black Water Consulting Engineers, Inc. Engineer: Aja Verburg, P.E. 602 Lyell Drive Modesto, CA 95350

#### 2.3 Name of District's Representative

Antonio Tovar District Manager-Engineer Salida Sanitary District Salida, CA 95368

#### 3.0 TIME ALLOWED FOR COMPLETION

In accordance with the provisions of Paragraph 00700-6.2, <u>Time of Completion</u>, substantial completion of this project shall be completed within <u>sixty (60)</u> consecutive calendar days from the effective date of the Notice to Proceed and final completion shall be achieved within <u>ten (10)</u> consecutive calendar days following substantial completion.

## 4.0 DAMAGES FOR DELAYS

In accordance with the provisions of Paragraph 00700-6.5, <u>Liquidated Damages</u>, for the period of time that any portion of the work remains unfinished after the time fixed for substantial completion, and for the period of time that any portion of the work remains unfinished after the time fixed for final completion, in the Contract documents, as modified by extensions of time granted by the District, it is understood and agreed by the Contractor and the District that the Contractor shall pay the District <u>One-Hundred Dollars (\$100.00)</u> per day liquidated damages. Should work remain unfinished after the time fixed for both substantial completion and final completion, the liquidated damages shall remain <u>One-Hundred Dollars (\$100.00)</u> per day.

## 5.0 WEATHER DAYS

In accordance with the provisions of Paragraph 00700-6.4.2.c., Weather Delays, an allowance of <u>five (5)</u> calendar days of weather caused delay is provided.

#### 6.0 WORK SEQUENCE AND CONSTRAINTS

Refer to Section 01040, <u>COORDINATION</u>.

## 7.0 OCCUPANCY REQUIREMENTS

Refer to Section 01040, COORDINATION.

## 8.0 DISTRICT FURNISHED MATERIALS

8.1 **Plans and Specifications** - The District will furnish to the Contractor one (1) copy of the full-sized plans, specifications, and half-sized plans (if available). The cost to provide additional copies of the plans and specifications shall be the responsibility of the Contractor. At the Contractor's request, the District will deliver original documents to, and pickup up from, a duplication service in the Modesto-Salida area. The Contractor shall be responsible for the cost of the additional copies, and for picking up such copies. At no time will the District make the original documents available to the Contractor.

#### 9.0 TRENCH EXCAVATION

The maximum amount of trench remaining open without backfill shall be <u>twenty (20)</u> feet. No trench in public areas shall be left open during periods when the Contractor is not at the site of work, trenches in these areas shall either be backfilled and temporarily paved, where applicable, or covered with steel trench plates as specified in the technical specifications. No more than two consecutive trench plates will be allowed at any time when the Contractor is not at the site of work.

## 10.0 WORK UNDER OTHER CONTRACTS

The District's facilities are critical facilities that operate twenty-four hours each and every day. During the life of this contract, other contracts may be let to construct, operate, maintain, or repair

facilities in and/or around the project sites. The Contractor shall refer to the provisions pertaining to cooperation and coordination elsewhere in these Contract Documents, and shall coordinate with the District to minimize interferences to or caused by other contracts.

Other work anticipated to occur during the life of this project includes, but is not limited to, the following: N/A

#### 11.0 CONTRACTOR'S WORK PERCENTAGE

The minimum portion of the work to be performed by the Contractor's forces shall be fifty-one percent (51%) for this contract.

#### 12.0 UNDERGROUND FACILITIES

The Contractor is responsible for coordinating all project documentation, including but not necessarily limited to, the Contract Documents and existing record drawings for the determination of the location of all underground facilities.

The Contractor shall exercise care in all excavations to avoid damage to existing underground facilities. This shall include potholing or hand digging in those areas where underground facilities are known to exist, prior to installation work, until they have been sufficiently located to avoid damage to the facilities.

Prior to fabrication, the Contractor shall verify the location and elevations of existing underground facilities which the Contractor is connecting to.

No additional compensation shall be provided to the Contractor for compliance with the provisions of this section or for the damage and repair of facilities due to the lack of such care.

## 13.0 LEGAL AND DISTRICT HOLIDAYS

New Year's Day	Martin Luther King's Birthday	
Presidents' Day	Memorial Day	
Fourth of July	Labor Day	
Veteran's Day	Thanksgiving and the Day after	
Christmas Eve	Christmas Eve and Christmas Day	

The District will have limited staff and support capabilities available during these holidays. Requests for inspection or other District services on holidays will be paid for by the Contractor at the established holiday pay scale rate for the services required. The District shall determine the appropriate level of response and support needed in terms of any request.

#### \*\*\*END OF SECTION\*\*\*

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# **SECTION 01015 – GENERAL PROVISIONS**

#### 1.0 GENERAL

#### 1.1 Description

This Section covers general provisions and requirements for the Work and is supplementary to the Standard Specifications and the Conditions of the Contract.

#### 1.2 Guarantee

The Contractor shall guarantee that the equipment, materials and workmanship furnished under this Contract will be as specified and will be free from defects for a one-year guarantee period, starting from the date of Final Completion of the Work, unless a longer period of time is prescribed by law or required by special provisions elsewhere in the Contract Documents and except as otherwise noted herein. If a specific item (or items) of equipment or material cannot be utilized by the Owner at Final Completion because the Work is incomplete or defective, the guarantee for that item (or items) shall begin when the Owner is provided beneficial use. Beneficial use for any such items shall be provided prior to Final Completion. 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, failure or abnormalities 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 defects, failure or abnormalities shall be paid by the Contractor. In the event warranty work involves repair or replacement of parts, machine work, or any other work which affects the equipment or materials installed under this Contract, the Contractor's guarantee on such items and work shall be extended for a period of one year from the date of installation of said items, or the performance of said work. If, within ten (10) days, unless specified otherwise by the Owner, after the Owner gives the Contractor notice of a defect, failure, or abnormality of the Work, the Contractor neglects to make the necessary repair or adjustments, the Owner may make the repair or adjustments or order the Work to be done by a third party, 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 serious loss or damage, repairs or adjustments may be made by the Owner, without giving notice to the Contractor, and the cost of the work shall be paid by the Contractor.

#### 1.3 Contractor's License

The Contractor for this Project shall possess at the time of bid, and maintain throughout the duration of the Contract, a valid California Class A General Engineering and C-10 Contractor's Licenses.

#### 1.4 Patents

Royalties and fees from patents covering materials, articles, apparatus, devices, or equipment (as distinguished from processes) used in the Work, shall be included in the Contract amount. The Contractor shall satisfy all demands that may be made at any time for such royalties or fees and he shall be liable for any damage or claims for patent infringements. The Contractor shall, at his own cost and expense, defend all suits or proceedings that may be instituted against the Owner for infringement or alleged infringement of any patents involved in the Work and, in case of an award of damages, the Contractor shall pay such award. Final payment to the Contractor by the Owner will not be made while any suit or claim remains unsettled. The Contractor, however, will not be held liable for the defense of any suit or other proceeding, nor the payment of any damages or

other costs for the infringement of any patented process required by the Contract Documents; except if the Contractor has information that the process so required is an infringement of a patent, the Contractor shall be liable for any damages or claims in connection therewith unless he promptly notifies the Owner of such infringement.

2.0 **PRODUCTS** (Not applicable in this Section)

#### 3.0 EXECUTION

#### 3.1 Public Complaints.

The Contractor shall respond to public complaints when requested by the Owner.

#### 3.2 Guarantees and Warranties

Except as herein specified, all guarantees and warranties shall conform with applicable requirements of Paragraph 00700-12.0, <u>Correction of Defective Work and Guarantee to Repair</u> <u>Period</u>.

#### **3.3 Precedence of Contract Documents**

- A. Section 00700, Paragraph 1.2 applies.
- B. Detail Drawings take precedence over small-scale drawings, and full-size Drawings shall be followed in preference to both. Full-size Drawings take precedence over reduced-size Drawings.

#### 3.4 Care and Protection of Property

If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition, as determined by the District, which is similar or equal to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the Owner. The Contractor is responsible for the following at his own expense:

- A. To conduct the operation in a manner which will cause the least amount of damage, inconvenience and interference with the normal use of any public or private property. Such operations shall be confined to the least possible space and shall be accomplished in a neat and workmanlike manner, taking care not to unnecessarily disturb or damage adjoining property, disturbing only those trees, shrubbery, floral pieces or other landscaping planting, fences, buildings, structures or other facilities of any kind or description in the manner and as directed by the Owner. Remove all transplantable trees, shrubs and bushes that may be damaged or destroyed by construction and reset them after construction. Re-vegetation of disturbed property shall be accomplished in such manner as required to return the property to its prior condition or better.
- B. To store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of his Work or the work of any other contractor.
- C. To provide suitable storage facilities for all materials which are liable to injury by exposure to weather, theft, breakage, or otherwise. If the Owner determines that suitable storage for certain materials is not being provided, he may direct the Contractor to remove it from the job site, or to store it properly at the job site.

- D. To place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.
- E. To clean up not less than at the end of each work day, all refuse; rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the Work shall present a neat, orderly and workmanlike appearance. More frequent clean-up shall be performed as required to maintain access to all other Owner facilities still in operation.
- F. To remove and dispose of off-site in accordance with all Federal, State and local regulations, all surplus material, false-work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition before final payment.
- G. To affect all cutting, fitting or patching of his Work required to make the same to conform to the Drawings and Specifications and, except with the consent of the Owner, not to cut or otherwise alter the work of any other contractor.
- H. To close work access during time when active construction work is not ongoing.

# 3.5 Field Check of Existing Improvements

It shall be the responsibility of the Contractor to check all dimensions, elevations, and location of existing structures, utilities, pipelines, grades or other existing items affected by or affecting the Work under this Contract, prior to the start of construction and ordering of materials and equipment affected thereby. The Contractor shall be solely responsible for determining the extent and cost of all removal and salvage operations. The Contractor shall notify the Owner if existing conditions are not as shown on drawings.

# 3.6 **Protection of Existing Improvements**

- A. In the performance of the Work contemplated under this Contract, the Contractor shall take all precautions necessary, including but not limited to those described herein, to ensure that all existing improvements not specifically indicated for removal are not damaged or interfered with in any way. Should the Contractor disturb or damage such improvements without authorization, all expense for replacement or repair of the existing improvements so disturbed or damaged shall be borne by the Contractor. The Owner has diligently attempted to correctly locate and show the existing utilities, pipelines and substructures in the vicinity of the Work, but the Owner does not guarantee that there are not improvements other than those shown, nor that the locations shown are entirely correct. Failure of the Owner to show all the existing utilities, pipelines and substructures shall not be a basis for claim for extra work. The Contractor shall be held responsible for all damage to existing utilities, pipelines and substructures whether shown or not.
- B. Notify Underground Service Alert (U.S.A.), telephone 800-642-2444, at least forty-eight (48) hours prior to performing any excavation for this Work. In coordination with the appropriate authorities' probe, pot-hole, or otherwise ascertain the exact location of all existing underground improvements in advance of excavation such that no damage to these improvements will occur. In the event interferences in construction are encountered with the various existing improvements, the Owner reserves the right to appropriately change the alignment and grade of the facilities.

# 3.7 Cooperation With Others

- A. The Contractor is hereby advised that work on other contracts within or adjacent to his contract limits may already be in progress. Contracts for construction may also be subsequently awarded to others and because of relocation and construction of various utilities he may not have exclusive occupancy of the territory within or adjacent to the limits of the Contract.
- B. In case of interferences between the operations of different construction contractors, the Owner will determine the work priority of each contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Owner shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for any claims for additional compensation.
- C. The Contractor shall coordinate his activities with the Owner as they relate to utility shutdowns. The sewer lift station must operate 24 hours per day and only the Owner's staff will be permitted to operate valves or other utilities.

# 3.8 Unfavorable or Hazardous Construction Conditions

During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operation to work which will not be affected adversely thereby. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the Work in a proper and satisfactory manner as determined by the Owner.

# 3.9 Testing and Substantial and Final Completion

See Section 01660.

\*\*\* END OF SECTION \*\*\*

# **SECTION 01025 - MEASUREMENT AND PAYMENT**

## 1.0 <u>GENERAL</u>

#### 1.1. Measurement of Quantities

Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to United States Standard Measures and the units of measurement for payment, and the limits thereof, shall be made as shown on the Plans, Specifications, General Requirements, and Supplementary Conditions.

#### 1.2 Units of Measurement

Measurements shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.

#### 1.3 Certified Weights

When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales, or when approved by the Construction Manager, on a completely automated weighing and recording system. The Contractor shall furnish the Construction Manager with duplicate licensed weigh master's certificates showing the actual net weights. The District will accept the certificates as evidence of the weights delivered.

#### 1.4 Methods of Measurement

Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the method stipulated in the particular sections involved. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.

Material not used from a transporting vehicle shall be determined by the Construction Manager and deducted from the certified tag.

When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Construction Manager in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Construction Manager and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.

Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefore.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to the provisions of the Contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the Construction Manager; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

Measurement and Payment 01025-1

# 2.0 DESCRIPTION OF BID ITEMS

# 2.1. General

Bid Items 1 through 18 are presented to indicate major categories of the work for purposes of comparative bid analyses, payment breakdown for monthly progress payments. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item (work phase) as shown and specified.

# 2.2 Duration of Prices

Quoted prices accepted by the District shall be held good and in effect until the Work is completed and accepted by the District, unless modified by Change Order.

#### 2.3 Bid Items

Compensation for all equipment, tools, materials, labor, service, travel, and incidentals, and for doing the work and all other items required to complete the Work in conformity with the Contract Documents will be included in the payment provided in this Section unless specifically excluded. No other compensation will be made except for the items listed in the Bid Proposal. Work for which no separate payment has been provided will be considered as a subsidiary obligation of the Contractor, and the cost therefore included in the applicable contract price for the item to which the work applies. All measurements of work done will be made by the Construction Manager. No adjustment in prices will be made where any quantities provided in the Item Description vary from actual quantities, unless the work described and shown in the Contract Documents has been modified by the District.

**2.3.1 Bid Item 1** - Bid Item 1 includes preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings and other facilities necessary for work on the project; for the marshaling of equipment; disposal of materials and equipment; demobilization; and for all other work and operations which must be performed or costs incurred prior to beginning work or at the end on the various contract items on the project site, including obtaining the bonds, insurance policies, and permits required by the Contract Documents for this Project.

Payment for Bid Item 1 will be in the amount shown in the Bid Schedule and will be made on a lump sum basis at one hundred percent (100%) of the indicated amount contingent upon the Contractor furnishing, and the Construction Manager's acceptance of, the Construction Schedule, the Contractor's Cost Breakdown, and proof of acquisition of all required bonds, insurance, and permits. Payment for Bid Item 1 shall be subject to retention in accordance with applicable contract requirements.

**2.3.2** Bid Item 2 - Bid Item 2 is a furnish, install and maintain a sewer bypass system, as described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, fuel, sewer plugs, pumps, generator, piping, controls, traffic control, and all equipment necessary for the complete and continuous bypassing of sewer flows with a redundant pumping system.

Payment for Bid Item 2 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.3** Bid Item 3 - Bid Item 3 is a furnish and install item for the complete installation of a new magnetic flow meter, transmitter and flow meter vault with H-20 access hatch on the 12" force main, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, testing, vaults, excavation, pipe removal, pipe supports, base material, compaction, shoring, and any other incidentals necessary to complete the bid item. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Payment for Bid Item 3 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.4** Bid Item 4 – Bid Item 4 is a furnish and install item for the installation of a new 12" plug valve, valve extension and valve box with traffic rated lid on the 12" force main, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, excavation, pipe removal, base material, compaction, shoring and any other incidentals necessary to complete the bid item. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Payment for Bid Item 4 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.5** Bid Item 5 - Bid Item 5 is a furnish and install item for the installation of a new valve box with traffic rated cover and vault to replace the existing valve box and cover, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, excavation, pipe removal, base material, compaction, shoring and any other incidentals necessary to complete the bid item. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Payment for Bid Item 5 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.6** Bid Item 6 - Bid Item 6 is a furnish and install item for the installation of the portable davit crane and pedestal base, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, pedestal base installation, testing, and any other incidentals necessary to complete the bid item. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Payment for Bid Item 6 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.7 Bid Item 7** - Bid Item 7 is a furnish and install item for the installation of all improvements to the Pump Pit, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor; materials; tools; equipment; pipe removal; furnish and install check valves, ductile iron spool pieces, pressure gauges, plug valves, lighting, junction

box, and safety grating modifications; testing; and any other incidentals necessary to complete the bid item.

Payment for Bid Item 7 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.8 Bid Item 8** - Bid Item 8 is a furnish and install item for the installation of all internal and external improvements to the Wet Well, as shown on the Drawings and described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, testing, and furnishing and installing new locking hinges, new radar level sensor, stainless steel chain and weight, backup floats and assembly, and any other incidentals necessary to complete the bid item.

Payment for Bid Item 8 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

2.3.9 Bid Item 9 - Bid Item 9 (Specialty Item) is the furnishing equipment and materials for the new motor control center-power side pedestal, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 10 through 14. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Costs shall include, but not limited to, all materials, equipment, enclosure, transformers, hardware, breakers, and any other incidentals necessary to complete the bid item.

Payment for Bid Item 9 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.10** Bid Item 10 - Bid Item 10 (Specialty Item) is the furnishing equipment and materials for the new motor control center-control side pedestal, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 9, and 11 through 14. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Costs shall include, but not limited to, all materials, equipment, enclosure, hardware, software, PLCs, HMI, flowmeter transmitter, level transmitter, relocation and reconnection of SCADA radio, and any other incidentals necessary to complete the bid item.

Bid item shall also include furnishing a <u>spare</u>, fully programmed PLC and HMI, as spares. Include all SCADA connection software hooks.

Payment for Bid Item 10 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.11** Bid Item 11 - Bid Item 11 (Specialty Item) is the furnishing basic electrical materials, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 9 through 10, and 12 through 14.

Costs shall include, but not limited to, all materials, equipment, breakers, junction boxes, seals, pullboxes, wiring, conduit, and any other incidentals necessary to complete the bid item.

Payment for Bid Item 11 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.12** Bid Item 12 - Bid Item 12 (Specialty Item) is the labor costs for the installation of new motor control center power and control pedestals, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 9 through 11, and 13 through 14.

Costs shall include, but not limited to, all labor associated with assembling the motor control center, programming, commissioning, testing and any other incidentals necessary to complete the bid item.

Payment for Bid Item 12 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.13** Bid Item 13 - Bid Item 13 (Specialty Item) is the labor associated with the transition from existing to new electrical, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 9 through 12, and 14.

Costs shall include, but not limited to, all labor associated with the transition from existing to new electrical, connection between existing service cabinet to new cabinet(s), and any other incidentals necessary to complete the bid item.

Payment for Bid Item 13 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.14** Bid Item 14 - Bid Item 14 (Specialty Item) is the labor costs associated completing all electrical connections, as shown on the Drawings and as described in the Specifications, except for the work and electrical improvements covered by Bid Items 9 through 13.

Costs shall include, but not limited to, all labor to connect the various devices and equipment (flow meter, radar level sensor, davit crane, lockout stop and job controls, etc..) to the motor control center, underground work, terminations, and any other incidentals necessary to complete the bid item.

Payment for Bid Item 14 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.15** Bid Item 15 - Bid Item 15 is the completion of all site grading, drainage and asphalt paving improvements, as shown on the Drawings and as described in the Specifications.

Costs shall include, but not limited to, all labor, materials, tools, equipment, base material, grading, drainage improvements, compaction, asphalt concrete paving, and any other incidentals necessary to complete the bid item. All excavated materials shall become the property of the Contractor and shall be disposed of properly.

Payment for Bid Item 15 will be made at the per square footage given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.16** Bid Item 16 - Bid Item 16 includes performing the work and the payment of all related expenses necessary for instruction and training of the District's personnel, as described in the Specifications.

Payment for Bid Item 16 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.17 Bid Item 17** - Bid Item 17 includes performing the work and the payment of all related expenses necessary for assembling and providing Instructional Operations and Maintenance Manuals on all work, as described in the Specifications.

Payment for Bid Item 17 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

**2.3.18 Bid Item 18** - Bid Item 18 includes performance of the work necessary for the maintenance and submission of the Contractor's Record Drawings, as shown on the Drawings and as described in the Specifications.

Payment for Bid Item 18 will be made at the lump sum fixed price given in the Bid Schedule, in accordance with the accepted Contractor's Cost Breakdown and subject to retention in accordance with applicable contract requirements.

2.3.9 **Total Bid** - The total amount bid includes the summation of Bid Items 1 through 18 and represents the total price bid to provide the work as shown on the drawings and as specified.

# 2.4 PAYMENT FOR MOBILIZATION

- A. Limit amounts included under mobilization to the following items:
  - 1. Moving on the site any equipment required for first month operations.
  - 2. Installing temporary construction power, wiring, and lighting facilities.
  - 3. Establishing fire protection plan and safety program.
  - 4. Developing construction water supply.
  - 5. Providing field office trailers for the Contractor and the Construction Manager, complete with all specified furnishings and utility services including telephones.
  - 6. Providing on-site sanitary facilities and potable water facilities as specified.
  - 7. Arranging for and erection of Contractor's work and storage yard, employee parking facilities, and entrance road.
  - 8. Submit all required insurance certificates and bonds.
  - 9. Obtaining all required permits, licenses, and fees.
  - 10. Developing construction schedule.
  - 11. Submit preliminary schedule of values of the Work.
  - 12. Provide and erect the project sign.
  - 13. Post all OSHA, (state agency), Department of Labor, and all other required notices.
  - 14. Limits of construction and clearing have been located and flagged.
  - 15. Have Contractor's project manager and/or general superintendent on job site fulltime.
  - 16. The Construction Manager is satisfied that responsive and responsible progress on the Contract Work is under way.
- B. Furnish data and documentation to substantiate the amounts claimed under mobilization.
- C. Limit price for mobilization to no more than five percent (5%) of Contract Price.

D. No payment for mobilization, or any part thereof, will be recommended until all mobilization items listed above have been completed.

# 2.5 PAYMENT FOR START-UP AND DEMOBILIZATION

A. Total Price for start-up and demobilization shall not be less than 3 percent of Contract Price.

## 3.0 CONTRACTOR'S COST BREAKDOWN

**Lump Sum Price Breakdown** - For work to be performed for a lump sum price, the Contractor shall submit a price breakdown to the Construction Manager prior to the first payment and within ten (10) days after Notice to Proceed. The price breakdown, as agreed upon by the Contractor and the Construction Manager, shall be used for preparing future estimates for partial payments to the Contractor, and shall list the major items of work with a price fairly apportioned to each item.

If not identified as a bid item, mobilization, overhead, bond, insurance, other general costs and profit shall be prorated to each item so that the total of the prices for all items equal the lump sum price. At the discretion of the Construction Manager, mobilization, bond and insurance costs may be provided for separately if accompanied by invoices to verify actual expenses.

The price breakdown shall be generally in the same format as the Contract specifications divisions and subdivisions, with major items of work listed individually. The price breakdown shall be by structure, civil, landscaping, or other logical division of work. The price breakdown for architectural, structural, mechanical, and electrical work shall include separate items for identifiable portions of the structures. The price breakdown shall include separate allowances for any testing and startup work required. Measurable approximate quantities of work performed by the Contractor or its subcontractors shall be provided. For quantities that are the sum total of several individual quantities, backup summaries shall be provided which list the individual descriptions and quantities. These summaries then will be used to determine the quantities of work in place in subsequent progress payment requests.

The above is a statement of the intent of the Contract Documents to provide a moderate level of detail, acceptable to the Construction Manager, to allow a fair and reasonable estimate to be made of the value of work installed. The detail of the price breakdown must be sufficient to provide timely processing of the monthly progress payment request.

The price breakdown will be subject to the approval of the Construction Manager, and upon request, the Contractor shall substantiate the price for any or all items and provide additional level of detail, including quantities of work. The price breakdown shall be sufficiently detailed to permit its use by the Construction Manager as one of the bases for evaluating requests for payments. The Construction Manager shall be the sole judge of the adequacy of the price breakdown.

\*\*\* END OF SECTION \*\*\*

Measurement and Payment 01025-8

# **SECTION 01035 - MODIFICATION PROCEDURES**

# 1.0 CHANGES IN CONTRACT PRICE

Whenever corrections, alterations, or modifications of the work under this Contract are ordered by the Construction Manager and approved by the District and increase the amount of work to be done, such added work shall be known as extra work; and when such corrections, alterations, or modifications decrease the amount of work to be done, such subtracted work shall be known as work omitted.

The difference in cost of the work affected by such change will be added to or deducted from the amount of said Contract price, as the case may be, by a fair and reasonable valuation, which shall be determined in one or more of the following ways as directed by the Construction Manager:

- a. By unit prices accepted by the District and stated in the Contract Documents;
- b. By unit prices subsequently fixed by agreement between the parties;
- c. By an acceptable lump sum proposal from the Contractor; or
- d. By Force Account (as described in Paragraph 01035-3.0, **FORCE ACCOUNT PAYMENT**, when directed in writing and administered by the District through its agents or representatives.

When required by the Construction Manager, the Contractor shall submit, in the form prescribed by the Construction Manager, an itemized breakdown with supporting data of the quantities and prices used in computing the value of any change that may be ordered.

The Construction Manager will review the Contractor's proposal for the change and negotiate an equitable adjustment with the Contractor. After there is an agreement the Construction Manager will prepare and process the Change Order and make a recommendation for action by the District. All Change Orders must be approved by the District in writing before the work can be authorized and the Change Order executed.

The prices agreed upon and any agreed upon adjustment in Contract Time shall be incorporated in the written order issued by the District, which shall be written so as to indicate an acceptance on the part of the Contractor as evidenced by its signature. By signature of the Change Order, the Contractor acknowledges that the adjustments to cost and time contained in the Change Order are in full satisfaction and accord, payment in full, and so waives any right to claim any further cost and time impacts at any time during and after completion of the Contract for the changes encompassed by the Change Order.

# 2.0 NEGOTIATED CHANGE ORDERS

Under the methods described in Paragraph 01035-1.0b and 1.0c above, the Contractor shall submit substantiating documentation with an itemized breakdown of Contractor and subcontractor direct costs, including labor, material, equipment rentals, and approved services, pertaining to such ordered work in the form and detail acceptable to the Construction Manager. The direct costs shall include only the payroll cost for workers and foremen, including wages and fringe benefits as established by negotiated labor agreements or state prevailing wages. To the actual payroll cost will be added a labor surcharge which shall be the actual costs of taxes and insurance. Such labor

Modification Procedures 01035-1 surcharge shall constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to, or on behalf of, the workmen, other than actual payroll cost and subsistence and travel allowances. No other fixed labor burdens will be considered, unless approved in writing by the Construction Manager.

Other direct costs include the cost of materials used and equipment delivered and installed in such work as substantiated by appropriate documents; the cost of construction machinery and equipment based on fair rental or ownership values acceptable to the Construction Manager as described in Paragraph 01035-3.0, **FORCE ACCOUNT PAYMENT**; and the cost of incidentals directly related to such work. The direct costs shall not include any payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work, labor or office costs pertaining to the Contractor's managers or superintendents, its office and office facilities, or anyone not directly employed on such work, nor the cost of small tools as all such indirect costs form a part of the Contractor's overhead expense.

Under the method described in Paragraph 01035-1.0b and 1.0c the maximum percentage which will be allowed for the Contractor's combined overhead and profit will be:

a. For work by its own organization, the Contractor may add the following percentages:

1.	Direct Labor	24 percent
2.	Materials	15 percent
3.	Equipment (owned or rented)	15 percent

b. For all such work performed by a subcontractor, approved in accordance with the provisions in Section 00100-17.0 SUBCONTRACTORS, said subcontractor may add the same percentages listed in (a.) above to its net costs, for combined overhead and profit. The Contractor may add up to five (5) percent of the subcontractor's net cost, before above markup. Said additional five (5) percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a subcontractor.

For all such work performed by a sub tier-subcontractor, approved in accordance with the provisions in Section 00100-17.0 **SUBCONTRACTORS**, said sub tier-subcontractor may add the same percentages listed in (a.) above to its net costs, for combined overhead and profit. The subcontractor may add up to five (5) percent of the sub tier-subcontractor's net cost, before markup, for its combined overhead and profit. The Contractor may add up to five (5) percent of the net cost of the sub tier-subcontractor who performed the work, before markup. Said additional five (5) percent markup shall reimburse the subcontractor and the Contractor, respectively, for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a sub tier-subcontractor.

c. To the total of the actual costs and fees allowed herein under, not more than two (2) percent shall be added for additional bond and insurance other than labor insurance. The above fees represent the maximum limits which will be allowed, and they include the Contractor's and all subcontractors' indirect home office expenses and all costs for cost proposal preparation.

When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any, for each area of work, i.e. direct labor, materials, equipment, and subcontractors. The amount of credit to be allowed by the Contractor to the District for any such change which results in a net decrease in cost will be the amount of the actual net decrease and a credit in accordance with the markups allowed under the use of the method described in Paragraph 01035-3.0, **FORCE ACCOUNT PAYMENT**. The Contractor shall not claim for anticipated profits on work that may be omitted.

#### 3.0 FORCE ACCOUNT PAYMENT

If either the amount of work or payment for a Change Order cannot be determined or agreed upon beforehand, the District may direct by written Change Order or Field Order that the work be done on a force account basis. The term "force account" shall be understood to mean that payment for the work will be done on a time and expense basis, that is, on an accounting of the Contractor's forces, materials, equipment, and other items of cost as required and used to do the work. For the work performed, payment will be made for the documented actual cost of the following:

- a. Direct labor cost for workers, including foremen, who are directly assigned to the force account work: Direct labor cost is the actual payroll cost, including wages and fringe benefits as established by negotiated labor agreements or state prevailing wages. To the actual payroll cost will be added a labor surcharge which shall be the actual costs of taxes and insurance. Such labor surcharge shall constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to, or on behalf of, the workmen, other than actual payroll cost and subsistence and travel allowances. No other fixed labor burdens will be considered, unless approved in writing by the District.
- b. Material delivered and used on the designated work, including sales tax, if paid for by the Contractor or its subcontractor.
- c. Equipment rental, including necessary transportation for items having a value in excess of One Thousand Dollars (\$1,000.00).
- d. Additional bond.
- e. Additional insurance, other than labor insurance.

To the preceding costs, there shall be added the following fees for the Contractor, subcontractor, or sub-subcontractor actually performing the work:

- 1. A fixed fee not to exceed twenty-four (24) percent of the cost of Item a above, and fifteen (15) percent of the costs of Items b and c above.
- 2. To the total of the actual costs and fees allowed in items a, b, and c above, not more than two (2) percent shall be added for additional bond and insurance as the cost of Items d and e above.

For all such work performed by forces other than the Contractor's organization, the Contractor shall reach agreement with such other forces as to the distribution of the payment made by the District for such work. No additional payment therefore will be made by the District by reason of the performance of the work by a subcontractor or other forces.

The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, profit, and any other general expense. The above fixed fees represent the maximum limits which will be allowed, and they include the Contractor's and all subcontractors' indirect home office expenses and all costs for cost proposal preparation and record keeping.

The District reserves the right to furnish such materials and equipment as it deems expedient and the Contractor shall have no claim for profit or added fees on the cost of such materials and equipment.

For equipment under Item c above, rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Payment shall be based on actual rental and transportation invoices but shall not exceed the monthly rate in the Cal Trans "Labor Surcharge and Equipment Rental Rates" publication. The rental cost allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, ownership, and incidental costs and no further allowances will be made for those items, unless specific agreement to that effect is made. For Contractor owned equipment, costs shall be based on either actual cost accounting records or the Cal Trans "Labor Surcharge and Equipment Rental Rates" publication. Hourly rates shall be determined by dividing the monthly rate by 176 hours.

Prior to the commencement of force account work, the Contractor shall notify the Construction Manager of its intent to begin work. Labor, equipment and materials furnished on force account work shall be recorded daily by the Contractor upon report sheets approved by the Construction Manager. The reports, if found to be correct, shall be signed by both the Contractor and Construction Manager, or inspector, and a copy of which shall be furnished to the Construction Manager no later than the working day following the performance of said work. The daily report sheet shall thereafter be considered the true record of force account work provided. If the Construction Manager, or inspector, do not agree with the labor, equipment and/or materials listed on the Contractor's daily force account report, the Contractor and Construction Manager shall sign-off on the items on which they are in agreement. The Construction Manager shall then review the items of disagrees with this determination, it shall have the right to file a claim notice as provided in Paragraph 00700-7.4.2.1, **Notice**. The Contractor shall maintain its records in such a manner as to provide a clear distinction between the direct costs of work paid for on a force account basis and the costs of other operations.

To receive partial payments and final payment for force account work, the Contractor shall submit, in a manner approved by the Construction Manager, detailed and complete documented verification of the Contractor's and any of its subcontractor's actual costs involved in the force account pursuant to the pertinent Change Order or Field Order. Such costs shall be submitted within thirty (30) days after said work has been performed.

The force account invoice shall itemize the materials used and shall cover the direct costs of labor and the charges for equipment rental, whether furnished by the Contractor, subcontractor, or other forces. The invoice shall be in a form acceptable to the Construction Manager and shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated. Material charges shall be substantiated by valid copies of vendor's invoices.

When both additions and credits are involved in any one change, the combined overhead and profit shall be figured on the basis of the net increase, if any. The amount of credit to be allowed by the Contractor to the District for any such change which results in a net decrease in cost will be the amount of the actual net decrease and a credit in accordance with the markups allowed under the use of the method described in this Section. The Contractor shall not claim for anticipated profits on work that may be omitted.

# 4.0 UNIT PRICE ADJUSTMENTS DUE TO INCREASED OR DECREASED QUANTITIES

The unit prices as stated in the bid form and as negotiated in Change Orders shall apply to one hundred (100) percent of the quantity indicated to be estimated quantity for the bid item, plus or minus twenty-five (25) percent. Adjustments in unit prices will be made in accordance with Section 9-1.06, Increased or Decreased Quantities, and 9-1.15, Changes in Character of Work, of the State of California Specifications, with the following modifications:

- a. Delete all references to "Section 9-1.04" and insert "Paragraph 01035-3.0, <u>FORCE</u> <u>ACCOUNT PAYMENT</u>."
- b. Delete the last paragraph (fourth paragraph) of Section 9-1.15, Changes in Character of Work.

#### 5.0 TIME EXTENSIONS FOR CHANGE ORDERS

If the Contractor requests a time extension for the extra work necessitated by a proposed Change Order, the request must comply with the applicable requirements of Paragraph 01310-6.0, <u>TIME</u> <u>IMPACT ANALYSES</u>.

#### 6.0 CONTRACTOR CHANGE REQUESTS

Change requests may be initiated by the Contractor's Representative. Such requests must be presented in a format mutually agreeable to the Construction Manager, and shall include the following information:

- a. Reason for Request An introductory statement which clearly identifies the need for the change; change requests which do not directly benefit the District or the project, or which are intended solely as contractual relief shall be rejected.
- b. Nature of the Request A complete description of the requested change, its impact on the functional performance of the System, and its effect on the delivery schedule of the System.
- c. Cost or credit of the Requested Change The total impact on cost or credit to the District for the change to the System.

# 7.0 VALUE ENGINEERING COST PROPOSALS

Refer to section 00700-7.4, Value Engineering Change Proposals (VECP).

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# **SECTION 01040 - COORDINATION**

#### 1.0 GENERAL

This Section covers coordination requirements supplementary to those of the Contract and other Sections of these Specifications. These requirements may be modified as mutually agreed upon by the Contractor and Construction Manager.

The Contractor will obtain construction schedules from subcontractors and suppliers, and assume responsibility for correctness.

The contractor will incorporate schedules from subcontractors and suppliers into Progress Schedule to plan for and comply with sequencing constraints.

#### 2.0 COOPERATION WITH OTHERS

The Contractor is hereby advised that work on other contracts within or adjacent to its contract limits may already be in progress. Contracts for construction may also be subsequently awarded to others and because of relocation and construction of various utilities he may not have exclusive occupancy of the territory within or adjacent to the limits of the Contract.

# Contractor shall cooperate with the District's SCADA Integrator. Contractor shall provide the District's SCADA Integrator with documentation required to successfully incorporate the Project and telemetry readings into the existing, master SCADA system at 6200 Pirrone Road, Salida, CA.

In case of interferences between the operations of different construction contractors, the Construction Manager will determine the work priority of each contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Construction Manager shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for claims for additional compensation.

The Contractor shall coordinate his activities with the District as they relate to utility shutdowns. The District facilities must operate 24 hours per day, except as otherwise noted elsewhere in these specifications, and only the Owner's staff will be permitted to operate valves or other utilities.

#### 3.0 ORGANIZATION AND COORDINATION

#### 3.1 Monthly Reports

The Contractor shall prepare and submit a progress report to the Construction Manager by the tenth calendar day of each month. This progress report shall include a description of all efforts completed during the previous month, tasks scheduled for the next month, outstanding problems, and personnel changes. The report shall also include updated schedule milestones with narratives.

#### 3.2 Daily Reports

The Contractor shall complete a Contractor's daily report, a copy of which shall be submitted to the Construction Manager on a daily basis by the end of the succeeding work day. The information contained in the daily report shall include, but not necessarily be limited to, the following:

- Project name and number
- Contractor's name
- Date
- Report #\_\_ (also "page \_\_\_ of \_\_\_")
- Weather conditions
- Staff employed on the project and duties performed
- (Distinguish between field and office staff)
- Trades on job site, respective number of trades persons used, and work description
- Subcontractors on job site, number of respective subcontractor's staff present and work description
- Equipment on job site, type and number and whether or not used.
- Summary of work performed
- Materials delivered to site
- Delays to project
- Visitors to project
- Other comments
- Contractor's signature
- Safety/accident activities

The Contractor's standard daily report form may be used provided it furnishes, as a minimum, all the information cited above.

#### 3.3 Correspondence

All correspondence from the Contractor to the Construction Manager shall be dated and numbered in sequence. The Construction Manager will likewise number its correspondence and transmittals to the Contractor.

#### 4.0 SYSTEM OUTAGE REQUESTS

Modifications to existing facilities, the construction of new facilities, and the connection of new to existing facilities may require the temporary outage or bypass of treatment processes, equipment, utilities, or other facilities. In addition to the Construction Schedule required under Section 01310, the Contractor shall submit a System Outage Request (SOR) and a detailed outage plan and time schedule for all construction activities which will make it necessary to remove a tank, pipeline, channel, electrical circuit, control circuit, equipment, structure, road or other facilities from service.

The SOR and outage plan shall be submitted to the Construction Manager for review and acceptance a minimum of two weeks in advance of the time that such outage is needed. The outage plan shall be coordinated with the construction schedule specified in Section 01310 and shall meet the restrictions and conditions specified in this section. The detailed plan shall describe the Contractor's method for preventing bypassing of other facilities; the length of time required to complete said operation; any necessary temporary power, controls, instrumentation or alarms required to maintain control, monitoring and alarms for the District's facilities; and the manpower, plant and equipment which the Contractor shall provide in order to ensure proper operation of associated treatment units.

In addition, the outage plan shall describe the Contractor's contingency plan that shall be initiated in the event that his temporary facilities fail or it becomes apparent that the time constraints described in the approved outage plan cannot be met. The contingency plan shall conform to all specified outage requirements. All costs for preparing and implementing both the outage and contingency plans shall be borne by the Contractor with no additional compensation therefore. The Contractor shall provide, Monday through Friday at least two days prior to the actual shutdown, written confirmation of the shutdown date and time, or written notification that the schedule for performing the work has changed or revisions to the outage plan are required.

# 5.0 SEQUENCING OF THE WORK

Operations of the District's Covert Lift Station is critical to the public health and safety of the citizens of Salida. The lift station shall be remain fully operational at all times. Sufficient facilities to serve the needs and demands of the District shall remain in service at all times. The District shall be the sole judge as its needs and the facilities that must remain in service to provide adequate service.

The Contractor shall coordinate and cooperate with the District to establish his schedule for work at all of the project facilities. The approved project schedule shall be subject to change as it pertains to site work and shutdowns, when required by the District to accommodate unforeseen or emergency situations in the operation of its facilities.

#### 6.0 ACCESS TO PROJECT FACILITIES

The District will provide keys and alarm codes to the Contractor to provide access to each facility site included in this contract work. Keys and alarm codes will be provided only to the Contractor's Representative and jobsite foremen; the actual number of keys provided shall be determined by the District, based upon the Contractor's scheduling for work crews.

The Contractor shall ensure that each site is locked and secure, with alarm activated, at all times that workers are not at the site.

\*\*\* END OF SECTION \*\*\*

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# **SECTION 01050 - FIELD ENGINEERING**

## 1.0 CHECK OF EXISTING IMPROVEMENTS

It shall be the responsibility of the Contractor to check all dimensions, elevations, and location of existing structures, utilities, pipelines, grades or other existing items affected by or affecting the Work under this Contract, prior to the start of construction and ordering of materials and equipment affected thereby. The Contractor shall be solely responsible for determining the extent and cost of all removal and salvage operations. The Contractor shall notify the Construction Manager if existing conditions are not as shown on the Contract Documents.

#### 2.0 DATUM

Where applicable, elevation datum for this Project is based on the Project bench mark shown on the Drawings. All connections shall be installed based on actual elevations of existing structures to which connections are made.

#### 3.0 LINES AND GRADES

The Contractor shall lay out all work, including structures and pipelines, and shall be responsible for any errors resulting there from. In all questions arising as to proper location of lines and grades, the Construction Manager's decision will be final.

As part of the bid price for the construction of the improvements the Contractor shall provide and be responsible for the layout of all work on this project. The Contractor shall provide all necessary surveys, field staking, and positioning for the construction of all components at the proper alignment, elevations, grades, and positions, as indicated on the Drawings and as required for the proper operation and function. The Contractor shall stake the work limits.

The Contractor's layout shall be based on existing structures, survey control and bench marks established by the District.

The Contractor shall supply such labor as required, at no extra charge, to aid and assist the Construction Manager in checking location and grades of the work as set by the Contractor, if requested by the Construction Manager. This shall include moving materials and equipment located between monuments and the construction work.

\*\*\* END OF SECTION \*\*\*

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# **SECTION 01060 - REGULATORY REQUIREMENTS**

## 1.0 APPLICABLE CODES

This Section summarizes without limitation the laws and codes by which the Work has been designed and to which the Contractor shall conform in the prosecution of the Work. The Contractor shall make available for their use at the site such copies of laws, regulations, or codes applicable to the Work as the District may request of it.

#### 1.1 Laws and Regulations

- a. As specified in Sections 00700-4.11 and 00700-4.12 of the General Conditions, and in Section 7-1.09 of the Standard Specifications.
- b. In the event that utility or other conflicts require excavations of 5 feet or greater in depth, comply with the requirements of Sections 6705 and 6707 of the California Labor Code.

Before any excavation work requiring permits is commenced, secure and pay for the required excavation permits.

#### 1.2 Codes

- a. California Building Code (CBC), 2010 Edition.
- b. Title 8, Industrial Relations, California Administrative Code, Chapter 4, Division of Occupational Health and Safety, Safety Orders.
- c. Title 19, Public Safety, California Administrative Code, State Fire Marshal.
- d. Codes and Standards listed in Section 16010 of these Specifications.
- e. Local Mechanical Code.
- f. Local Plumbing Code.
- g. National Fire Protection Association.
- h. National Electric Code
- i. State and Local Public Health Codes.
- j. San Joaquin Valley Unified Air Pollution Control District Regulations.

#### 1.3 Specifications

Standard Specifications and State of California Specifications, as defined in Section 01090.

#### 2.0 LICENSES, FEES, AND PERMITS

The District will pay the fee for Stanislaus County issued permits specific to the Project; the Contractor will be responsible for picking up said permits at the appropriate times. For those permits and licenses generally required to work or do business as a Contractor, the Contractor shall procure the permit or license and pay all charges and fees. In <u>all</u> cases, the Contractor shall pay all costs for complying with special requirements of permits and shall give notice necessary and incident to the prosecution of the Work. For any permits obtained by the District after the Contract Bid Date, an adjustment (add or deduct) in the Contract Price, as appropriate, will be

Regulatory Requirements 01060-1 made by change order, to account for all costs incurred in complying with the requirements of the respective permit. See also Section 00700-4.9 of the General Conditions.

#### 2.1 Contractor's License

The Contractor shall possess at the time of bid and maintain throughout the duration of the contract, a valid California "Class A" and "C-10" Contractor's License.

#### 2.2 Business License

Not Applicable.

#### 2.3 State Stormwater Permit

Contractor shall be required to comply with all conditions of the State Water Resources Control Board ("State Water Board") National Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity ("Permit") for all construction activity which results in the disturbance of in excess of one acre of total land area or which is part of a larger common area of development or sale. Contractor shall be responsible for filing the Notice of Intent and for obtaining the Permit. Contractor shall be solely responsible for preparing and implementing a Storm Water Pollution Prevention Plan ("SWPPP") prior to initiating Work. In bidding on this Contract, it shall be the Contractor's responsibility to evaluate the cost of procuring the Permit and preparing the SWPPP, as well as complying with the SWPPP and any necessary revision(s) to the SWPPP. Contractor shall comply with all requirements of the State Water Resources Control Board. Contractor shall include all costs of compliances with specified requirements in the Contract amount.

- a. Contractor shall be responsible for procuring, implement and complying with the provisions of the Permit and the SWPPP, including the standard provisions, monitoring and reporting requirements as required by the Permit. Contractor shall provide copies of all reports and monitoring information to the Construction Manager.
- b. Contractor shall comply with the lawful requirements of any applicable state, county or other local agencies regarding discharges of stormwater to separate storm drain system or other water courses under their jurisdiction, including applicable requirements in stormwater management programs.
- c. Storm, surface, nuisance, or other water may be encountered at various times during the construction of the Work. Therefore, the Contractor, by submitting a Bid, hereby acknowledges that is has investigated the risk arising from such waters, has prepared its Bid accordingly, and assumes any and all risks and liabilities arising therefrom.

#### 2.4 Agency Permits

a. Any excavation, traffic control, or other work in Stanislaus County right-of-way (Covert Road and Toomes Road) shall require an Encroachment Permit from the County of Stanislaus Public Works Department.

# \*\*\* END OF SECTION \*\*\*

# **SECTION 01090 - REFERENCES**

#### 1.0 **DEFINITIONS**

Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, applicable, appropriate, sufficient, proper, desirable, necessary, prescribed, approved, acceptable, satisfactory or words of like import, refer to actions, expressions, and prerogatives of the District Design Consultant, or Construction Manager.

Masculine gender words include the feminine. References to gender, such as "workman" and "flagman" and the pronouns "he" or "his" referring to such titles, are abstract in the specifications, used for the sake of brevity, and are intended to refer to persons of either sex.

Singular words include the plural and "person" includes firms, companies, and corporations.

Where used in the Contract Documents, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine, and feminine of the words and terms.

<u>Acceptance</u> - The formal written acceptance by the District of an entire Contract which has been completed in all respects in accordance with the Contract Documents and any modifications thereof previously approved.

<u>Act of God</u> - An earthquake, flood, cyclone, or other cataclysmic phenomenon of nature. A rain, windstorm, high water, or other natural phenomenon, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as an Act of God.

<u>Addenda</u> - Written or graphic instruments issued prior to the bid which modify or interpret the Contract Documents, drawings, and specifications, by additions, deletions, clarifications, or corrections.

<u>Agreement</u> - The written document covering the performance of the Work as more fully described in the Contract Documents.

Authorized District Official - The District Manager-Engineer or his designee.

**Beneficial Occupancy** - The District operating and maintaining specific constructed facilities for the purpose for which they are intended, after District has provided written acceptance of substantial completion for such facilities.

**<u>Bid</u>** - The offer or proposal of the Bidder submitted on the prescribed form setting forth the price for the work to be performed.

**<u>Bidder</u>** - Any properly licensed and qualified individual, firm, partnership, corporation, joint venture, or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

**Bond(s)** - Bid, Performance, or Labor and Material Bonds and other instruments of surety, furnished by the Contractor and Contractor's surety in accordance with the Contract Documents.

<u>**Calendar Day</u>** - Any day including legal holidays, Saturdays and Sundays.</u>

**<u>Construction Manager</u>** - The person designated, in writing, by the District to act as its representative at the construction site and to perform construction inspection services and administrative functions relating to this Contract. Initial contact by the Contractor with the District shall be through the Construction Manager.

<u>Contract Change Order</u> - A written order to the Contractor, covering changes in the plans or quantities, or both, and establishing the basis of payment and time adjustments for the work affected by the changes. Also referred to as a Change Order.

<u>**Contract Documents</u>** - The words "Contract Documents" shall mean any or all of, but not limited to, the following items, as applicable:</u>

Notice Inviting Bids Instructions to Bidders Official Bidding Documents **Designation of Subcontractors Bid Guaranty Bond** Agreement Acknowledgments Performance Bond Payment Bond **General Conditions** Supplementary Conditions General Requirements Standard Specifications Technical Specifications Drawings and Plans Addenda, if any Executed Change Orders, if any Notice of Award Notice to Proceed Standard Drawings

Each of these items is to be considered by reference as part of the Contract Documents, also referred to as Contract.

**Contract Price** - The amount payable to the Contractor under the terms and conditions of the Contract based on the price given on the bidding schedule, with adjustments made in accordance with the Contract. The base amount given in the bidding schedule shall be either a lump sum bid or the summation of the unit price bids multiplied by the estimated quantities set forth in the bid form. Also referred to as Contract Amount or Contract Sum.

<u>Contract Time</u> - Number of calendar days stated in the Contract for the completion of the Work.

<u>Contract Completion Date</u> - The date on which the District accepts the work as being complete.

<u>Contractor</u> - The person or persons, firms, partnership, corporation, or combination thereof, who have entered with the District, as party or parties of the second part of its or their legal representatives.

<u>Contractor's Plant and Equipment</u> - Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the Work, but not to be incorporated in the Work.

Day(s) - Calendar Day(s).

**<u>Direct</u>** - Action of the District or Construction Manager by which the Contractor is ordered to perform or refrain from performing work under the Contract.

District - Salida Sanitary District.

**District's Representative** - The person designated, in writing, by the District to act as its agent on specified matters relating to this Contract. The District's Representative is an employee of the District or other individual who has been designated to represent the District. The District's Representative may also act as the Construction Manager.

**<u>Drawings</u>** - Refers to the Contract drawings, profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the Design Consultant, approved by the District, and are referred to in the Contract Documents, which show the location, character, dimensions, and details of the work to be performed. The terms drawing, plan and plans have the same meaning as the term drawings unless otherwise stated or specified.

**Design Consultant** - The engineer or architect designated by the District to have design control over the Work or a specified portion of the Work, acting either directly or through duly authorized representatives. Such representatives shall act within the scope of the particular duties delegated to them.

Engineer - See Resident Engineer.

<u>Field Directive</u> - Written documentation of the actions of the District or Construction Manager in directing the Contractor. Also referred to as a Directive.

**Field Order** - A written instruction given to the Contractor authorizing work that is a change to the scope of work carried out on a time and material basis.

**Final Completion** - Final Completion is the date upon which written acceptance by the District has occurred stating that the Construction of all work as required by the Contract Documents has been completed in accordance with the Contract Documents.

<u>Float</u> - Float or "total float" shall be defined as provided in the Associated General Contractors of America "CPM in Construction, A Manual for General Contractors."

**Furnish** - To deliver to the job site or other specified location any item, equipment, or material.

<u>General Conditions</u> - Part of the Contract Documents representing the general clauses that establishes how the project is to be administered.

<u>General Requirements</u> - Part of the Contract Documents establishing special conditions or requirements peculiar to the work and supplementary to the General Conditions.

<u>Geotechnical Engineer</u> - Registered professional engineer in the State of California who conducted the site sub-surface investigation and prepared the soils report utilized for design purposes.

Herein - Refers to information presented in the Contract Documents.

<u>Holidays</u> - Legal holidays designated by the District or specifically identified in the Contract and Paragraph 01010-13.0

**Inspector** - District or Construction Manager staff who inspect and review the work for conformance with the Contract Documents.

Install - Placing, erecting, or constructing any item, equipment, or material.

**Laboratory** - The designated materials testing laboratory authorized by the District to test materials and work involved in the Contract.

<u>Life Cycle Cost</u> - The sum of all costs over the useful life of a building, system, or product, including the cost of design, construction, acquisition, operation, maintenance, and salvage value. The useful life will be determined by the District.

**Liquidated Damages** - The amount prescribed in Paragraph 00700-6.5, <u>Liquidated Damages</u>, and Paragraph 01010-4.0, <u>DAMAGES FOR DELAYS</u>, to be paid to the District or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the Work beyond the time allowed in the specifications.

<u>Net Cost Savings</u> - The reduction in construction contract cost to the District resulting from implementation of a value engineering change proposal submitted by the Contractor. Net cost savings shall be determined by deducting from the estimated gross savings, the estimated amount of increased costs to the District resulting from the proposed change. Estimated gross savings shall include all labor, material, equipment, overhead, profit, and bond. Estimated District costs shall include, but not be limited to, design, construction, acquisition, operation, and maintenance costs.

**Notice of Award** - A written notice by the District to the Contractor informing it that the Contract has been awarded to the Contractor.

**<u>Notice to Proceed</u>** - The written notice by the District to the Contractor authorizing the Contractor to proceed with the Work and establishing the date of commencement of the Work.

<u>Official Bidding Document</u> - A separately bound manual which contains copies of all documents to be submitted as the bid.

Owner - Salida Sanitary District.

**<u>Paragraph</u>** - For references or citation purposes, refers to the paragraph(s), called out by paragraph number and alphanumeric designator.

**Person** - Includes firms, companies, corporations, partnerships, and joint ventures.

**<u>Project</u>** - The undertaking to be performed under the provisions of the Contract.

**<u>Project Manual</u>** - Those Contract Documents which are bound into one or more volumes prior to bidding.

**Provide** - Furnish and install, complete in place.

**<u>Punch List</u>** - List of incomplete items of work and of items of work which are not in conformance with the Contract.

**Resident Engineer** - Construction Manager or his designee.

<u>Sewer Standards and Specifications</u> - The Salida Sanitary District Sewer Standards and Specifications in effect at the time of advertising the Work.

**Shall** - Refers to actions by either the Contractor or the District and means the Contractor or District has entered into a covenant with the other party to do or perform the action.

<u>Shown</u> - Refers to information presented on the Drawings, with or without reference to the Drawings.

Site - The property as described in the General Conditions or as shown on the Drawings.

<u>Soils Engineer</u> - Shall mean the Engineer, or at his discretion, may mean the Geotechnical Engineer.

<u>Specifications</u> - That part of the Contract Documents consisting of the General Conditions, Supplementary Conditions, General Requirements, Salida Sanitary District Specifications, applicable State Standard Specifications, and Technical Specifications.

**Specify** - Refers to information described, shown, noted or presented in any manner in any part of the Contract.

<u>State of California Specifications</u> - The State of California Department of Transportation Standard Specifications in effect at the time of advertising the Work. Also referred to as State Standard Specifications and Cal Trans Standard Specifications.

<u>Subcontractor</u> - A subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the Site. The term subcontractor means a subcontractor or subcontractor's authorized representative. The term subcontractor, does not include any separate contractor or any separate contractor's subcontractors.

<u>Submittals</u> - The information which is specified for submission to the Construction Manager in accordance with the Project Manual.

**Substantial Completion** - Substantial Completion is the date upon which written acceptance by the District has occurred stating that the construction of facilities is sufficiently completed in accordance with the Contract Documents, such that specific facilities can be utilized for the purpose for which they are intended, and the District thereupon takes beneficial occupancy of each facility.

<u>Sub-subcontractor</u> - A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform any of the Work at the Site. The term sub-subcontractor means a sub-subcontractor or an authorized representative thereof.

**Supplier** - Any person, firm, corporation, or organization who supplies materials or equipment for the Work, including that fabricated to a special design, and may also be a Subcontractor or a Sub-subcontractor.

<u>Surety</u> - The person, firm, corporation, or organization that joins with the Contractor in assuming the liability for the faithful performance of the Work and for the payment of all

obligations pertaining to the Work in accordance with the Contract Documents by issuing the Bonds required by the Contract Documents or by law.

<u>Value Engineering</u> - Modifications to the project which are proposed by the Contractor and which provide the product or services equivalent to that called for in the project specifications, but at lower cost than the cost of those products or services designated in the specifications.

<u>Will</u> - Actions entered into by the Contractor or the District as a covenant with the other party to do or to perform the action.

<u>Work</u> - The labor, materials, equipment, supplies, and other items necessary for the execution, completion, and fulfillment of the Contract.

**Working Day** - Any day, other than a holiday, Saturday or Sunday, on which the Contractor may proceed with regular work on the current controlling operation as determined by the Construction Manager toward the completion of the Contract. A working day is equivalent to 1.45 calendar days.

#### 2.0 ABBREVIATIONS

Whenever the following terms are used, the intent and meaning shall be as follows:

American Association of State and Highway and Transportation
Officials
Architectural Aluminum Manufacturers Association
American Boiler Manufacturers Association
American Concrete Institute
Air Diffusion Council
American Gas Association
American Gear Manufacturers Association
American Institute of Steel Construction
American Iron and Steel Institute
Air Moving and Conditioning Association
American National Standard Institute (formerly United States of
America Standards Institute)
American Plywood Association
American Petroleum Institute
American Railway Engineers Association
American Society of Civil Engineers
American Society of Heating, Refrigerating and Air Conditioning
Construction Managers
American Society of Mechanical Engineers
American Society of Testing and Materials
American Wood-Preserver's Association

# Abbreviations Stands For

#### Abbreviations Stands For (cont.)

AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute CAL/OSHA State of California
	Department of Industrial Relations, Division of Industrial Safety
CBC	California Building Code
СВМ	Certified Ballast Manufacturers
CBR	California Bearing Ratio
CI	Chlorine Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Products Safety Commission
CBA	California Redwood Association
	California Redwood Association
	Cooling Tower Institute
	Develop Fir Dhused Acception
	Douglas Fil Plywood Association
	Electronic industries Association
	U.S. Environmental Protection Agency
EIL	Electronic Testing Laboratory
FM	Factory Mutual Insurance Company
FPS	Fluid Power Society
FS	Federal Specifications
GO 95	General Order No. 95, California Public Utilities Commission
	Rules for Overhead Electric Line Construction
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
IAPMO	International Association of Plumbing and Mechanical Officials
IBR	Institute of Boiler and Radiator Manufacturers
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCE	International Power Cable Engineers Association
ISA	Instrument Society of America
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NSF	National Sanitation Foundation
	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Act
PCMAC	Prestressed Concrete Manufacturers Association of California
SMACNA	Shoot Motal and Air Conditioning Contractors National
SIVIACINA	Association
22DC	Association Structural Steel Deinting Council TCA Tile Council of America
	Structural Steel Painting Council TCA The Council of America
	Uniform Flumping Code
	Underwriters Laboratories
WCLIB	vvest Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California

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# **SECTION 01200 - PROJECT MEETINGS**

# 1.0 PRE-CONSTRUCTION CONFERENCE

The Construction Manager will schedule a pre-construction conference and organizational meeting at the project site or other convenient location upon award and/or execution of the Contract and prior to commencement of construction activities.

# 1.1 Attendees

The District, Design Consultant, Contractor and its superintendent, invited subcontractors, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

# 1.2 Agenda

The Construction Manager will prepare an agenda for discussion of significant items relative to contract requirements, procedures, coordination and construction. The agenda may include, but may not be limited to:

- 1. Adequacy of distribution of Contract Documents.
- 2. Distribution and discussion of list of major subcontractors and suppliers.
- 3. Proposed progress schedules and critical construction sequencing.
- 4. Major equipment deliveries and priorities.
- 5. Project coordination.
- 6. Designation of responsible personnel.
- 7. Procedures and processing of:
  - a. Field decisions.
  - b. Proposal requests.
  - c. Submittals.
  - d. Change Orders.
  - e. Applications for Payment.
  - f. Record Documents.
- 8. Use of premises:
  - a. Office, construction, and storage areas.
  - b. OWNER's requirements.
- 9. Construction facilities, controls, and construction aids.
- 10. Shoring requirements and submittal of CONTRACTOR's geotechnical report.
- 11. Temporary utilities.
- 12. Safety and first aid procedures.
- 13. Security procedures.
- 14. Housekeeping procedures.

# 1.3 Minutes

Meeting minutes will be taken by the Construction Manager and distributed accordingly within fourteen (14) days. If the Contractor does not submit written objection to the contents of such minutes within seven (7) days after presentation to him, it shall be understood and agreed that the Contractor accepts the minutes as a true and complete record of the meeting.

# 2.0 PROGRESS MEETINGS

The Construction Manager will conduct progress meetings at the project site at regularly scheduled intervals which may be as frequent as weekly. Frequency of meetings are to be determined at the pre-construction conference.

# 2.1 Schedule

The dates, times and locations for the various meetings shall be agreed upon and recorded at the preconstruction conference. Subsequent changes to the schedule shall be by agreement between the Construction Manager and Contractor, with appropriate written notice to all parties involved.

#### 2.2 Attendees

The District, Design Consultant, Construction Manager, Contractor, and its Superintendent shall each be represented at these meetings. Attendance by subcontractors, suppliers and other entities is subject to issues and/or items of the agenda which may, or may not, require attendance.

# 2.3 Agenda

Purpose of progress meetings: To expedite work of subcontractors or other organizations that are not meeting scheduled progress, resolve conflicts, and coordinate and expedite execution of the Work.

- 1. Review progress of the Work, Progress Schedule, narrative report, Application for Payment, record documents, and additional items of current interest that are pertinent to execution of the Work. Verify: Actual start and finish dates of completed activities since last progress meeting.
- 2. Durations and progress of activities not completed.
- 3. Reason, time, and cost data for Change Order Work that will be incorporated into Progress Schedule and application for payment.
- 4. Percentage completion of items on Application for Payment.
- 5. Reasons for required revisions to Progress Schedule and their effect on Contract Time and Contract Price.
- 6. Discuss potential problems which may impede scheduled progress and corrective measures.

# 2.4 Minutes
Meeting minutes will be taken by the Construction Manager and distributed accordingly within fourteen (14) days. If the Contractor does not submit written objection to the contents of such minutes within seven (7) days after presentation to him, it shall be understood and agreed that the Contractor accepts the minutes as a true and complete record of the meeting.

## 3.0 CONFERENCES

At any time during progress of the Work, the District and the Construction Manager shall have the authority to require the Contractor and any subcontractor, suppliers, or service providers to attend job-site conferences. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to the District.

## 4.0 POST CONSTRUCTION MEETING

The Contractor shall plan, and include in its bid, all costs for a post construction meeting, including the following:

The Contractor shall:

- A. Meet with and inspect the Work 11 months after date of Substantial Completion with District and Construction Manager.
- B. Arrange the meeting at least 7 days before meeting.
- C. Meet in the District's office or other mutually agreed upon place.
- D. Inspect the Work and draft list of items to be completed or corrected.
- E. Review service and maintenance contracts, and take appropriate corrective action when necessary.
- F. Complete or correct defective work and extend correction period accordingly.
- G. Require attendance of Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors.

## \*\*\* END OF SECTION\*\*\*

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# **SECTION 01300 - SUBMITTALS**

## 1.0 DESCRIPTION

This Section covers requirements for submittals and forms a part of all other Specification Sections in which submittals are specified or required. Refer to the specific Sections and Divisions of the Specifications for additional submittal requirements.

#### A. <u>Submittal Requirements Included In This Section</u>

- 1. Number of submittal copies required.
- 2. Progress schedule.
- 3. Schedule of values.
- 4. Shop drawings.
- 5. Samples.
- 6. Materials lists and equipment data.
- 7. Instruction (operation and maintenance) manuals.
- 8. Installation instructions.
- 9. Record Drawings and Specifications.
- 10. Certificates.

#### B. Submittal Requirements Covered In the Conditions of the Contract and Other Sections

- 1. Applications for payments.
- 2. Schedule of testing laboratory services.
- 3. Written guarantees and warranties.
- 4. Manufacturers' certified reports.
- 5. Web Based Construction Document Management

## 2.0 SUBMITTAL-GENERAL REQUIREMENTS

Submit to the Owner for its review and approval technical data and drawings for all shop drawings, samples, materials lists, equipment data, software, assemblies and installations, test procedures, instruction manuals, record documents, manufacturers' equipment manuals, and other submittals required by the Technical Specifications. All such items required to be submitted for review shall be furnished by and at the expense of the Contractor and any work affected by them shall not proceed without such review. Properly prepare, identify, and transmit submittals and their contents as provided herein or as the Owner may otherwise direct. Except for record documents, test procedures, and instructional manuals for operation and maintenance, obtain submittal approval before the material or equipment covered by the submittal is delivered to the site. Contractor will not be paid for equipment or material delivered to the project site until the appurtenant submittals have been approved. Coordinate the progress schedule required under Section 01310 and the Special Provisions to this requirement.

A. <u>Submittal Review Time</u> Allow no less than thirty (30) days for the review of submittals, not including the time necessary for delivery or mailing, and this time shall cause no delay in the Work. Extension of the Contract Time shall not be granted because of the Contractor's failure to make timely and correctly prepared and presented submittals with allowance for the checking and review periods. All submittals shall be completed within ninety (90) days after Notice to Proceed by the District, unless the Construction Manager accepts an alternate

Submittals 01300-1

schedule for submission of submittals proposed by the Contractor. This time provision does not obligate the Construction Manager to approve submittals that may otherwise be deemed not acceptable.

- B. <u>Deviations</u> At the time of the submission, give notice in writing in the submittal of any deviation from the requirements of the Technical Specifications and Project Plans. Clearly indicate or describe the deviations and reasons therefore, including all other changes required to correlate the Work. State in writing all variation in costs occasioned by the deviations and any assumption of the cost of all related changes if the deviation is approved. Requirements stated in Paragraph E below shall also apply.
- C. <u>Number of Submittals</u> Except for manufacturer's instruction manuals and samples, the Owner shall require and retain four (4) copies of all submittals, specified or required in this and all other Sections of these Specifications, for his and his representatives' use, unless otherwise specifically noted in a specific Specification section. Submit such additional number of copies, not to exceed four (4), to be reviewed and returned for your use. For submitted drawings 11 x 17 and larger, submittal of a reproducible copy set with two (2) sets of black-line printed copies is preferred and encouraged. Additional sets for the Contractor's use are not necessary in this case as the reproducible set will be returned to the Contractor marked to show the required corrections or approval.

The number of submittals required for manufacturer's instruction manuals and samples are described later in this Section.

- D. Method of Submittal Deliver submittals by means of separate, dated, signed, and sequence numbered transmittals, identifying as to initial or re-submittal status, and fully describing the submittal contents. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole. Except as noted, do not combine in a single submittal equipment which is specified in one section of the Specifications with equipment specified in other Sections of the Specifications. Submittals are not acceptable directly from Subcontractors, suppliers, or manufacturers. In each transmittal state the Owner's Project Number and Name, Name and Address of Contractor, Name and Address of Subcontractor, Manufacturer, Supplier or Distributor as applicable, Plan Reference and Specification Section, Articles, and paragraphs to which the submittal pertains; identify accompanying data sheets, catalogs, and brochures in the same manner. Where several types or models are contained in the literature, delete non-applicable portions or specifically indicate which portions are intended and applicable. Fully index all items submitted in the transmittal letter.
- E. <u>Submittals in electronic media format</u>
  - 1. General: Provide all information In PC compatible format using operating system as utilized by the Construction Manager and District.
  - 2. Text: Provide text documents and manufacturer's literature using current version of MS Word or Adobe Acrobat (i.e. PDF extension) as utilized by the District and Construction Manager.
  - 3. Graphics: Provide all graphic submittals (drawings, diagrams) utilizing current version of AutoCAD, Microstation, Adobe Acrobat (i.e. PDF extension) as utilized by the Construction Manager and District.

- 4. Contractor using other software shall be required to provide to the Construction Manager conclusive evidence of 100 percent data transfer compatibility.
- 5. Delivery: Deliver submittals to Construction Manager.
- 6. <u>Incomplete Submittals</u>, including those not correctly transmitted, not correctly titled and identified, or not bearing the Contractor's review and approval stamp, shall be returned to the Contractor without review.
- 7. <u>Interrelated Submittals</u>, except where the preparation of a submittal is dependent upon the approval of a prior submittal, simultaneously submit all submittals pertaining to the same class or portion of the Work.

During the preparation of submittals, informal communication and clarifications may be required between the Contractor and the District for exchange of technical information to assist and expedite preparation of complete submittals. As a result of this informal information exchange, certain minor refinements and revisions in the systems specified may be authorized informally by the District, but these shall not alter the scope of work or case increase or decrease in the Contract price. During this informal exchange, no oral statement by the District shall be construed to give formal approval of any component or method, nor shall any statement be construed to grant formal exception to, or variation from these Specifications.

F. <u>Contractor's Review and Approval</u> All submittals shall be submitted as the instruments of the Contractor, who shall be responsible for their accuracy and completeness and coordination. Such responsibility shall not be delegated in whole or part to subcontractors or suppliers. These submittals may be prepared by the Contractor, subcontractors, or suppliers, but the Contractor shall ascertain that submittals meet all of the requirements of the Contract Documents. The Contractor shall insure that there is no conflict with other submittals and notify the Construction Manager in each case where its submittal may affect the work of another contractor or the District. The Contractor shall insure coordination of submittals among the related crafts and subcontractors.

On every submittal of shop drawings, samples, materials lists, equipment data, instruction manuals, and other submittals upon which the proper execution of the Work is dependent, mark with the Contractor's review and approval stamp certifying that (1) the submittal has been reviewed, checked, and approved and the contents have been coordinated with the requirements of the Work and the Technical Specifications and Project Plans including related Work, (2) all quantities, field measurements, field construction criteria, materials, equipment, catalog numbers, and similar data have been determined and verified, or that it shall be done, and (3) the Work covered by the submittal is recommended by the Contractor and the Contractor's guarantee shall fully apply thereto. The Contractor's stamp shall be dated and signed by the Contractor in every case.

G. <u>Review and Approval</u> Submittals will be reviewed only for conformance with the design concept of the Project and with the information given in the Technical Specifications and Project Plans. The approval of a separate item as such shall not indicate approval of the assembly in which the item functions nor shall approval be construed as revising, in any way, the requirements for a fully integrated and operable system as specified. The approval of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Technical Specifications and Project Plans or for any revision in resubmittals unless the Contractor has given notice in writing of the deviation or revision at the

time of submission or resubmission and written approval has been given to the specific deviation or revision. The approval of submittals shall not relieve the Contractor of responsibility for errors or omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution, and completion of the Work.

H. <u>Form of Approval</u> Review of submittals has as its primary objective the completion for the District of a project in full conformance with the Contract Plans and Specifications, unmarred by field corrections, and within the time provided. In addition to this primary objective, submittal review as a secondary objective will assist the Contractor in its procurement of equipment that will meet all requirements of the project Plans and Specifications, will fit the structures detailed on the Plans, will be completed with respect to piping, electrical, and control connections, will have the proper functional characteristics, and will become an integral part of a complete operating facility.

After review by the Design Consultant of each of the Contractor's submissions, the material will be returned to the Contractor with actions defined as follows:

- 1. NO EXCEPTIONS NOTED (RESUBMITTAL NOT REQUIRED) Accepted subject to its compatibility with future submissions and additional partial submissions for portions of the work not covered in this submission. Does not constitute approval or deletion of specified or required items not shown in the partial submission.
- 2. MAKE CORRECTIONS NOTED (RESUBMITTAL NOT REQUIRED) Same as 1, except that minor corrections as noted shall be made by the Contractor.
- AMEND AND RESUBMIT- Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Design Consultant.
- 4. NOT ACCEPTABLE (RESUBMIT) Submitted material does not conform to Plans and Specifications in major respect (i.e., wrong size, model, capacity, or material).

Items 1 and 2 above (no re-submittal required) are considered "favorable review." Items 3 and 4 above (correction and re-submittal required) are considered "unfavorable review." It shall be the Contractor's responsibility to copy and/or conform reviewed submittals in sufficient numbers for its files, subcontractors, and vendors.

- I. <u>Corrections and Re-submittals</u> Make all required corrections and resubmit the required number of corrected submittals until approved by the Owner. Direct specific attention in writing to revisions other than the corrections called for by the Owner on previous submittals, and state in writing all variations in costs and your assumption of the cost of related changes the same as is required for deviations in 2.0B. Identify each re-submittal with number of the original submittal followed by consecutive letters starting with "A" for first re-submittal, "B" for second re-submittal, etc. The Owner reserves the right to deduct moneys from the amounts due the Contractor to cover the cost of its review time for any and all submittals beyond the second submission.
- J. <u>Check of Returned Submittals</u> Check returned submittals for correction and ascertain if the corrections result in extra cost above that included under the Technical Specifications and Project Plans, and give written notice to the Owner within five days if, in your opinion, such

extra cost results from corrections. By failing to so notify the Owner or by starting any Work covered by a submittal, all claims for extra costs resulting from required corrections are waived.

- K. <u>Conformance</u> Do not purchase, fabricate, deliver, construct, or commence any Work represented by required submittals until the applicable submittal has been approved. Conform Work to the approved submittals and all other requirements of the Technical Specifications and Project Plans unless subsequently revised by contract change order, in which case prepare and submit revised submittals as may be required. Do not proceed with any related Work which may be affected by the Work covered under submittals until the applicable submittals have been approved, particularly where piping, machinery, equipment, concrete work and the required arrangements, embedments and clearances are involved.
- L. <u>Piecemeal Submittals</u> Except for reinforcing steel submittals, piecemeal submittals shall be returned un-reviewed. However, for mechanical equipment and the like, separate submittals for embedded items, embedded metal work and anchors shall be reviewed.

## 3.0 SCHEDULE OF VALUES

Submit to the Owner for acceptance, in the form directed by or acceptable to the Owner, a complete schedule of the values of the various portions of the Work to coincide with the construction schedule, including quantities and unit prices aggregating the Contract Price (except in cases and to the extent that accepted unit prices form the basis for payment). In the schedule, subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction and to coordinate with the progress schedule required for this Work. Provide support data to substantiate its correctness as required by the Owner. Include with each item in the schedule of values, its proper share of overhead and profit. An unbalanced breakdown providing for overpayment to the Contractor on items of Work which would be performed first will not be approved. The schedule of values, when accepted by the Owner, shall be used only as a basis for the Contractor's applications for payment and not for additions to or deductions from the Contract Price. Provide the initial submittal for the schedule of values at the preconstruction conference as per Section 01200.

## 4.0 PROGRESS SCHEDULE

Refer Section 01310, Construction Schedule.

#### 5.0 SHOP DRAWINGS

Each submittal shall be complete with respect to dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and shall be accompanied by technical and performance data as necessary to fully illustrate conformance with the Technical Specifications and Project Plans. Provide the number of submittal sets as indicated in paragraph 2.0C of this Section.

- A. <u>Title Block and Identification</u> On each shop drawing, provide a space for the Engineer's approval or correction stamp and a title block showing the following:
  - 1. Name and address of Contractor.

- 2. Name and address of Subcontractor, manufacturer, supplier, or distributor, as applicable.
- 3. Name and address of Owner.
- 4. Date, scale of drawings, and identification number.
- 5. Revision date, number, and brief description.
- 6. Contractor's review and approval stamp.
- 7. Owner's Number.
- 8. Plan Reference and Specification Section reference.
- 9. Project Name.
- B. <u>Preparation and Size</u> Details and information shall be clearly drawn, dimensioned, noted, and cross referenced. Unless otherwise approved, prepare shop drawings of the same size as the Contract Drawings or on 8-1/2 by 11 inch or 11 x 17 inch sheets as applicable. Maximum sheet size shall be 22 inches by 34 inches. Refer to Paragraph 2.0C above regarding use of a reproducible copy set for the larger drawings.

Submittal and record drawings shall be drafted and submitted in AutoCAD with two copies of half sheet drawings and a magnetic media copy on a CD.

- C. <u>Data</u> Unless the following data is included in the instruction manuals or equipment data submitted prior to or with the shop drawings, submit with the shop drawings complete catalog and technical data for all manufactured products, materials, machinery, and equipment covered by the shop drawing submittal. Include data showing for each item, as applicable, the following information:
  - 1. Manufacturer's specifications and details.
  - 2. Applicable technical data and performance curves.
  - 3. Preparation, assembly, and installation instruction with allowable tolerances.
  - 4. Connection requirements.
  - 5. Pre-start-up servicing and operating methods.
  - 6. Other data and information necessary to demonstrate that the proposed items conform to the Technical Specifications and Project Plans.
- D. <u>Information Required</u> Shop drawings shall contain details and information fully developing the pertaining Technical Specifications and Project Plans requirements and such other information as may be specified or required for approval, including but not limited to:

- 1. Related work with cross references to applicable portions of the Technical Specifications and Project Plans.
- 2. Dimensions including variations between indicated dimensions and actual conditions.
- 3. Physical configurations with critical dimensions for clearance, access, and servicing.
- 4. List of materials including fasteners and connectors.
- 5. Structural construction and assemblies, welds shown by AWS symbols, and each fastener and connector shown by type and class.
- 6. Grouting work, including grouting space and material.
- 7. Concrete foundations and bases for machinery and equipment including joints, joint filler and sealer, and reinforcing.
- 8. Anchor bolt details showing type and class, sizes, embedments, projections, and locations measured with respect to permanent structural features. An anchor bolt template shall be shown on the Shop Drawings and shall be furnished unless waived in writing by the Owner.
- 9. Protective coatings and factory finishes fully described as to materials, number of coats, plated and metallic coating finishes, treatments, and similar information, all based on specified requirements. The term "as specified" is not acceptable for this purpose.
- 10. Machinery and equipment details. Standard catalog items need not be illustrated in detail, but indicate and detail sizes, supports, and connections.
- 11. Location of auxiliary items that are parts of machinery and equipment including sight glasses, petcocks, gauges, lubrication fittings and access, and maintenance monitoring devices.
- 12. Piping systems and piping including layout, fittings, valves, appurtenances, hangers and supports, and sleeves.
- 13. Electrical equipment showing plans, elevations, sections, arrangements, materials, anchor bolts, supports, weights, wiring and circuit diagrams, internal connections, busses, grounding, conduit spaces, layout of instruments, gages, meters, and other components. Diagrams shall carry a uniform and coordinated set of wire numbers and terminal block numbers to permit cross-referencing between the contract document drawings, the drawings prepared by the Contractor's installer, and equipment Technical Manual Drawings. Drawing number cross-referenced shall be provided.
- 14. Written descriptions fully describing the operation of all control circuits, start-up sequencing, shut down sequencing and alarms.
- 15. Underground duct banks showing typical details of conduits, joints, spacers, and means of securing conduits in place during concrete placement.

- 16. Dielectric connections, and materials and methods to be used to isolate aluminum from dissimilar materials.
- 17. Full-size lettering layouts for data plate and nameplate inscriptions.
- E. <u>Details and Connections</u> Satisfactorily detail all connections required to complete the Work, including details necessary to make indicated or specified additions to existing work or to provide connections for future work. Design connections and parts of strength to withstand, without adverse deflection or stress, all loads or pressures to which they may be subjected and to develop the strength of the members or parts connected. In no case shall the connections, parts, or details be inferior to those required by the Technical Specifications or Project Plans.
- F. <u>Related Work</u> The term "by others" is not acceptable for the description of related work shown in the shop drawings. Clearly note by name or description the Contractor, Subcontractor, or trade to provide such related Work; where such name or description is missing, it shall be understood and agreed that the Contractor is to furnish and install such related Work.
- G. <u>Clearances</u> Do not proceed with any related Work that may be affected by piping, machinery, equipment, or other work therein until shop drawings and data showing all components with acceptable clearances have been approved.
- H. <u>Composite Shop Drawings With Installation Layouts</u> Prepare and submit drawings, wherever specified or required, to resolve tight or conflicting field conditions. Show dimensional plans and elevations of the materials or equipment of all trades in the involved area or space, and include complete information as to arrangements, locations, clearances, avoidance of interferences, access, sizes, supports, connections, services, assembly, disassembly, and installation. Composite shop drawings and layouts shall be coordinated in the field by the Contractor and his Subcontractors for proper relationship to the Work of all trades, based on field conditions, and shall be checked and approved by them before submittal. Contractor shall have competent technical personnel readily available for such coordinating and checking.

## 6.0 SAMPLES

Where samples are required in any of the following Specification Sections, unless otherwise specified, each sample submittal shall include two sets of samples. One set of approved samples and all disapproved samples shall be returned to the Contractor. Samples of value retained by the Owner shall be returned to the Contractor after completion of the Work if the Contractor's first transmittal of the sample requests its return. Approved samples of manufactured items returned to the Contractor may be installed in the Work if the location is recorded and the samples bear temporary identification as such.

- A. <u>Identification</u> Label or tag each sample or set of samples identifying the manufacturer's name and address, brand name, catalog number, intended use and other data as required by these Specifications.
- B. <u>Colors, Patterns, and Textures</u> For items required to be of selected and approved colors, patterns, textures, or other finish, submit sufficient samples to show the range of shades,

tones, values, patterns, textures, or other features corresponding to the instructions and requirements specified.

- C. <u>Field-Applied Paint and Coatings</u> Submit samples of finishes at least 60 days prior to start of such finishing operations in conformance with requirements specified in Section 09900, Painting and Protective Coatings.
- D. <u>Factory Finish Colors</u> of material specified to be furnished with a factory finish are subject to approval. Submit duplicate samples of factory finishes showing the full range of available colors for selection and approval when requested by the Owner.

### 7.0 MATERIALS LISTS AND EQUIPMENT DATA

Within thirty (30) days after the Notice to Proceed, the Contractor shall submit a List of Materials to the Construction Manager for review. The List shall include all items of equipment and materials for mechanical, piping, architecture, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been or will be placed. Items on the List shall be arranged in the same order as in these Specifications, and shall contain sufficient data to identify precisely the items of material and equipment the Contractor proposes to furnish. The List shall include the Specifications or Drawing references. After the submission is favorably reviewed and returned to the Contractor by the Construction Manager, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review as set forth elsewhere in the Contract Documents. The favorable review of shop drawings shall be obtained prior to the fabrication, delivery and construction of items requiring shop drawing submittal.

In determining acceptability, consideration shall be given to the availability of maintenance and replacement parts and materials, the availability of manufacturer's technical representatives, other factors that relate to the maintenance and repair of installed items without excessive inconvenience to the Owner, guarantees and warranties, as well as determination of conformance with the Technical Specifications and Project Plans.

- A. <u>Materials Furnished Under Standard Specifications</u> For materials specified by reference to standard or reference specifications, prepare and submit for approval a list of such materials by manufacturer's names and identifications to the extent requested by the Owner.
- B. <u>Material Lists</u> Neatly bind submittal copies with sturdy labeled covers. Copies shall contain an index listing the contents. Loose submittals shall be returned un-reviewed. For each item listed, include the manufacturer's name and address, trade or brand name, local supplier's name and address, catalog numbers and cuts, brochures, terms and conditions of manufacturer's guarantee and warranty, other information to fully describe the item, and supplementary information as may be required for approval. Mark cuts, brochures, and data to indicate the items proposed and the intended use. Provide the number of submittal sets as specified in Paragraph 2.0C above.
- C. <u>Equipment Data</u> Submit complete technical and catalog data for every item of mechanical and electrical equipment and machinery to be incorporated in the Work, including components. Submittal copies shall be bound, indexed, and contain information as required in paragraph 7.0B for submittal of materials lists and shall further include specific information on performance and operating curves and data, ratings, capacities, characteristics, efficiencies, and other data to fully illustrate and describe the items as may be specified or

required for approval, in particular, equipment incorporating logic circuits shall have a draft of a detailed theory of operation. Data shall be submitted in sets covering complete systems or functioning units. The number of submittal sets required shall be as specified in Paragraph 2.0C above.

D. <u>Foreign Materials</u> which are manufactured, produced or fabricated outside of the United States shall be delivered to a distribution point in Salida, unless otherwise required in these specifications or the special provisions, where they shall be retained for a sufficient period of time to permit inspection, sampling, and testing.

Attention is directed to the provisions in Section 00700-6.5 <u>Liquidated Damages</u>. The Contractor shall not be entitled to an extension of time for acts or events occurring outside of the United States and it shall be the Contractor's responsibility to deliver materials obtained from outside of the United States to the point of entry into Continental United States in sufficient time to permit timely delivery to the job site.

The Contractor, at no cost to the District, shall supply the facilities and arrange for any testing required in Salida which the District is not equipped to perform. All testing by the Contractor shall be subject to witnessing by the District.

The manufacturer, producer or fabricator of foreign material shall furnish to the District a Certificate of Compliance. In addition, certified mill test reports clearly identifiable to the lot of material shall be furnished where required in these specifications or otherwise requested by the District.

#### 8.0 INSTRUCTION MANUALS

Obtain data from the various manufacturers and submit instruction (operation and maintenance) manuals covering all mechanical and instrumentation equipment and machinery installed in the Work.

- A. <u>Contents</u> Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
  - 1. General, introduction and overall equipment description, purpose, functions, and simplified theory of operation.
  - 2. Specifications.
  - 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal, and vertical alignment.
  - 4. Grouting requirements including grout spaces and materials.
  - 5. List showing lubricants for each item of mechanical equipment, approximate quantities needed per year, and recommended lubrication intervals; where possible, types of lubricants shall be consolidated with equipment manufacturers' approval to minimize the number of different lubricants required for plant maintenance.
  - 6. Start-up and beginning operation procedures.

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- 7. Operational procedures.
- 8. Shutdown procedures.
- 9. Short and long term inactivation procedures.
- 10. Maintenance, calibration, repairs and rebuilds instruction.
- 11. Parts lists and spare parts recommendations.
- 12. Lists of all special tools, instruments, accessories, and special lifting and handling devices required for periodic maintenance, repair, adjustment, and calibration.
- 13. Wiring diagrams and detailed circuit operation description.
- 14. Performance curves and data.
- 15. Other information as may be specified or required for approval.

In addition to the above information, the Contractor, with the assistance of the respective equipment manufacturer, shall complete and include as part of the instruction manual for all equipment and machinery, the District's "Preventative Maintenance Modification/Addition Request Form." A copy of the subject form is included at the end of this Section for information. Both pages of the entire form must be completed by the Contractor. Clean copies of this form will be provided to the Contractor for his use. A copy of the District's "PM Procedure Number and Description Report" will be provided to the Contractor and is to be used in completing the aforementioned form.

#### B. Format and Organization

- 1. Use drawings and pictorials to illustrate the printed text as necessary to fully present the information.
- 2. Where information covers a family of similar items of equipment, identify the applicable portions by heavy weighted arrows, boxes or circles, <u>or strike-out the inapplicable information</u>. Non-conforming data are not acceptable and shall be returned for rework and re-submittal. The submittal cover should state the method used to identify the applicable portions.
- 3. Incorporate into books all Manufacturers' Equipment Manuals including those specified in pertinent Sections of the Specifications. These books shall be organized by Equipment Class in same manner and sequence as the Specifications, i.e. Mechanical, Electrical, Instrumentation, etc. Book size and quantity shall be sufficient for inclusion of all data, and be of type and quality hereinafter specified in Paragraph 8.0C below.
- 4. Within <u>each</u> book of manuals, provide a Table of Contents for that book. If more than one book is necessary for a Class of Equipment, place a complete Table of Contents for that Class of Equipment within each book of that Class.

- 5. In addition, an overall Index of Contents shall be prepared in the same number of sets as required below for the final manuals and submitted separately to the Owner for his insertion in the Operation and Maintenance Manuals.
- 6. When a manufacturer's manual exceeds one inch in thickness and is bound as specified in Paragraph 8.0C it need not be rebound within another book, but the Overall Index shall refer to it by title and indicate that it is bound separately.
- 7. Electronic assembly drawings: Detailed circuit schematics, circuit board drawings, and chassis layouts shall be provided for all electrical and electronic equipment as part of the submittal. The circuit schematics, circuit board drawings, and chassis layouts shall clearly show, locate, and identify all components and component wiring. Circuit boards and circuit board components shall be identified by the original manufacturer's name and part number. Component values and tolerance shall be shown.
- 8. Drawings: Preprinted drawings provided by manufacturers of off-the-shelf equipment may be used if the drawings are an integral part of an offset printed O&M Manual, are not larger than 11-inches by 17-inches, are clearly legible when reproduced using conventional office copying machines, and, in the opinion of the Construction Manager, satisfy the requirement of these specifications. One reproducible of the O&M Manual drawing original must be supplied for each O&M Manual drawing larger than 11-inches by 17-inches, and must satisfy all drawing requirements specified herein. Those preprinted O&M Manual drawings, which are not acceptable, or which must be modified or corrected to show the actual as-built design, shall be redrawn as new speciallyprepared shop drawings. Acceptable equipment manufacturer's drawings incorporated into equipment operating and maintenance manuals need not be duplicated or removed from the manuals.

## C. Manual Binding

- 1. Bind all materials in sturdy three-ring loose leaf binders designed to provide full view opening and ease of making content additions or replacements. Maximum binder size shall be three (3) inches, with this binder size containing not more than 2<sup>1</sup>/2 inches of material. Binders of smaller thickness shall contain correspondingly less material. All bound material shall be three-hole punched; loose material shall not be permitted. Prints larger than 11 x 17 inches shall be inserted into a clear plastic cover envelope equipped with a three-hole tab on one edge suitable for inserting in the above described binders.
- Permanently label face of cover and bound edge of each book "MANUFACTURERS' INSTRUCTION MANUAL," and indicate Class of Equipment, i.e., Mechanical, Electrical, Instrumentation, etc. or name specific equipment if a single unit is contained. Where more than one book is needed for a Class of Equipment or a single specific equipment unit, number books consecutively BOOK I, BOOK II, etc.
- 3. If more than one Class of Equipment is contained in a book, separate each class with a tabbed stiff divider insert page.
- 4. Prior to purchase or delivery, submit samples of each intended type of binder and obtain approval from the Owner.

D. <u>Manual Submittals</u> Submittals shall include three (3) complete copies of each manual, one of which shall be returned to the Contractor marked to show the required corrections or approval. When approved, the Contractor shall deliver four (4) sets of unmarked (without review comments) manuals and one electronic PDF version of the manual to the Owner. The Contractor shall submit preliminary instruction manuals at least ten (10) days prior to the start of Factory Acceptance test.

In addition to the above information, the Contractor, with the assistance of the respective equipment manufacturer, shall complete and include as part of the instruction manual for all equipment and machinery the District's "Equipment Data and Preventive Maintenance Tasks Sheet." A copy of the subject form is included at the end of this Section for information.

## 9.0 INSTALLATION INSTRUCTIONS

In addition to the instructions submitted under the above Section 8.0, submit copies of manufacturers' installation instructions for material and equipment incorporated in the Work to the extent specified in other Sections and Divisions of the Specifications or requested by the Owner for its review. Installation instructions shall be reviewed for general adequacy only. After review, the Contractor shall distribute copies to all those involved with the instructions.

## 10.0 DISTRICT PERSONNEL TRAINING PLAN

The Contractor shall submit a training plan at least fourteen (14) days prior to the start of any required District personnel training. Training plans shall describe the training course objectives, the scope of subjects to be covered, course outline including approximate time devoted to each subject, course materials to be provided by the Contractor, training aids to be used and training methods to be used (lecture, demonstration, student practice, etc.). The submittal shall include resumes for instructors of each class demonstrating the instructor's qualifications.

#### 11.0 OTHER SUBMITTALS

Provide copies of other submittals such as calculations, manufacturer's certified reports, operational demonstration and system validation reports specified in other Sections and Divisions of the Specifications.

#### 12.0 STORAGE INSTRUCTIONS

For each equipment and material item furnished, provide for the Owner's records two (2) copies of the manufacturer's recommended instructions for storage of the respective equipment or material. The instructions shall address conditions both before installation and (for mechanical, electrical and instrumentation equipment) after installation but before placing into continuous operation. Submit manufacturer's storage instructions either prior to delivery of the material/equipment or with the request for payment of materials delivered. Payment for materials delivered shall not be approved without submittal of the manufacturer's storage instructions.

### 13.0 TOOLS, ACCESSORIES, SPARE PARTS, AND MAINTENANCE MATERIALS

Furnish and deliver all special tools, instruments, accessories, spare parts, and maintenance materials required by the Technical Specifications and Project Plans, and furnish and deliver the special tools, instruments, accessories, and special lifting and handling devices shown in the approved instruction manuals. Unless otherwise specified or directed, deliver the items to the Owner, with the Contractor's written transmittal accompanying each shipment, in the manufacturers' original containers labeled to describe the contents and the equipment for which it is furnished. Where specifically required in the Section covering the material, furnish a metal cabinet to house this equipment.

Provide spare parts and special tool lists. The list shall show the manufacturer's/supplier's name, address, and telephone number, the quantity of spare parts and special tools required for each item of equipment provided and the current list price of each.

## 14.0 RECORD DRAWINGS AND SPECIFICATIONS

Maintain one record copy of all Drawings, Specifications, Addenda, Modifications, approved submittals, correspondence, and transmittals at the site in good order and readily available to the Owner. Clearly and correctly mark the Record Drawings and the Record Specifications annotated to show all changes made during the construction process at the time the changed Work is installed. No such changes shall be made in the Work unless previously authorized by a Modification or by specific approval of deviations or revisions in submittals.

- A. <u>Buried and Concealed Work</u> Record the precise location of all piping, conduits, ducts, cables, and like Work that is buried, embedded in concrete or masonry, or concealed in wood or metal framed walls and structures at the time such Work is installed and prior to concealment. Each feature of the concealed Work, such as the beginning and end of straight runs, radius center point of curved runs, angles, connections, plugged tees or other fittings for future connections, and like items shall be accurately located by not less than two dimensions to permanent structures. The depth below finish grade, slab, or paving shall be noted for buried pipe, conduit, or ducts at the beginning and end of straight grade runs and at all grade change points, excepting sewer or drain lines run between manholes. Should the Contractor fail to record such buried or concealed Work, he shall uncover the unrecorded Work to the extent required by the Owner and shall satisfactorily restore and reconstruct the removed Work with no change in the Contract Price or the Contract Time.
- B. <u>Delivery</u> Upon completion and prior to final inspection of the Work, and as a condition of final payment, submit the Record Drawings and Specifications to the Owner for review, and make such revisions or corrections as may be necessary for them to be a true, complete, and accurate record of the Work in the opinion of the Owner. When approved, the Contractor shall deliver the Record Drawings and Specifications to the Owner.

## 15.0 REVISION OF SUBMITTALS

Whenever a contract change order causes a change to the information contained in previously approved submittals, submit information and data corresponding to the changed requirements for approval. Submit revisions following the procedure required for previously approved submittals.

#### 16.0 CERTIFICATES

Each certificate required under the Contract or in any of the following Sections shall be signed by the individual, office, or agent lawfully authorized to execute the certificate, and such authority shall be cited in the certificate by title, description, or other acceptable evidence. All certificates shall be sworn as to the correctness and validity of the contents. Where specifically required in the respective section, certificates shall be notarized and duplicate copies of required certificates shall be notarized to be true copies.

A Certificate of Compliance shall be furnished prior to the use of any materials for which these specifications or the special provisions require that such a certificate be furnished. In addition, when so authorized in these specifications or in the special provisions, the Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the specifications. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the plans and specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The District reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

The form of the Certificate of Compliance and its disposition shall be as directed by the Construction Manager.

#### 17.0 EARTHQUAKE DESIGN AND RESTRAINT

Design, construct and attach all manufactured equipment supplied under this Contract, and as noted in the respective technical Sections, to resist stresses produced by seismic forces specified in this Section. Rigidly attach equipment that does not vibrate during normal operation. For equipment that vibrates during normal operation, attach by means of isolators with mechanical stops that limit movement in all directions unless it can be demonstrated by calculations that such stops are not required. Restrain equipment or portions of equipment that move during normal operation with mechanical devices that prevent displacement unless it can be demonstrated by calculations that such restraints are not required.

- A. <u>Work Included</u> The work included in this Paragraph includes, but is not limited to, the following: All electrical equipment, cabinets and casework plus contents, electrical panels and lighting fixtures.
- B. <u>Minimum Earthquake Forces</u> Except as provided herein, base calculations on the minimum earthquake forces prescribed for Essential Facilities by the 2010 California Building Code as published by California Building Standards Commission, 2525 Natomas Park Drive, Suite 130, Sacramento, CA 95833-2936.

C. Include calculations with submittals of shop drawings, details and data specified in respective technical Sections of these Specifications. Calculations must bear the original seal and signature of a Professional Civil Engineer or if applicable, Professional Structural Engineer, licensed in California and who provided responsible charge for the design.

### 18.0 CONSTRUCTION PHOTOGRAPHS

The Contractor shall perform pre-construction and post-construction survey of all existing structures, pavements and other above ground facilities within the project limits prior to beginning any work, noting their condition by means of dated photographs supplemented by written documentation, where applicable.

Color photographs shall be taken with a digital camera at locations that are appropriate to show pre-existing conditions and after constructed conditions. Each photograph shall show the date and time the photograph was taken and clearly be labeled showing the location, viewing direction, and any special features noted. Two (2) 4"x6" copies of each photograph shall be submitted to the District. The photographs shall be indexed, inserted in a plastic viewing folder.

Full compensation for pre-construction survey shall be included in the contract price for the various items of work involved, and no additional compensation will be allowed therefore.

#### 18.1 SUMMARY

- A. Section includes requirements for:
  - 1. Pre-construction photographs.
  - 2. Pre-construction videos.
  - 3. Post-construction photographs.
  - 4. Post-construction videos.
- B. The purpose of the photographs and videos is to document the condition of the facilities prior to the Contractor beginning work at the Project site and after Substantial Completion of the Work.
- C. Areas to be photographed and videoed shall include the site of the Work and all existing facilities either on or adjoining the Project site, including the interior of existing structures, that could be damaged as a result of the Contractor's Work.
- D. The scope of the photographic and video graphic documentation shall be the sole responsibility of the Contractor, but shall be acceptable to the Construction Manager.
- E. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.
  - 3. The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.
    - a. Section 01200 Project Meetings.
    - b. Section 01700 Closeout Procedures.

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## 18.2 SUBMITTALS

- A. Key plan: Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph. Include the same label information as the corresponding set of photographs.
- B. Photographs:
  - 1. Paper media:
    - a. Submit 4 prints of each photographic view within 7 days of taking photographs.
    - b. Format:
      - 1) 4- by 6-inch photos.
      - 2) Photographs shall be enclosed in clear plastic sleeves that are punched for standard 3-ring binders.
    - c. Identification: On back or below each print, provide the following information:
      - 1) Name of project.
      - 2) Date photograph was taken.
      - 3) Description of vantage point, indicating location and direction by compass point.
  - 2. Digital media:
    - a. Provide photos as individual, indexed JPG files with the following characteristics:
      - 1) Compression shall be set to preserve quality over file size.
      - 2) Highest resolution JPG images shall be submitted. Resizing to a smaller size when high resolution JPGs are available shall not be permitted.
      - 3) JPG image resolution shall be 800 by 600 or higher.
      - 4) Images shall have rectangular clean images. Artistic borders, beveling, drop shadows, etc., are not permitted.
- C. Videos:
  - 1. Submit 4 copies of each video within 7 days of recording.
  - 2. Videos shall be submitted in a digital color video format on a DVD suitable for playback on a standard DVD player.
  - 3. Identification: On each copy provide a label with the following information:
    - a. Name of project.
    - b. Date video was recorded.
- D. Pre-construction photographs and videos: Submit prior to beginning work at the Project site or prior to the Preconstruction Conference specified in Section 01200, whichever occurs earlier.
- E. Post-construction photographs and videos: Submit with project closeout documents as specified in Section 1300.

#### 18.3 MEDIA

- A. Paper media:
  - 1. Commercial grade, glossy surface, acid-free photographic paper.
- B. Digital media:
  - 1. 120 millimeters, 700-MB, 80-minute CD compatible with Microsoft Windows XP.
- C. Videos:

1. 120 millimeters, DVD compatible with standard DVD players.

## 18.4 GENERAL

- A. Photographs (paper and digital media):
  - 1. Date stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

## B. Videos:

1. Display continuous running time. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site. No additional compensation shall be provided for construction photographs and all costs therefore shall be included in the overall bid for construction of the project.

## \*\*\* END OF SECTION \*\*\*

(One Entit	Equipment Data & PM Tasks	nal)
	y per offeet prease en die offer fiew of addition	
Equipment Tag #:	Date installed:	
Equipment Name:	Warranty Start Date:	
Equipment Initial Value:	Warranty End Date:	
Equipment Description:	Supplier Name:	
· · · · · · · · · · · ·		
Manufacturer Name:		
Model NO:	Serial NO:	
Equipment Location:		
	Misc. Equipment	
Size:	Manufacturer:	
Capacity:	Model NO:	
Voltage:	Serial NO:	
Phase:	Hertz:	
	Pumps	
Galons Per Minute:	Seal Type:	
Size:	Manufacturer:	
RPM:	Model NO:	
TDH:	Serial NO:	
Туре:	Voltage:	
Phase:	Hertz:	
	Motors	
Frame:	Phase:	
RPM:	Horsepower:	
Voltage:	Weight:	
Amerpage:	Manufacturer:	
Model NO:	Serial NO:	
Control Voltage:		
	Engines	
Primary Fuel:	Manufacturer:	
RPM:	Model NO:	
Cylinders:	Serial NO:	
Horsepower:		

		Generator				
Manufacturer:		Amps:				
Model NO.:		Phase:				
Serial NO.:		Power Factor:				
KVA:		Frame:				
Voltage:		KW:				
		Fan Specs				
Manufacturer:		Wheel Diam, Inches:				
Model NO.:		Discharge:				
Serial NO.:		Rotation:				
Туре:		BHP:				
Weight:		SP (in. wg):				
CFM:						
Valve Specs						
Manufacturer:		Actuator Type:				
Model NO.:		Body Type:				
Serial NO.:		Material:				
Voltage:		Connection Type:				
Service:		Size:				
PM Tasks						
				Start		
NO of Days/Hours	Task NO	Task Description	Est Time	Date		
NO. of Days/Hours: How often does this task need to be completed? If this is a new task, leave the task number blank and write out the description						
Task NO.:	of the new tas	sk.				
Est. Time:	What is the estimated time to complete the task?					
Start Date:	When should this task start?					

# **SECTION 01310 - PROGRESS SCHEDULE**

### 1.0 CONSTRUCTION SCHEDULE

- A. Section includes: Preparation, submittal, and maintenance of computerized progress schedule and reports, Contract time adjustments, and payment requests, including the following:
  - 1. Preliminary Schedule.
  - 2. Baseline Schedule.
  - 3. Weekly Schedule.
  - 4. Schedule Updates.
  - 5. Schedule Revisions.
  - 6. Time Impact Analyses.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.
  - 3. The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Document 00700 General Conditions

The schedule shall be submitted within ten (10) days of Notice to Proceed and favorably reviewed by the Construction Manager before the first partial payment can be made.

The Contractor shall provide with its schedule a procedural outline of the system shutdowns and proposed tie-in procedures, which shall be subject to the favorable review of the Construction Manager and the District.

## 1.1 Base Schedule

The Contractor shall submit the schedule based on either the bar chart method or the Critical Path Method (CPM). The schedule shall indicate preceding activity relationships and/or restraints where applicable and a controlling path shall be indicated. The schedule shall be time scaled and shall be drafted to show a continuous flow from left to right. The construction schedule shall clearly show the sequence of construction operations and specifically list:

- a. The start and completion dates of all work items.
- b. The dates of submittals, procurement, delivery, installation and completion of each major equipment and material requirement.
- c. Progress milestone events or other significant stages of completion.
- d. The lead time required for testing, inspection and other procedures required prior to acceptance of the work.

Activities shall be no longer than fifteen (15) workdays, except for submittals and delivery items. If an activity takes longer, it shall be broken into appropriate segments of work for measurement of progress. This limitation may be waived, upon approval of the Construction Manager, for repetitious activities of longer durations for which progress can be easily monitored.

### 1.2 Responsible Person

- A. Contractor shall designate, in writing and within 5 calendar days after Notice of Award, person responsible for preparation, maintenance, updating, and revision of all schedules.
- B. Qualifications of responsible person:
  - 1. Authority to act on behalf of Contractor.
  - 2. 5 years verifiable experience in preparation of complex construction schedules for projects of similar value, size, and complexity.

Knowledge of critical path method (CPM) scheduling utilizing Primavera Project Planner or SureTrak or Microsoft Project software.

### 1.3 Reports

The following reports shall be submitted with the Base Schedule:

- Bar Chart: A bar chart which lists each activity description, early start and finish dates, and all preceding and succeeding activities. The chart shall indicate all critical activities. A chart with the above information shall be provided with each monthly update in lieu of the report specified in Paragraph 01310-4.1.1.a.
- b. CPM Schedule: A CPM network report sorted by I-J or activity number which lists each activity description, early start and finish dates, preceding and succeeding activities and restraints, including lead/lag durations. The report shall show the critical path.
  - 1. CPM network report sorted by total float.
  - 2. CPM network report sorted by early start.

## 2.0 WEATHER CONDITIONS

Seasonal weather conditions shall be considered in the planning and scheduling of work influenced by high or low ambient temperatures or precipitation to ensure the completion of the Work within the Contract Time. No time extensions will be granted for the Contractor's failure to take into account such weather conditions for the location of the Work and for the period of time in which the Work is to be accomplished.

The expected loss of working days specified in the Supplementary Conditions, Paragraph 01010-5.0, **WEATHER DAYS**, shall be included in a separate identifiable critical activity labeled "Weather Days Allowance" to be included at the end of the project schedule. When weather days occur, and are approved as such by the Construction Manager, the Contractor shall either:

- a. Increase the duration of the current critical activity (ies) by the number of weather days experienced, or
- b. Add a critical activity to the schedule to reflect the occurrence of the weather day(s).

The duration of the weather day allowance activity shall be reduced as weather days are experienced and included in the schedule. Any remaining weather days in the weather day allowance activity at the completion of the project shall be considered as float and shall not be for the exclusive use or benefit of either the District or Contractor.

#### 3.0 UPDATES

#### 3.1 Submittal Period

The Contractor shall submit at monthly intervals a report of the actual construction progress. Each monthly report shall cover a period of approximately thirty (30) days ending around the 30th of each month, or on another mutually agreed upon date each month. The monthly reports shall be submitted within ten (10) days of the end of the reporting period.

- A. Submit, on a monthly basis, updated schedules as specified. Submit final schedule update as specified.
- B. Submit revised schedules and time impact analyses as specified.
- C. Submit schedules in the media and number of copies as follows:
  - 1. 3 sets of the CPM network and/or bar chart (as specified by the OWNER) on D-size sheets. Color-coding to be specified by the OWNER.
  - 2. 3 sets of Tabular reports listing all activities sorted numerically identifying duration, early start, late start, early finish, late finish, total float, and all predecessor/successor information.
  - 3. 2 sets of CPM Schedule data electronic files stored on CD/DVD.
- 3.1.1 **All Monthly Updates -** All monthly updates shall include as a minimum:
  - a. Tabulation reports for the following sorts:
    - 1. I-J [or Activity] Numbers
    - 2. Total Float
    - 3. Early Start
    - 4. Logic report of proceeding and succeeding activities with all restraints indicated (precedence schedules only)
  - b. Narrative Report The report shall show the activities or portions of activities completed during the reporting period. The report shall state the percentage of the work actually completed and scheduled, the remaining duration, and the progress along the critical path in terms of days ahead or behind the allowable dates as of the report date. Any changes made by the Contractor to the schedule, including I-J (or Activity) numbers and activity descriptions, shall be listed.

Progress Schedule 01310-3

- 3.1.2 **On-Schedule Updates** If the project is proceeding on schedule, the monthly update report may consist of a marked-up copy of the graphical network diagram. This submittal shall clearly indicate the status of any minor shifts in sequence or schedule and the estimated completion date or percent complete of all activities currently in progress. The Contract completion date shall also be indicated. The Contractor shall submit a narrative report relating to status of construction, the schedule, and factors which may affect the remainder of the schedule.
- 3.1.3 **Delayed Schedule Updates** If, in the opinion of the Construction Manager, the project is behind schedule, the monthly report shall include a revised network diagram and/or mathematical analysis showing the Contractor's proposed revised schedule. The schedule shall be revised under the conditions defined in Paragraph 01310-3.3, <u>Schedule Revisions</u>. An analysis of the effect that the delay has on progress along other paths shall also be included in the report. The Contractor shall also submit a narrative report with each updated analysis which shall include but not be limited to a description of current and anticipated problem areas, delaying factors and their impact, and an explanation of corrective actions taken or proposed.

### 3.2 Schedule Review

Once each month, on a date mutually agreed upon, but no later than seven (7) working days after the submittal of the monthly update specified herein, a jobsite meeting will be held to review the Construction Schedule, job progress and the monthly update, or the Construction Manager will provide written comments on the monthly update.

#### 3.3 Schedule Revisions

The conditions under which the Construction Manager will require revisions of the Construction Schedule include the following:

- a. When delay in completion of any work item or sequence of work items results in an estimated extension of project completion by either twenty (20) working days or by five percent (5%) of the remaining duration of time to complete the Contract, whichever is less.
- b. When delays in submittals or deliveries make re-planning or rescheduling of the work necessary.
- c. When the schedule does not represent actual prosecution and progress of the work.
- d. When any change to the sequence of activities, the completion date for major portions of the work, or changes occur which affect the critical path.
- e. When Contract modification necessitates schedule revision.

The Contractor shall not make any changes to the critical path without the Construction Manager's written consent.

## 4.0 TIME IMPACT ANALYSES

## 4.1 Requirement

When change orders impacting project duration are initiated, delays are experienced, or the Contractor desires to revise the schedule logic, the Contractor shall submit to the Construction Manager a written Time Impact Analysis illustrating the influence of each change, delay, or Contractor request on the current contract schedule completion date.

### 4.1.1 Construction Schedule Analysis -

- a. Each Time Impact Analysis shall include an analysis demonstrating how the Contractor proposes to incorporate the change order, delay, or Contractor request into the Schedule.
- b. The analysis shall demonstrate the time impact based on the date of occurrence of the change, delay or revision; the status of construction at that point in time; and the impact of all affected activities.

## 4.2 Delays

Activity time delays will not automatically mean that an extension of Contract Time is warranted or due the Contractor.

- a. It is possible that a strike or contract modification will not affect existing critical activities or cause non-critical activities to become critical, i.e., a strike or modification may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on the Contract completion date or time.
- b. The Contractor acknowledges and agrees that mitigation for delays due to changes, differing site conditions, and other causes will require revision of preferential sequences of the Work before proposing an updated schedule which supports a delay to the Project as a whole. When a delay to the Project as a whole can be avoided by revising preferential sequencing, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension but is not entitled to compensation for indirect overhead.
- c. Float or slack shall not be for the exclusive use or benefit of the District or the Contractor. Extensions of time for performance will be granted only to the extent that the equitable time adjustments for the activity or activities affected exceeds the total float along the activity chain involved at the time the change was ordered or the delay occurred.
- d. The definitions of "non-critical activities" and "total float" shall be as provided in the Associated General Contractors of America book "CPM in Construction, A Manual for General Contractors."

#### 4.3 Submittal

Time Impact Analyses shall be submitted in quadruplicate and within fifteen (15) days after a delay occurs or with the Contractor's cost proposal in response to a notice of change from the Construction Manager. In cases where the Contractor does not submit a Time Impact Analysis

for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

- a. Approval or rejection of Time Impact Analyses by the Construction Manager and the District will be made within fifteen (15) days after receipt of the Time Impact Analysis unless subsequent meetings and negotiations are necessary.
- b. Upon mutual agreement by both parties, schedule revisions illustrating the influence of change orders, delays, and/or Contractor requests will be incorporated into the next schedule update.

## 5.0 WEEKLY ACTIVITIES PLAN

On the last working day of every week the Contractor shall submit to the Construction Manager the Contractor's Plan of Activities for the following three weeks. The Plan of Activities shall describe the activity and location of the activity and include the activity's I-J or Activity number as provided in the Construction Schedule.

### 6.0 CASH FLOW PROJECTION

A cash flow projection shall be submitted with the Construction Schedule. This cash flow projection shall be revised and resubmitted when revisions of the Construction Schedule will result in changes to the projected cash flow.

#### 7.0 WORKHOUR PROJECTION

A work hour projection shall be submitted with the Construction Schedule. The projection shall list projected work hours for each intended trade. This applies to the Contractor and the Subcontractors as listed in the bid. The projection shall include work hours for project management, superintendence and administration. The work hour projection shall be revised and resubmitted when revisions to the Construction Schedule will result in changes to the projected manpower.

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# **SECTION 01400 - QUALITY CONTROL**

## 1.0 QUALITY CONTROL

All materials and equipment shall be new and of the specified quality and equal to the samples found to be acceptable by the Design Consultant if samples have been submitted. It shall be the duty of the Contractor to call the Construction Manager's attention to apparent errors or omissions and request instructions before proceeding with the Work. The Construction Manager may, by appropriate instructions, correct errors and supply omissions not involving extra cost, which instructions shall be as binding upon the Contractor as though contained in the original Contract Documents.

At the option of the Construction Manager, materials and equipment to be supplied under this Contract will be tested and inspected either at their place of origin or at the site of the Work. The Contractor shall give the Construction Manager written notification at least 30 days prior to the shipment of materials and equipment to be tested and inspected at point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the materials and equipment nor shall such tests and inspections preclude retesting or reinspection at the site of the Work.

Inspection of the Work by the District, Construction Manager and/or Design Consultant shall not relieve the Contractor of its obligations to conduct comprehensive inspections of the Work and to furnish materials and perform acceptable Work, and to provide adequate safety precautions, in conformance with the intent of the Contract.

#### 2.0 INSPECTION

All work and materials are subject to the inspection of the Construction Manager. The Contractor shall notify the Construction Manager before noon of the working day before inspection is required. If the Specifications, the Construction Manager's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give timely notice, in writing, of its readiness for inspection. Unless otherwise determined by the Construction Manager, all inspections shall be done only in the presence of the Construction Manager or its authorized representatives. The District, Construction Manager, Design Consultant and authorized government agents and their representatives shall at all times be provided safe access to the Work wherever it is in preparation or progress and to all warehouses and storage yards wherein materials and equipment are stored, and the Contractor shall provide facilities for such access and for inspection, including maintenance of temporary and permanent access. Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract, and improper work will be subject to rejection. Work and materials not meeting such requirements shall be made good, and unsuitable work or materials may be rejected; notwithstanding that such work or materials have been previously inspected by the Construction Manager or that payment therefore has been included in a progress estimate.

No portion of any work or installed materials shall be covered or concealed in any manner whatsoever without first being inspected by the Construction Manager. If any work should be covered up without the approval or consent of the Construction Manager, the Construction Manager shall have the authority to require that such work be uncovered for examination; defective work, if any, corrected; and recovered at the Contractor's expense.

## 3.0 SAMPLES AND TESTS

At the option of the Construction Manager, the source of supply of materials for the Work shall be subject to tests and inspection before the delivery is started and before such materials are used in the Work. Representative preliminary samples of the character and quality prescribed shall be submitted by the Contractor or producer of materials to be used in the Work in sufficient quantities or amounts for testing or examination.

All tests of materials furnished by the Contractor shall be made in accordance with the commonly recognized standards of national technical organizations, and such special methods and tests as are prescribed in the Contract Documents.

Certificates of compliance shall be provided by the Contractor as required in the Technical Specifications.

#### 3.1 Sampling

The Contractor shall furnish such samples of materials as are requested by the Construction Manager, without charge. No material shall be used until the Construction Manager has had the opportunity to test or examine such materials. Samples will be secured and tested whenever necessary to determine the quality of the material. Samples and test specimens prepared at the jobsite, such as concrete test cylinders, shall be taken or prepared by the Construction Manager or Testing Firm in the presence and with the assistance of the Contractor.

#### 3.2 Testing

Unless otherwise provided, all initial testing for concrete and soils shall be at no expense to the Contractor and shall be performed in the District's laboratory or in a laboratory designated by the District. Any retesting required due to failed test or defective material or sample shall be at the Contractor's expense. When required by the Contract or the Construction Manager, the Contractor shall furnish, at no extra charge, certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory.

The Contractor is responsible for all system and equipment testing as provided for in these Contract Documents.

### 3.3 Test Standards

All sampling, specimen preparation, and testing of materials shall be in accordance with the standards of nationally recognized technical organizations.

The physical characteristics of all materials not particularly specified shall conform to the latest standards published by the American Society for Testing Materials, where applicable.

## \*\*\* END OF SECTION \*\*\*

# **SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

## 1.0 GENERAL

The Contractor shall provide all temporary facilities and utilities required for prosecution of the work, protection of employees and the public, protection of the work from damage by fire, weather or vandalism, and such other facilities as may be specified or required by any legally applicable law, ordinance, rule, or regulation.

The Contractor shall respond to public complaints when requested by the District.

### 2.0 TEMPORARY UTILITIES

#### 2.1 Electrical Service

The Contractor shall arrange, at its own cost, with the local utility to provide adequate temporary electrical service at a mutually agreeable location. The Contractor shall then provide adequate jobsite distribution facilities conforming to applicable codes and safety regulations. The Contractor shall provide, at its own cost, all electric power required for construction, testing, general and security lighting, and all other purposes whether supplied through temporary or permanent facilities. Electric power may be available for the Contractor's use, on a site specific basis, and at the District's sole discretion.

#### 2.2 Water

The Covert Lift Station site does not have a water source. The Contractor shall pay for and shall construct all facilities necessary to furnish water for its use during construction. Water used for human consumption shall be kept free from contamination and shall conform to the requirements of the State and local authorities for potable water. The Contractor shall pay for all water used for the Contractor's operations prior to final acceptance. The contractor shall be responsible for the disposal of all water used in the course of construction in accordance with all local, state and national laws.

#### 2.3 Temporary Lighting

The Contractor shall provide temporary lighting in all work areas sufficient to maintain a lighting level during working hours not less than the lighting level required by California OSHA standards. As permanent lighting facilities are completed they may be used in lieu of temporary facilities, provided however, that bulbs, lamps, or tubes of such facilities used by the Contractor shall be replaced prior to final acceptance of the Work.

#### 2.4 Heating and Ventilation

The Contractor shall provide means for heating and ventilating all work areas as may be required to protect the Work from damage by freezing, high temperatures, weather, or to provide a safe

environment for workers. Unvented direct fired heaters shall not be used in areas where freshly placed concrete will be exposed to the combustion gases until at least two hours after the concrete has attained its initial set.

## 2.5 Sanitary Conveniences

The Contractor shall provide suitable and adequate sanitary conveniences for the use of all persons at the site of the Work. Such conveniences shall include chemical toilets or water closets and shall be located at appropriate locations at the site of the Work. All sanitary conveniences shall conform to the regulations of the public authority having jurisdiction over such matters. At the completion of the Work, all such sanitary conveniences shall be removed and the site left in a sanitary condition.

## 3.0 CONSTRUCTION FACILITIES

Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided.

### 3.1 Staging and False work

Temporary supports shall be designed by a professional registered engineer with an adequate safety factor to assure adequate load bearing capability. If requested by the Construction Manager, the Contractor shall submit design calculations for staging and shoring prior to application of loads.

Excavation support shall be in accordance with Section 00700-4.12, Safety.

#### 3.2 Temporary Enclosures

When sandblasting, spray painting, spraying of insulation, or other activities inconveniencing or dangerous to property or the health of employees or the public are in progress, the area of activity shall be enclosed adequately to contain the dust, over-spray, or other hazard. In the event there are no permanent enclosures of the area, or such enclosures are incomplete or inadequate, the Contractor shall provide suitable temporary enclosures. The Contractor shall comply with the San Joaquin Valley Unified Air Pollution Control District regulations for such work.

## 3.3 Warning Devices and Barricades

The Contractor shall adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers. Such devices shall, as a minimum, conform to the requirements of Cal/OSHA.

A. Hazards in public right-of-way: Contractor shall:

- 1. Mark at reasonable intervals, trenches and other continuous excavations in public rightof-way, running parallel to general flow of traffic, with traffic cones, barricades, or other suitable visual markers during daylight hours:
  - a. During hours of darkness, provide markers with torches, flashers, or other adequate lights.
- 2. At intersections or for pits and similar excavations, where traffic may reasonably be expected to approach head on, protect excavations by continuous barricades:
  - a. During hours of darkness, provide warning lights at close intervals.

### 3.4 Above Grade Protection

On multi-level structures the Contractor shall provide safety protection that, as a minimum, shall meet the requirements of Title 8, California Code of Regulations.

#### 3.5 Use of Explosives

All persons engaged in the activities of receiving, storing, using, handling or transporting any explosives must obtain a permit from the local fire agency and all work shall be governed by the Health & Safety Code and any amendments or existing Articles of the National Board of Fire Underwriters Fire Prevention Code. The Contractor must notify the Construction Manager at least 14 days prior to the use of explosives.

## 4.0 PROTECTION AND RESTORATION OF PROPERTY

The Contractor shall be responsible for the protection of public and private property at and adjacent to the Work and shall exercise due caution to avoid damage to such property. The Contractor is responsible for the following, at no additional cost to the District:

- a. The Contractor shall conduct operations in a manner which will cause the least amount of damage, inconvenience and interference with the normal use of any public or private property. The Contractor shall repair or replace all existing improvements which are not designated for removal (e.g., curbs, sidewalks, survey points, fences, walls, signs, utility installations, pavements, structures, etc.) and are damaged or removed as a result of its operations. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.
- b. Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. Remove all transplantable trees, shrubs and bushes that may be damaged or destroyed by construction and reset them after construction. If damaged or removed because of the Contractor's operations, they shall be restored or replaced as required to return the property to its prior condition and location, or better, as is reasonably possible. Lawns shall be re-sod, or re-seeded and covered with suitable mulch if appropriate sod is not available.
- c. The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers, and other improvements within the right-of-way which are designated for removal or would be destroyed because of the Work.

- d. To store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the Work as will not unduly interfere with the progress of his Work or the work of any other contractor.
- e. To provide suitable storage facilities for all materials which are liable to injury by exposure to weather, theft, breakage, or otherwise. If the Owner determines that suitable storage for certain materials is not being provided, he may direct the Contractor to remove it from the job site, or to store it properly at the job site.
- f. To place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.
- g. In coordination with the appropriate authorities probe, pot-hole, or otherwise ascertain the exact location of all existing underground improvements in advance of excavation such that no damage to these improvements will occur. In the event interferences in construction are encountered with the various existing improvements, the District reserves the right to appropriately change the alignment and grade of the facilities.
- h. Provide for the flow of all sewers and drains interrupted during the progress of the Work, in a manner acceptable to the District and immediately cart away and remove all offensive matter at no additional cost to the District.

Where interruption of existing utilities occurs as the result of the Contractor's activity for this Work, whether intentional or accidental, repairs to the interrupted utility shall be performed by the Contractor in a manner acceptable to the Owner unless instructed otherwise in these Contract Documents. The repairs, including materials used, shall be performed in accordance with the requirements of the respective utility as well as the requirements of the Contract Documents for this Project. Where a conflict exists between the requirements of the respective utility and those of the Contract Documents for this Project, the more stringent of the two shall apply unless instructed otherwise by the Owner.

#### 5.0 PROJECT SECURITY

The Contractor shall make adequate provision for the protection of the Work area against fire, theft, and vandalism, and for the protection of the public against exposure to injury and shall comply with the District's security measures.

#### 5.1 Fire Extinguisher

Sufficient number of fire extinguishers of the type and capacity required to protect the Work and ancillary facilities, shall be provided and maintained in readily accessible locations. The local fire marshal shall have jurisdiction in determining the appropriate level of protection required.

#### 5. 2 First aid

Post first aid facilities and information posters conforming to requirements of OSHA and other applicable Laws and Regulations in readily accessible locations.
#### 5.3 Temporary Fences

Except as otherwise provided, the Contractor shall enclose the site of the Work with a fence adequate to protect the Work and temporary facilities against acts of theft, violence, or vandalism.

In the event all or a part of the site is to be permanently fenced, this permanent fence or a portion thereof may be built to serve for protection of the Work site, provided however, that any portions damaged or defaced shall be replaced prior to final acceptance.

Temporary openings in existing fences shall be protected to prevent intrusion by unauthorized persons. During night hours, weekends, holidays, and other times when no work is performed at the site, the Contractor shall provide temporary closures or guard service to protect such openings. Temporary openings shall be fenced when no longer necessary.

#### 6.0 ACCESS ROADS

Access roads shall be maintained to all storage areas and other areas to which frequent access is required. Similar roads shall be maintained to all existing facilities on the site of the Work to provide access for delivery of material and for maintenance and operation. Where such temporary roads cross buried utilities that might be injured by the loads likely to be imposed, such utilities shall be adequately protected by steel plates or wood planking, or bridges shall be provided so that no loads shall discharge on such buried utilities.

#### 7.0 SPECIAL CONTROLS

The Contractor shall take all reasonable means to minimize inconvenience and injury to the public by dust, noise, diversion of storm water, or other operations under its control.

## 7.1 Dust Control

The Contractor at its expense shall take whatever steps, procedures, or means as are required to prevent abnormal dust conditions being caused by its operations in connection with the execution of the Work; and on any unpaved road which the Contractor or any of its subcontractors are using, excavation or fill areas, demolition operations, or other activities. Control shall be by sprinkling, use of dust palliatives, modification of operations, or any other means acceptable to agencies having jurisdiction. Haul routes shall be kept visibly wet during excavation and hauling operations.

Unless the construction dictates otherwise, and unless otherwise approved by the Construction Manager, the Contractor shall furnish and operate a self-loading motor sweeper with spray nozzle at least once each working day to keep paved areas acceptably clean whenever construction, including restoration, is incomplete.

#### 7.2 Mud Control

The Contractor shall: Prevent mud nuisance caused by construction operations, unpaved roads, excavation, backfilling, demolition, or other activities.

#### 7.3 Noise Abatement

Operations at the Worksite shall be performed so as to minimize unnecessary noise. Special measures shall be taken to suppress noise during night hours. Noise levels due to construction activity shall not exceed the levels specified by local ordinance.

Internal combustion engines used on the Work shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

#### 7.4 Working Hours

Construction shall be allowed only between the hours of seven (7:00) a.m. and four (4:00) p.m. on weekdays and nine (9:00) a.m. to six (6:00) p.m. on weekends and holidays, unless otherwise approved by the District.

Normal working hours are defined as between the hours of seven (7:00) a.m. and four (4:00) p.m. on weekdays.

The Contractor shall be responsible for any inspection and additional administration costs incurred by the District, or its agents and representatives, for work by the Contractor outside the hours defined above on weekdays, or any work on weekends or holidays recognized by the District. Such costs shall be withheld from the succeeding monthly progress payment. Any work in Section 01010, **SUMMARY OF WORK**, specifically required to be performed outside the normal working hours is excluded from the provisions of this paragraph.

The Contractor shall notify the Construction Manager at least 48 hours prior to any work outside the normal working hours defined above, on weekends or holidays. No work outside normal working hours will be allowed to take place without proper notification and approval by the construction manager.

#### 7.5 Drainage Control

In all construction operations, care shall be taken not to disturb the existing drainage pattern whenever possible. Particular care shall be taken not to direct drainage water onto private property. Drainage water shall not be diverted to streets or drainage ways inadequate for the increased flow. Drainage means shall be provided to protect the Work and adjacent facilities from damage due to water from the site or due to altered drainage patterns from construction operations.

Temporary provisions shall be made by the Contractor to insure the proper functioning of gutters, storm drain inlets, drainage ditches, culverts, irrigation ditches, and natural water courses.

#### 7.6 Construction Cleaning

The Contractor shall, at all times, keep property on which work is in progress and the adjacent property free from accumulations of waste material or rubbish caused by employees or by the Work. The Contractor shall clean up not less than at the end of each work day, all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the Work shall

present a neat, orderly and workmanlike appearance. More frequent clean-up shall be performed as required to maintain access to all other District facilities still in operation.

All surplus material shall be removed from the site immediately after completion of the work causing the surplus materials. Upon completion of the construction, the Contractor shall remove all temporary structures, rubbish, and waste materials resulting from its operations.

Before final inspection of the work, the Contractor shall clean the project site, material sites, and all ground occupied by him in connection with the work of all rubbish, excess materials, false-work, temporary structures, and equipment. All parts of the work shall be left in a neat and presentable condition.

Nothing herein, however, shall require the Contractor to remove warning, regulatory, and guide signs prior to formal acceptance by the District.

Full compensation for all site maintenance and cleanup will be considered as included in the prices paid for the various contract items of work and no separate payment will be made therefore.

#### 7.7 Disposal of Material

The Contractor shall make arrangements for disposing of materials outside the Site and the Contractor shall pay all costs involved. The Contractor shall first obtain permission from the property owner on whose property the disposal is to be made and absolve the District from any and all responsibility in connection with the disposal of material on said property. When material is disposed of as above provided, the Contractor shall conform to all required Federal, State, and local regulations pertaining to such disposal.

#### 7.8 Parking and Storage Areas

All stockpiled materials and parked equipment at the job site shall be located to avoid interference with private property and to prevent hazards to the public. Locations of stockpiles, parking areas, and equipment storage must be approved by the Construction Manager.

#### 8.0 TRAFFIC REGULATION

#### 8.1 General

The Contractor shall take all necessary steps to minimize inconvenience to the general public throughout all work under this Contract. No driveways or private roads shall be blocked without notifying the property owner and access must be restored during all non-working hours. Safe access must be maintained for pedestrian traffic throughout the work area at all times.

At least one lane of traffic in each direction must be kept open at all times unless prior approval is provided by the District and any affected agency. No roads shall be blocked or made inaccessible, due to the Contractor's work, without prior written approval of the District and the affected agencies.

The Contractor shall not block or obstruct fire lanes at any time.

#### 8.2 Haul Routes

Prior to the pre-construction conference, the Contractor shall submit for approval the proposed route(s) for all construction traffic on the project. This shall include any designated routes, if any, shown on the Contract Drawings. Upon approval, the Contractor shall strictly adhere to that route(s) only, unless written permission is obtained to change the route(s).

#### 8.3 Traffic Control

Traffic control shall be in accordance with the California Department of Transportation Traffic Manual and/or Stanislaus County Public Works Department. The Contractor shall submit for approval to the District and Stanislaus County, its traffic control plans prior to work on public streets.

Traffic control shall include signs, warning lights, reflectors, barriers, and other necessary safety devices and measures, including sufficient flaggers to direct vehicular traffic through the construction areas.

No material or equipment shall be stored/parked where it will interfere with the free and safe passage of public traffic, and at the end of each day's work, and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from the public right-of-way.

Should the Contractor appear to be negligent in furnishing warning and protective measures, as above provided, the Construction Manager may direct attention to the existence of a hazard, and the necessary warning and protective measures shall be furnished and installed by the Contractor at its expense.

#### 9.0 PROJECT OFFICE

The Contractor shall maintain on the project site a suitable office or other protected area in which shall be kept project copies of the Contract Documents, project progress records, project schedule, shop drawings, and other relevant documents which shall be accessible to the District and Construction Manager during normal working hours.

#### 10.0 CONTRACTOR'S SAFETY RULES

The Contractor shall execute and abide by all terms and conditions of the District's "Contractor's Safety Rules," a copy of which is included at the end of this section. The Contractor shall post "Contractor's Safety Rules" on the job site for the entire construction period for this Project.

## 11.0 CONSTRUCTION MANAGER'S OFFICE

Removed.

## SALIDA SANITARY DISTRICT CONTRACTOR'S SAFETY RULES

THESE SAFETY RULES ARE TO INFORM YOU OF CERTAIN SAFETY AND HEALTH REQUIREMENTS THAT MUST BE FOLLOWED WHILE WORKING AT THE COVERT SEWER LIFT STATION. THE LIFT STATION PUMPS DOMESTIC RAW SEWAGE.

- 1. DO NOT DRINK FROM ANY FAUCET, PIPELINE OR HOSE WHILE WORKING AT THE COVERT LIFT STATION.
- 2. STRICT ADHERENCE TO CONFINED SPACE ENTRY PROCEDURES OUTLINED BY CAL-OSHA TITLE 8 ARTICLE 108 MUST BE FOLLOWED.
- 3. WASH HANDS THOROUGHLY BEFORE EATING OR DRINKING.
- 4. WORK ONLY IN CONTRACTED AREAS. DO NOT WANDER THROUGH THE SITE.
- 5. OBSERVE THE SPEED LIMIT WHILE WORKING AT THE COVERT LIFT STATION. OBSERVE ALL STOP SIGNS.
- 6. CHECK WITH THE CONSTRUCTION MANAGER BEFORE BEGINNING ANY CONTRACTED WORK TO REVIEW ANY SPECIAL HAZARDS OR SAFE PRACTICE PROCEDURES FOR THE AREA YOU ARE WORKING IN.
- 7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADVISE WORK CREWS AND SUBCONTRACTORS REGARDING HAZARDS, AND HEALTH AND SAFE PRACTICE MEASURES REQUIRED WHILE DOING ANY WORK AT SALIDA SANITARY DISTRICT FACILITIES. POTENTIALLY HAZARDOUS CHEMICALS ARE STORED AND USED AT MANY SSD SITES.
- 8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADVISE AND PROVIDE WORK CREWS WITH THE APPROPRIATE TRAINING AND PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING AT THE COVERT SEWER LIFT STATION.
- 9. THE ABOVE RULES DO NOT EXEMPT ANY CONTRACTOR OR SUBCONTRACTOR FROM ANY APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS.

THE ACKNOWLEDGMENT BELOW MUST BE SIGNED AND RETURNED TO THE CONSTRUCTION MANAGER. THANK YOU FOR YOUR COOPERATION.

I UNDERSTAND AND AGREE TO COMPLY WITH THE ABOVE RULES WHILE ON ANY SALIDA SANITARY DISTRICT FACILITIES.

CONTRACTOR'S SIGNATURE

DATE

COMPANY NAME

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## SECTION 01510 - SEWER BYPASS PUMPING

## 1.0 GENERAL

### 1.1 Scope of Work

Portions of the Work will require that the Covert Lift Station be placed out-of-service for prolonged periods. In these instances, the Contractor shall furnish all labor, equipment, materials, and incidentals required to maintain continuous and reliable wastewater service, that is impacted during construction.

The maximum amount of time the collection system can handle a complete shutdown of the pumping system at the Covert Lift Station is <u>5-hours</u>. After 5-hours, the pumping system will be placed back inservice to lower the levels of sewerage in the wet well and collection system.

If a shutdown of the lift station is required in excess of 5-hours to complete the Work, the Contractor shall install a temporary bypass sewer system to bypass the lift station and maintain continuous and reliable wastewater service during construction. The Contractor shall be responsible for all bypass pumping of sewerage that is required to prevent the backing-up of sewerage. The suction end of the bypass system can be installed in the wet well, while the discharge end can be installed at a maintenance hole in Stanislaus County right-of-way roadway. The closest, available maintenance hole to discharge into is located at the northwest corner of Toomes Road and Covert Road (refer to the figures below).

In addition, once the new 12" plug valve is installed on the 12" force main, the existing buried tee may be used to bypass the pump pit. The material for the 12" force main is Ductile Iron Pipe, Class 50.

A traffic control plan and a Stanislaus County Encroachment Permit will be required for any work or obstructions in the County right-of-way.

Refer to the Figure on the Right:

Maintenance Hole #75 (MH), located on the northwest corner of Covert Road and Toomes Road, can be utilized as the discharge MH for bypass pumping system. The MH is part of a separate gravity system that discharges to the Maximillian Lift Station (located north of Covert Road)



For the installation of the new 6" check valves on the discharge side of both pumps, existing plug valves on the discharge and suction ends of both pumps exist and can be utilized to isolate the area. To replace the single 12" plug valve on the discharge end, other methods to isolate the area will need to be considered.

Contractor shall be responsible for determining the appropriate sewer bypass system with redundancy.

In the event of any spills or overflows, the Contractor shall immediately contact the District. The Contractor shall immediately remove and dispose of all sewage spilled during the bypass pumping at the Contractor's expense. Contractor shall contain spill and not allow spill to flow into the storm drainage system. The Contractor shall also be responsible for paying any fines imposed as a result of spills or overflows that occur as a result of the bypass pumping operations.

## 1.2 Submittals

The design, installation and operation of the temporary pump system shall be the Contractor's responsibility.

The Contractor shall prepare specific, detailed descriptions of the proposed pump system (Bypass Pumping Plan). The Bypass Pumping Plan shall be submitted and approved prior to the mobilization of any equipment as part of the Bypass Pumping Plan. The Bypass Pumping Plan shall outline all provisions and precautions to be taken by the Contractor regarding the handling of wastewater flows. The Bypass Pump Plan must be specific and complete, include such items as schedules, locations, elevations, capacity of equipment, materials, and all other incidental items necessary and/or required to ensure protection of all facilities. No construction shall begin until all provisions and requirements have been reviewed and accepted by the Owner. The plan shall include, but not limited to, the following details:

- A. Staging areas for pumps.
- B. Sewer plugging method and types of plugs.
- C. Size and location of maintenance holes or access points for suction and discharge piping.
- D. Size of pipeline or conveyance system to be bypassed.
- E. Number, size, materials, location, method of installation of suction piping.
- F. Number, size, materials, location, method of installation of discharge piping.
- G. Bypass pump sizes, capacities and number of each size to be provided onsite, including all primary, secondary, and spare pumping units.
- H. Calculations of static lift, friction losses, and flow velocity
- I. Pump curves shallowing pump operating ranges.
- J. Downstream discharge plan.
- K. Method of protecting discharge maintenance holes or structures from erosion and damage.
- L. Thrust and restraint block sizes and locations. Provide the details necessary to demonstrate the integrity of all suction and discharge piping, including piping and fittings associated with all primary and secondary pumping units.
- M. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
- N. Noise attenuation for each pump and any additional equipment that is included in the Bypass Pumping Plan (Project is in a residential area).
- O. Any temporary pipe supports and anchoring.
- P. Access plans to all bypass pumping locations indicated on the drawings.
- Q. Calculations for selection of bypass pumping pipe size.
- R. Schedule for installation and maintenance of bypass pumping lines
- S. Plan indicating location of bypass pumping pipe locations
- T. Equipment and materials readily accessible in the event of any spills
- U. Emergency plan for adverse weather and flooding for various phases of the Works.
- V. Contractor's plan for providing continuous monitoring of the bypass pumping operation, as well as, the monitoring persons' qualifications.
- W. Description of emergency call-outs/notifications for any failure in bypass pumping system during nonworking hours.

## 2.0 EXECUTION

## 2.1 Bypass Pumping of Flow in Existing Sewers

A. The Contractor shall supply pumps, conduits, power, and other equipment to divert the flow of sewage around the section in which Work is to be performed. The bypass system shall be of sufficient capacity to handle the wastewater flows in the table located at the end of this Section. It is the intent of these Specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

Sewer Bypass Pumping 01510-2

- B. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. The pressure and leakage test shall be conducted at one-and-a half times the maximum pressure the system will experience based on the approved Bypass Pumping Plan for a period of two hours. No leakage is permitted during this test. The Construction Manager will be given 48 hours' notice prior to testing. In addition, the Contractor shall demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by perform a test run for a period of 24-hours prior to beginning the Work.
- C. Each bypass pumping operation shall include the components and systems to accomplish the bypass in accordance with these Specifications and the Technical Specifications.
- D. The Contractor shall provide on-site oversight of all bypass pumping operations 24 hours per day, 7 days per week when the bypass pumping system is in operation.
- E. The Contractor shall be required to repair, at their expense, any damages to public or private property caused by these operations.
- F. Should damage occur to the existing sewers, the Contractor shall, at their own expense, make repairs to the satisfaction of the Owner.
- G. The Contractor shall immediately notify the Owner should a sanitary sewer overflow (SSO) occur and take the necessary action to clean up and disinfect the spillage to the satisfaction of the Owner and/or other government agency responding to the SSO. If sewage is spilled onto public or private property, the Contractor shall wash down, cleanup and disinfect the spillage to the satisfaction of the property owner, Owner and/or government agency. Every effort shall be made to prevent the discharge of sewage into the local storm drainage system.
- H. The Contractor shall not be permitted to overflow, bypass, pump, or by any other means convey drainage to any land, street, storm drain, or water course.
- I. The Contractor shall cease bypass pumping operation and return flows to the new and/or existing sewer when directed by the Owner. During bypassing, no wastewater shall be leaked, dumped or spilled in or onto any area outside the existing wastewater system. When bypass operations are complete, all bypass piping shall be flushed with fresh water and drained into the wastewater collection system prior to disassembly.
- J. Contractor must take care to prevent damage to existing structures. Discharge piping to gravity sewer system shall be designed in such a manner as to prevent discharge form contact maintenance hole walls or benching and full discharge shall go into downstream pipe with as minimal turbulence as possible.
- K. The Contractor shall install bypass pumping in compliance with the conditions stipulated above and anticipate severe weather conditions and increases in peak flows during rain events. Available pump capacity data for the Contractor's use in sizing equipment is as follows:

Existing Pump Rating (main duty pump):	1,250 gpm
Existing Pump Rating (standby pump):	1,250 gpm
Existing Pump Horsepower	20 HP

- L. The Contractor shall be properly trained, experienced and mechanically qualified such that they can quickly and effectively address any potential emergency and non-emergency situations associated with the pumps and bypass pumping system that must remain in operation for an extended period of time.
- M. Contractor shall be responsible for the security of the Covet Lift Station site for the duration of the Project. Wet well, pump pit and trenches shall not be left exposed or open when Contractor is not at the construction site.

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## SECTION 01520 - DUCTILE IRON PIPE, AWWA C151

## 1.01 SUMMARY

- A. Section includes: Ductile iron pipe, joints, fittings, gaskets, and pipe linings and coatings.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Division 2 Site Construction.
    - b. Section 09960A High-Performance Coatings.

## 1.02 **REFERENCES**

- A. American Society of Mechanical Engineers (ASME):
  - 1. B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- B. American Water Works Association (AWWA):
  - 1. C104 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
  - 2. C105 Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 3. C110 Standard for Ductile-Iron and Gray-Iron Fittings.
  - 4. C111 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 5. C115 Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
  - 6. C150 Standard for Thickness Design of Ductile-Iron Pipe.
  - 7. C151 Standard for Ductile-Iron Pipe, Centrifugally Cast.
  - 8. C153 Standard for Ductile-Iron Compact Fittings for Water Service.
  - 9. C600 Installation of Ductile Iron Water Mains and Their Appurtenances.
  - 10. C606 Standard for Grooved and Shouldered Joints.
- C. American Welding Society (AWS):

- 1. D11.2 Guide for Welding Iron Castings.
- D. ASTM International (ASTM):
  - 1. A 47 Standard Specifications for Ferritic Malleable Iron Castings.
  - 2. A 183 Standard Specifications for Carbon Steel Track Bolts and Nuts.
  - 3. A 536 Standard Specifications for Ductile Iron Castings.
  - 4. C 283 Standard Test Methods for Resistance of Porcelain Enameled Utensils to Boiling Acid.
  - 5. D 792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- E. Ductile Iron Pipe Research Association (DIPRA):
  - 1. Thrust Restraint Design Manual.
- F. NACE International (NACE):
  - 1. SP0188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- G. National Association of Pipe Fabricators, Inc. (NAPF):
  - 1. 500-03 Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.
- H. Society for Protective Coatings (SSPC):
  - 1. PA-2 Measurement of Dry Coating Thickness with Magnetic Gages.

## 1.03 SYSTEM DESCRIPTION

- A. Thrust restraint system design:
  - 1. Design restrained joint thrust restraint system.
  - 2. Determine the length of pipe that must be restrained on each side of the focus of a thrust load in accordance with the procedures and criteria established by the DIPRA Thrust Restraint Design Manual as specified in Piping Schedule in Section 15052 Common Work Results for General Process Piping and the following additional criteria:
    - a. Design pressure: Test pressure.
    - b. Laying condition: Type 5 in accordance with AWWA C150.
    - c. Soil designation: Silt:
      - 1) As defined by DIPRA.
    - d. Unit friction resistance: Based upon the criteria presented in the DIPRA Thrust Restraint Design Manual.
    - e. Safety factor: 1.5 (for thrust restraint calculations only).

## 1.04 SUBMITTALS

- A. Product data: Photographs, drawings, and descriptions of fittings, gaskets, couplings, grooving of pipe and fittings, pipe linings, and coatings.
- B. Shop drawings:

- 1. Detailed layout drawings showing alignment of pipes, location of valves, fittings, and appurtenances, types of joints, connections to structures, and thrust restraint system layouts.
- 2. Thrust restraint systems: Calculations and layout for restrained joint thrust restraint systems.
- C. Design calculations:
  - 1. Calculations for thrust restraint system design.
- D. Test reports:
  - 1. Submit Coating Manufacturer's Technical Representative's reports.

## 1.05 **QUALITY ASSURANCE**

## A. Qualifications:

- 1. Lining manufacturers: For piping specified to receive glass or epoxy lining, use only a lining manufacturer having a minimum of 5 years' experience supplying this type of product to the wastewater and water industry.
- B. Pre-installation meeting:
  - 1. Arrange for Coating Manufacturer's Technical Representative to attend preconstruction conferences, and to make periodic visits to factory or shop to inspect surface preparation of pipe, fittings, and accessories; and to inspect application of linings to interior and coatings to exterior of pipe, fittings, and accessories.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Block piping and associated fittings for shipment to prevent damage to coatings and linings.
- B. Carefully handle piping and associated fittings during loading, unloading, and installation.
  - 1. Do not drop piping material from cars or trucks.
  - 2. Lower piping by mechanical means.
  - 3. Do not drop or pound pipe to fit grade.
- C. Protect gaskets and polyethylene encasement from long-term exposure to sunlight.
- D. Store piping, fittings, and other accessories such that they do not accumulate and hold rainwater, dirt, and debris.

## 2.01 MANUFACTURED UNITS

- A. Ductile iron piping:
  - 1. Typical type:
    - a. In accordance with AWWA C150 and AWWA C151.

- b. Pressure class or special thickness class as indicated in the Piping Schedule provided in Section 15052 Common Work Results for General Process Piping.
- 2. Type with screw-on flanges:
  - a. In accordance with AWWA C115 with minimum special thickness Class 53 wall thickness as required for screw-on flanges.
  - b. Special thickness class as indicated in the Piping Schedule as specified in Section 15052 Common Work Results for General Process Piping.
- 3. Type with grooved couplings:
  - a. Special thickness class as indicated in the Piping Schedule as specified in Section 15052 Common Work Results for General Process Piping.

## B. Joints:

- 1. Flanged joints:
  - a. Screw-on flanges: Comply with the diameter, thickness, drilling, and other characteristics in accordance with ASME B16.1. In addition, comply with the following requirements:
    - 1) Ductile iron.
    - 2) Long hub, threaded, and specially designed for ductile iron pipe.
    - 3) After attaching to pipe, machine flange face to make pipe end and flange even and perpendicular to the axis of the pipe.
  - b. Bolt holes on flanges: 2-holed and aligned at both ends of pipe.
  - c. Cap screw or stud bolt holes: Tapped.
  - d. Bolts and nuts: As specified in Section 15052 Common Work Results for General Process Piping.
  - e. Gaskets: Standard styrene butadiene copolymer (SBR) unless specified otherwise in Section 15052 Common Work Results for General Process Piping.
- 2. Push-on rubber gasket joints: In accordance with AWWA C111.
- 3. Integrally restrained push-on joints:
  - a. Application:
    - 1) Where designation restrained push-on is specified in the Piping Schedule provided in Section 15052 Common Work Results for General Process Piping, supply a restrained push-on joint piping system, which includes restrained push-on joints where necessary based upon thrust calculations.
    - 2) Standard push-on rubber gasket joints as specified above can be used where thrust calculations demonstrate restraint is not required.
  - b. Design:
    - 1) Restrained push-on joints of the configuration which utilizes a gripping or friction force for restraint will not be acceptable.
    - 2) Suitable for the following working pressures:
      - a) For 4 through 24-inch pipe: 350 pounds per square inch gauge.
      - b) For 30 through 54-inch pipe: 250 pounds per square inch gauge.
  - c. Manufacturers: One of the following or equal:
    - 1) United States Pipe and Foundry Company, TR Flex.
    - 2) Pacific States Cast Iron Pipe Company, Thrust Lock.
    - 3) American Cast Iron Pipe Company, Flex Ring or Lok-Ring.
    - 4) Griffin Pipe Products Co., Snap-Lok.

- d. Limit buried joints to half the manufacturer's published allowable angular joint deflection for purposes of pipeline alignment and elimination of fittings.
- C. Fittings:
  - 1. Ductile iron in accordance with AWWA C110.
  - 2. Joint type: Same as that of the associated piping as specified in Section 15052 Common Work Results for General Process Piping.
  - 3. Plain end-to-flanged joint connectors using setscrews are not acceptable.
  - D. Pipe linings and coatings:
    - 1. Cement-mortar lining:
    - a. In accordance with AWWA C104, apply cement-mortar on clean bare metal surfaces. Extend to faces of flanges, ends of spigots, and shoulders of hubs.
    - b. Minimum lining thickness: Standard in accordance with AWWA C104.
    - c. Type of cement: Type II.
  - 2. Asphaltic seal coat:
    - a. Apply over cement mortar linings and to outside surface of pipes that will not receive another coating. Apply in accordance with AWWA C151.
  - 3. Elastomeric polyurethane (100 percent solids) lining:
    - a. As specified in Section 09960A High-Performance Coatings.
  - 4. Ceramic epoxy lining:
    - a. Manufacturers: One of the following or equal:
      - 1) PROTECTO 401.
      - 2) SP-2000W.
    - b. Material: Amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment.
    - c. Minimum dry film thickness (DFT): 40 mills.
    - d. Application:
      - 1) The lining shall only be applied by a manufacturer-authorized representative with no less than 5 years of experience in applying the specified material.
      - 2) The application of the lining shall be performed in accordance with manufacturer's published specifications.
      - 3) Pipe and fittings shall be delivered to application facility with no interior lining.
      - 4) Interior of pipe shall be abrasive blasted per manufacturer's specifications.
    - e. Coverage:
      - 1) Gasket and spigot ends-on joints: Provide 6 mils minimum and 10 mils maximum coverage using joint compound as specified by the manufacturer for the gasket area and spigot ends.
      - 2) Mechanical joints: Extend lining from spigot end to edge of gauging ring.
      - 3) Number of coats: As recommended by the lining manufacturer.
    - f. Source quality control:
      - 1) Test pipe and fitting lining with a magnetic film thickness gauge. Perform testing in accordance with the method outlined in SSPC PA 2 Film Thickness Rating.

- 2) Test lining integrity of pipes using a holiday detection testing instrument set at the voltage as specified by the coating manufacturer:
  - a) Repair all holidays with joint compound in accordance with the recommendations of the coating manufacturer, and re-test.
- 3) Discard piping or reline piping when pinholes or discontinuities are found.
- 5. Fusion bonded epoxy lining and coating for fittings only:
  - a. As specified in Section 15057 Fusion Bonded Epoxy Lining.

## 2.02 POLYETHYLENE ENCASEMENT

- A. 2 layers of linear low-density polyethylene (LLDPE) film, minimum thickness of 8 mils in accordance with AWWA C105, or
- B. Single layer of high-density, cross-laminated polyethylene (HDCLPE) film, minimum thickness of 4 mils in accordance with AWWA C105.

## 2.03 CORROSION MONITORING FACILITIES

A. Provide joint bonding as specified in Section 13112 Pipeline Corrosion Monitoring Facilities.

## 3.01 INSTALLATION

- A. General:
  - 1. Install ductile iron piping in accordance with AWWA C600, modified as specified in Section 15052 Common Work Results for General Process Piping.
  - 2. For underground piping, the trenching, backfill, and compaction: As specified in Division 2 Site Construction.
- B. Polyethylene Encasement:
  - 1. 2 layers of linear low-density polyethylene (LLDPE) film, minimum thickness of 8 mils in accordance with AWWA C105, or
  - 2. Single layer of high-density, cross-laminated polyethylene (HDCLPE) film, minimum thickness of 4 mils in accordance with AWWA C105.
- C. Joints:
  - 1. Install types of joints as specified in the piping schedule provided in Section 15052 Common Work Results for General Process Piping.
  - 2. Mechanical joints are not acceptable in above ground applications.
  - 3. Field closure for restrained push-on pipe:
    - a. Locate field closures in areas where thrust calculations demonstrate restraint is not required.
- D. Tapping ductile iron pipe:
  - 1. Direct tapping of ductile iron pipe may be performed but is limited to the following conditions:

Pipe Size	Pressure Class				
(inches)	150	200	250	300	350
	Maximum Allowable Direct Tap Size (inches)				
3	-	-	-	-	3/4
4	-	-	-	-	3/4
6	-	-	-	-	1
8	-	-	-	-	1
10	-	-	-	-	1
12	-	-	-	-	1-1/4
14	-	-	1-1/4	1-1/2	1-1/2
16	-	-	1-1/2	2	2
18	-	-	2	2	2
20	-	-	2	2	2
24	-	2	2	2	2

a. Maximum allowable tap diameter by pipe diameter and pressure class:

- b. The maximum allowable tap diameter for pipelines greater than 24 inches is 2 inches.
- c. Two layers of 3-mil thread sealant are required to minimize the torque required to affect a watertight connection.

## 3.02 CORROSION MONITORING FACILITIES

A. Bond all pipe joints and associated fittings to provide electrical continuity. Install dielectric insulating fittings and corrosion monitoring facilities as indicated on the Drawings and specified in Section 13112 Pipeline Corrosion Monitoring Facilities.

## 3.03 FIELD QUALITY CONTROL

- A. Testing ductile iron piping:
  - 1. Test as specified in Section 15052 Common Work Results for General Process Piping.
  - 2. Do not test sections longer than 1/2 mile in total pipe length.
- B. Repair damaged cement mortar lining to match quality, thickness, and bonding of original lining in accordance with AWWA C104.
  - 1. When lining cannot be repaired or repairs are defective, replace defective piping with undamaged piping.
- C. Verify that interior surfaces of glass lined pipe and fittings have continuous coverage:

- 1. Verify with low voltage wet sponge holiday detector in accordance with NACE SP0188.
- 2. Discard glass lined ductile iron piping and fittings with voids or casting anomalies that represent more than 0.01 percent of the total glassed surface.
  - a. No more than 2 pinholes per fitting or an average of 5 or less pinholes per 20 feet of pipe.
- 3. Discard lined piping and fittings found to have pinholes, crazing, or fish scales, which expose the metal substrate.

## **SECTION 01600 - MATERIAL AND EQUIPMENT**

### 1.0 STORAGE OF MATERIALS

Materials shall be stored in such a manner as to ensure the preservation of their quality and fitness for the Work. When considered necessary by the Construction Manager, materials shall be placed on platforms or other hard, clean surfaces, and covered when directed.

Materials shall be stored so as to facilitate inspection. Storage areas shall be suitably fenced, if necessary to protect the public or the material.

Unless otherwise designated in the General Requirements, locations and arrangements for storage sites for materials and equipment outside the limits of work shall be selected and maintained by the Contractor at its expense. Full compensation for furnishing such storage sites as may be necessary or required by the Contractor shall be considered as included in the price bid and no additional compensation will be allowed therefore. The District shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. Use of portions of the District's area at the site for materials and equipment storage shall be permitted only upon the approval of the Construction Manager.

#### 2.0 HAZARDOUS MATERIALS

The storage and handling of potential pollution causing and hazardous materials, including but not necessarily limited to, gasoline, oil and paint shall be in accordance with all local, state and federal requirements. All hazardous materials shall be stored and handled in strict accordance with the Material Safety Data Sheets for the products. Material Safety Data Sheets shall be submitted to the Construction Manager prior to the delivery of materials to the project. Hazardous materials shall be removed and legally disposed as soon as no longer needed for project work. All spills of potential pollution causing and hazardous materials shall be contained, cleaned-up, removed and legally disposed, and remediated completely at no additional cost to the District.

## 3.0 MATERIAL AND EQUIPMENT SUBSTITUTIONS

#### 3.1 General

In preparing these Specifications, the Design Consultant has named those products which to its knowledge meet the Specifications and are equivalent in construction, functional efficiency, and durability.

Wherever catalog numbers and specific brands or trade names preceded by "similar and equal" or followed by the designation "or equal" are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, they are used to establish the standards of quality and utility required.

The first-named manufacturer is the basis for the project design and the use of alternative-named or unnamed manufacturer's products proposed by the Contractor may require modifications in the project design and construction. Where only one product has been named by brand, it is the only brand, trade name, or manufactured product known to the Design Consultant that meets these Specifications.

Material and Equipment 01600-1 Wherever catalog numbers and specific brands or trade names not preceded by designation "similar and equal" nor followed by the designation "or equal", are used in conjunction with a designated material, product, thing, installation, or service mentioned in these Specifications, to ensure compatibility with existing facilities, no substitutions will be allowed. Reference Paragraph 00100-19.0, <u>SUBSTITUTIONS DURING BIDDING</u>.

#### 3.2 Substitutions

Substitutions which are equal in quality and utility to those specified will be permitted, subject to the following provisions. For this purpose, the Contractor shall submit to the Construction Manager in accordance with Public Contract Code Section 3400, no later than thirty five (35) days after the Notice to Proceed, a typewritten list containing a description of each proposed substitute item or material. Sufficient data, drawings, samples, literature, calculations, or other detailed information as will demonstrate to the Design Consultant that the proposed substitute is equal in quality and utility to the material specified shall be appended to this list. The Design Consultant will favorably review in writing such proposed substitutions as are, in its opinion, equal in quality to the items or materials specified. In the event that a substitute is favorably reviewed, fifty percent (50%) of all savings shall be credited to the District.

Failure of the Contractor to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the Construction Manager of any substitutions otherwise proposed.

### 3.3 Modifications and Costs

If named alternatives or substitutions are proposed by the Contractor and favorably reviewed by the Design Consultant, the Contractor is responsible for providing, at no additional cost to the District, any electrical, mechanical, structural, or other related changes or testing that may be required to accommodate or provide the particular material or equipment the Contractor desires to use. Any deviation from the Specifications or the Drawings resulting from the type of material or equipment to be used shall not be the basis for any "extra charges" above and in excess of the original bid price of the work.

In addition the Contractor is responsible for all additional costs to the District, and its agents and representatives, for evaluation of data submitted by the Contractor for alternative named or substitutions and any redesign necessary. The District shall deduct said costs from the Contract monies due the Contractor.

## **SECTION 01660 - SYSTEM TESTING**

#### 1.0 GENERAL

#### 1.1 DESCRIPTION

A. The Contractor shall provide all necessary facilities for conducting the tests, including but not limited to, personnel, power, water equipment, and chemicals. The Contractor shall provide the required minimum notice to the Construction Manager of its readiness and intent prior to each test.

### 1.2 QUALITY ASSURANCE

- A. Installation.
  - All mechanical, electrical and instrumentation equipment provide under this Contract shall be installed in conformity with the details shown and specified, and with the manufacturer's requirements. Should a manufacturer's installation recommendations conflict with specific requirements of these Contract Documents the Contractor shall bring the matter to the attention of the Construction Manager. Any costs incurred by the Contractor through failure to timely notify the Construction Manager of a difference between the Contract Documents and manufacturer's installation requirements shall be borne by the Contractor.
- B. Testing.
  - 1. General Requirements. All equipment and partially completed or full completed portions of the work included in this Contract shall be tested and inspected to demonstrate compliance with the Contract requirements. Unless otherwise specified, all costs of testing, including temporary facilities and connections, shall be borne by the Contractor. For the purpose of this Section, equipment shall mean any mechanical, electrical, instrumentation, or other device with one or more moving parts or devices requiring an electrical, pneumatic or hydraulic connection. Installed pipeline and associated appurtenances, such as check valves, plug valves, and flowmeters, shall be tested for watertightness and leakage tests shall be performed as specified in the District's Sewer Standards and Specifications. Testing for electrical devices, instrumentation devices and systems shall be carried out in accordance with Division 16 Electrical.
  - 2. Approval for Testing. No tests specified herein shall be conducted until the item to be tested has been instructed and approval given by the Engineer for the application of such test.
  - 3. Scope. Tests and inspection shall include:
    - a. The delivery acceptance test and inspections.
    - b. The installed test and inspections including Pre-Operation Checkout and Operational Testing.
    - c. The commissioning of completed sections of the lift station by the District's personnel.
  - 4. Testing Standards. Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry. The Contractor shall ensure that scheduling and performance of all tests are coordinated with the involved subcontractors and suppliers.
  - 5. Testing Forms: The form of evidence of satisfactory fulfillment of delivery acceptance test and inspection requirements shall be, at the discretion of the Engineer, either by tests and inspections carried out by approved persons or organizations. The Contractor shall provide and use forms which include all test information, including specified operational parameters. The forms used shall be acceptable in content to the Engineer.
  - 6. Master Test Log Book. Prior to commencing testing and inspection, the Contractor shall submit to the Engineer the proposed format for the master test log book. The master log

book shall be maintained by the Contractor which shall cover all tests including piping, equipment, electrical, and instrumentation. The master test log book shall be provided with loose leaf pages which shall be copied weekly after updated for transmittal to the Engineer. At the completion of the project, the complete mater test log book shall be submitted to the Engineer.

- 7. Delivery Acceptance Tests and Inspections: The delivery acceptance tests and inspections and any remedial work to correct deficiencies shall be at the Contractor's expense for any equipment specified herein and shall include the following:
  - a. Tests of items at the place of manufacture during and/or on completion of manufacture, comprising hydraulic pressure tests, electric and instrumentation subsystems tests, performance and operating tests and inspections in accordance with the relevant standards of the industry and more particularly as detailed in individual sections of these specifications to satisfy the Engineer that the items tests and inspected comply with the requirements of the Contract documents.
  - b. Inspection of all items delivered at the site or to any authorized place of storage in order that the Engineer may be satisfied that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery. The Contractor shall be prepared to remove all coverings, containers or crates to permit the Engineer to conduct his inspection. Should the Engineer find, in his opinion, indication of damage or deficient quality of workmanship, the Contractor shall remedy such deficiencies and provide the necessary documentation or conduct such tests deemed necessary by the Engineer to demonstrate compliance.
- 8. Installed Tests and Inspections: All equipment shall be tested by the Contractor to the satisfaction of the Engineer before any facility is place in operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted, and corrected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.
- 9. Procedures: Prior to receipt of any progress payments in excess of 60% of the Contractor's lump sum bid for the work, the Contractor shall submit to the Engineer, details of the installed tests and inspection procedures he proposes to adopt for testing and start-up of all equipment to be operated singly and together, except when such procedures have been addressed in the Project Specifications. The procedures shall be divided into two distinct stages: pre-operation checkout and operation testing. Testing procedures shall be designed to duplicate, as nearly as possible, all conditions of operation and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been reviewed by the Engineer, the Contractor shall produce checkout, alignment, adjustment, and calibration signoff forms for each item of equipment to be used in the field by the Contractor and the Engineer jointly to ensure that each item of electrical, mechanical, and instrumentation equipment has been properly installed and tested. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question.
- 10. Pre-Operation Checkout: The installed tests and inspection procedures shall incorporate all requirements of these specifications and shall proceed in a logical, step wise sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation. Pre-operation checkout procedures shall include, but not necessarily be limited to:
  - a. Piping system pressure testing and cleaning as specified in Division 15 Mechanical.
  - b. Electrical system testing as specified in Division 16 Electrical.
  - c. Instrumentation system testing as specified in Division 16 Electrical.
  - d. Alignment of equipment.
  - e. Pre-operation lubrication.
- 11. Operational Testing: Once all affected equipment has been subjected to the required preoperational checkout procedures and the Engineer has witnessed and has not found deficiencies in that portion of the work, individual systems may be started and operated

under simulated operating conditions to determine as nearly as possible whether the equipment and systems meet the requirements of these specifications. Potable water shall be employed for the testing of all liquid systems except gaseous, oil or chemical systems unless specified otherwise. Test media for these systems shall either be the intended fluid or a compatible substitute. The equipment shall be operated a sufficient period of time to determine machine operating characteristics, including temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as electrical power, compressed air, control air, or instrumentation which have not yet been placed in service, the Contractor shall provide acceptable substitute sources, capable of meeting the requirements of the machine, device or system, at no additional cost to the Owner. Disposal methods for test media shall be subject to review and acceptance of the Engineer.

- 12. Repeated Tests: If under test, any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of repeating such tests.
  - a. Once simulated operation has been completed, all machines shall be rechecked for proper alignment, realigned, if necessary, and doweled in place. All equipment shall be checked for loose connections, unusual movement or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the Engineer. All machines or devices which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected. They shall then be repaired or removed from the site and replaced at no cost to the Owner.
- 13. Tolerances: Test results shall be within the tolerances set forth in the detailed specification sections of this Contract Document. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Where, in the case of an otherwise satisfactory installed test, any doubt, dispute, or difference should arise between the Engineer and the Contractor regarding the test results or the methods or equipment used in the performance of such test, then the Engineer may order the test to be repeated. If the repeat test, using such modified methods or equipment as the Engineer may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the Owner, otherwise the costs shall be borne by the Contractor. Where the results of any installed test fail to comply with the contract requirements for such test, then such remedial efforts and repeat tests as may be necessary to achieve the contract requirements shall be made by the Contractor at his expense.
- 14. Contractor Supplied Materials: Unless otherwise specified, the Contractor shall provide at no expense to the Owner, all power, fuel, compressed air supplies, labor and all other necessary items and work required to complete all tests and inspection specified herein. The Contractor shall provide, at no expense to the Owner, temporary heating, ventilating and air conditioning for any area requiring it in the case where permanent facilities are not complete and operable at the time of installed tests and inspections. Temporary facilities shall be maintained until permanent systems are in service.
- 15. Commissioning: After completion of the operation testing and certification by the Engineer that the systems did meet all performance requirements, commissioning will begin. The commissioning period for each system or system components shall be 20 working days except where specified otherwise. The Contractor shall remove all temporary piping or bulkheads that may have been in use during the operational testing. The Owner's operations and maintenance personnel will be responsible for operation of the plant or portion of the plant being operated during this period of time. The plant or portion thereof shall be fully operational, accepting all normal flow called for in design and performing all functions as designed. The Contractor and the equipment manufacturer's technical representative shall be available at all times during the commissioning period to provide immediate assistance in case of failure of any portion of the system being tested. At the

end of the commissioning period and when all corrections required by the Engineer to assure a reliable and completely operational facility are complete, the Engineer shall issue a certificate of substantial completion. During the commissioning period, the Owner shall be responsible for all normal operational costs and the Contractor shall bear the costs of all necessary repairs or replacements, including labor and materials, required to keep the portion of the plant being commissioned and operational.

16. Training: During the operational testing phase of equipment, the Contractor shall make available experienced factory trained representatives of the manufacturers of all the various pieces of equipment, to train the Owner's personnel in the operation and maintenance thereof. The time required for this training shall be as specified herein for the specific piece of equipment. The Contractor shall notify the Engineer of the time of the training at least 14 days prior to the time of training.

## 2.0 PRODUCTS

## 2.1 MATERIALS

- A. Installation
  - 1. Materials employed in the installation shall conform to the requirements of these Contract Documents and the recommendations of the equipment manufacturers.
- B. Testing
  - 1. Gages, Meters, Recorders, and Monitors: Gages, meters, recorders, and monitors shall be provided by the Contractor to supplement or augment the instrumentation system provided under this contract to properly demonstrate that all equipment fully satisfies the requirements of the Contract Documents. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specifically selected to be consistent with the variables to be monitored. All instruments shall be recently calibrated and the Contractor shall be prepared at all times to demonstrate, through recalibration, the accuracy of all instruments employed for testing purposes. Calibration procedures shall be in accordance with applicable standards of ASTM, ISA, and IEEE. The adequacy of all gages, meters, recorders and monitors shall be subject to review of the Engineer.
  - 2. Records: The Contractor shall provide signoff forms for all installed and operational testing to be accomplished under this contract. The signoff forms shall be produced in quadruplicate on pressure sensitive paper. Signoff forms shall be provided for each item of mechanical, electrical, and instrumentation equipment provided or installed under this contract and shall contain provisions for recording relevant performance data for original testing and not less than three retests. Separate sections shall be provided to record values for the pre-operation checkout, initials of representatives of the equipment manufacturers, the Contractor, and the Engineer.
  - 3. Master File: The Contractor shall maintain a master file of all equipment signoff sheets, which shall be available for inspection by the Engineer. Upon completion of testing, the Contractor shall furnish the Engineer with the original and two copies of the signoff sheet for each equipment item.

## 3.0 EXECUTION

## 3.1 METHODS

- A. Installation
  - 1. All equipment and apparatus used in testing shall be installed by specialists properly skilled in the trades and professions required to assure first class workmanship. Where required by detailed specifications, the Contractor shall cause the installation of specific equipment testing items to be accomplished under the supervision of factory trained installation specialists furnished by the equipment manufacturers. The Contractor shall be prepared to document the skills and training of all workmen engaged in the installation of all testing equipment furnished either by the Contractor or the Owner.

## B. Testing

1. Testing shall proceed on the step-by-step basis in accordance with the Contractor's written testing procedures. The Contractor's testing work shall be accomplished by a skilled team of specialists under the direction of a coordinator whose sole responsibility shall be the orderly, systematic testing of all equipment, systems, structures, and the complete facility as a unit. Each individual step in the procedures shall be witnessed by a representative of the Engineer. During the plant operational testing period, all equipment and systems in operation shall be operated to the greatest extent practicable, at conditions which represent the full range of operating parameters as defined by this Contract document.

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# **SECTION 01670 - TRAINING**

#### 1.0 GENERAL

Conduct an instruction program for District's operation and maintenance personnel. Provide training for the purpose of familiarizing the District's personnel with the proper operation and maintenance of all equipment. Training shall include both classroom instruction and "hands-on" instruction held at the equipment.

Additional specific requirements for each type of equipment and/or system are identified in the Specification sections covering the various project equipment and/or systems.

#### 2.0 INSTRUCTORS

Training for an individual component within a system shall be performed by the manufacturer's factory-certified personnel. Training provided by the system fabricator, packager, integrator, or supplier shall be in addition to the component training.

Training instructors shall be trained and familiar with giving classroom, hands-on and field training.

#### 3.0 SCHEDULING

Conduct training after the equipment has been installed, tested, and adjusted, and prior to District acceptance for beneficial occupancy or substantial completion of the respective equipment item, unless required earlier in the progress of the work the Specification section covering that equipment or system. Training shall be a prerequisite for acceptance.

Schedule instruction periods acceptable to the District, and provide formal written notice of the proposed instruction period at least fourteen (14) days prior to commencement of the instruction period. The District will review and comment on the proposed training schedule to accommodate scheduling of its shift personnel and ongoing or forecasted workload. The duration of the training sessions may vary from one hour up through multiple days, and should be based upon the complexity of the equipment involved and the training required.

For operation and routine maintenance instruction, three separate but identical training sessions for each respective equipment item or system shall be required (on different days or sets of days for multiple day sessions) to accommodate the scheduling of District's shift personnel and District's workload. For detailed maintenance and overhaul training, and for detailed troubleshooting, repair, and programming instruction for electrical and instrumentation equipment, two separate but identical training sessions (on different days or sets of days for multiple day sessions) shall be required for each respective equipment item or system.

#### 4.0 INSTRUCTION PROGRAM

Instruction programs shall include basic system operation theory, troubleshooting, routine maintenance and repair, "hands-on" operation of equipment, and rebuild/overhaul procedures. Provide copies of all training material (graphs, diagrams, cut-a ways, charts, descriptions,

instructions, etc.) used in the training sessions for the use of District's personnel in attendance and for insertion into the O&M manuals. All training material shall become the property of the District.

Instructors shall prepare a typed agenda for each training session and submit to District with the proposed training schedule twenty-one (21) days prior to the proposed commencement of the training period. District will review and comment on the adequacy of the proposed training and training schedule. Instructors shall obtain District approval of each training session agenda prior to the start of its respective session.

Training sessions, and their respective agendas, shall be organized into topic groupings to allow District to coordinate personnel attendance with the topics being taught. For example, operators do not need to attend overhaul training. Agenda shall also include a statement of the intended audience, list of major training topics, goals and objectives for each major training topic, and motivational statements (i.e. why is this important).

Training sessions shall cover the information required in the Operation and Maintenance manuals submitted in accordance with Section 01300 and the following topics, as applicable:

- a. Operation, including theory of operation, start-up procedures, shutdown procedures, instrumentation and controls
- b. Lubrication, including changing of major fluids
- c. Operation safety
- d. Emergency situation response
- e. Troubleshooting
- f. Preventive maintenance procedures
- g. Optimizing life of equipment components
- h. Maintenance, including adjustment and/or removal and replacement of wear components
- i. Overhaul and repair, including takedown procedures, disassembly and assembly
- j. Programming
- k. Record keeping

Training for overhaul and repair on mechanical equipment, and for troubleshooting, repair, and programming on electrical, instrumentation, and control equipment shall provide sufficient detail, duration, and quality to result in factory certification for District staff receiving such training, where factory certification is available. This training shall include an examination to determine the competency of the participating students. All tests shall be scored by the instructor and results submitted to the District. Certificates shall be issued by the manufacturer to those students demonstrating a level of competency acceptable to the manufacturer. The manufacturer/instructor shall anticipate training District staff to this level of detail as follows:

Mechanical Equipment	Two separate sessions with four District maintenance staff in each session (separate days)
Electrical, Instrumentation and control	Two separate sessions with four District maintenance staff in each session (separate days)

#### 5.0 LOCATION

All training shall be conducted at District facilities, except that training for factory certification in troubleshooting, repair, and programming of electrical, instrumentation, and control equipment may occur at the manufacturer's facility, at the manufacturer's option. Should the manufacturer choose

to conduct this factory certification training at its facilities, the Contractor shall arrange for and pay all costs for travel, lodging, meals, and other associated expenses for District staff to travel to and from, and receive training at, the manufacturer's facility, at no additional cost to the District.

## 6.0 RECORDING OF TRAINING SESSIONS

Contractor shall record in color using DVD format, every session of the instruction program for each respective equipment item or system. Recording shall be performed by a person experienced in the operation of video recording equipment. Care shall be taken to properly place the camera, and provide adequate lighting and sound systems to ensure good video and audio quality. The final submitted DVD shall be subject to District approval and acceptance.

For video recording of "hands-on" training at the equipment, ambient noise shall be considered too loud to obtain satisfactory sound quality. For "hands-on" training sessions at the equipment, the recording shall be done without sound and the instructor shall dub a detailed narrative onto the recording by a means that will provide sound quality satisfactory to the District. Contractor shall propose a dubbing methodology to the District for approval prior to the first "hands-on" training session. Contractor is not required to video record factory certification training that occurs at the manufacturer's facilities, but shall record any such training that occurs at District facilities.

Label each DVD identifying the session and respective equipment item or system. Multiple sessions of the same instruction program may be contained on the same DVD, but only one equipment item or system shall be recorded on the same DVD. The original and one copy of each DVD shall be submitted to the District within seven days following completion of each respective instruction program and any post-session dubbing. Responsibility for coordinating and providing all equipment, including video recorder and microphones, necessary to satisfactorily record each session, including all associated costs, shall be borne by the Contractor at no additional cost to the District.

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## SECTION 01700 - CONTRACT CLOSEOUT

#### 1.0 INSTRUCTION MANUALS

All Instruction Manuals shall be submitted to, and approval by the Construction Manager obtained, prior to seventy-five (75) percent of the work being completed, or prior to the District taking beneficial occupancy of any equipment or facility, whichever occurs first. Incomplete or unacceptable Instruction Manuals as determined by the Construction Manager shall constitute justification for withholding all or any portion of progress payments.

#### 2.0 EQUIPMENT START-UP

After all acceptance tests have been completed by the Contractor and District, but prior to final acceptance, the Contractor shall recheck all equipment for proper alignment, adjustment, and calibration, check oil levels, re-lubricate all bearing and wearing points, and in general assure that all equipment is in proper condition for regular continuous operation.

#### 3.0 FINAL CLEANING

#### 3.1 Final Clean Up

Before final inspection of the Work, the Contractor shall clean the construction area, material sites, adjacent property and streets, and all ground occupied by the Contractor in connection with the Work of all rubbish, excess materials, form lumber, etc. All parts of the Work shall be left in a neat and presentable condition.

Allow the District to salvage any equipment, parts or machinery being replaced or discarded as part of the Project. District will be responsible for picking-up items from Project site. Anything not reclaimed by the District shall remain the responsibility of the Contractor.

#### 3.2 Final Building Clean-Up

On all building projects and wherever else applicable, besides general broom cleaning, the following special cleaning shall be performed at completion of the Work:

- a. Putty stains and paint shall be removed from glass; glass shall be washed and polished, inside and outside. Care shall be exercised so as not to scratch glass.
- b. Marks, stains, fingerprints, and other soil and dirt shall be removed from painted, decorated, or stained work.
- c. Waxed woodwork shall be cleaned and polished.
- d. Hardware shall be cleaned and polished of all traces; this shall include removal of stains, dust, dirt, paints, and blemishes.
- e. Spots, soil, paint, plaster, and concrete shall be removed from tile; tile work shall be washed afterwards.
- f. Fixtures and equipment shall be cleaned, and stains, paint, dirt, and dust shall be removed.

- g. Temporary floor protections shall be removed; floors shall be cleaned, waxed, and buffed.
- h. Dust, cobwebs, and traces of insects and dirt shall be removed.

### 4.0 **PROJECT COMPLETION**

#### 4.1 Substantial Completion

Substantial Completion is the date upon which written acceptance by the Owner has occurred stating that the construction of facilities is sufficiently completed in accordance with the Contract Documents, such that specific facilities can be utilized for the purpose for which they are intended, and the Owner thereupon takes beneficial occupancy of each facility.

#### 4.2 Final Completion

Final Completion is the date upon which written acceptance by the Owner has occurred stating that the Construction of all remaining Work as required by the Contract Documents, has been completed in accordance with the Contract Documents. The following items as they pertain to all remaining Work of the Project are included in the requirements which shall be completed prior to Final Completion being certified:

- a. Removal and disposal of all non-salvageable materials, and clean-up of the project area.
- b. Correction of all work deficiencies and/or non-compliance items. The punch list for the entire Contract shall be resolved to the Owner's satisfaction prior to Final Completion.
- c. Written certification by the Contractor stating that all the above items have been accomplished and a request that the Owner accept the project as having attained "Final Completion."
- A. Submit following Closeout Submittals **upon Substantial Completion** and at least 7 days prior to submitting Application for Final Payment:
  - 1. Evidence of Compliance with Requirements of Governing Authorities.
  - 2. Project Record Documents
  - 3. Operation and Maintenance Manuals.
  - 4. Warranties and Bonds.
  - 5. Keys and Keying Schedule.
  - 6. Evidence of Payment and Release of Liens and/or Stop Payment Notices as outlined in Conditions of the Contract.
  - 7. Release of claims as outlined in Conditions of the Contract.
  - 8. Survey Record Documents as specified in Section 01722.
  - 9. Certificate of Final Completion.

### 4.3 PROJECT RECORD DOCUMENTS

- A. Maintain at Project site, available to the District and Construction Manager, 1 copy of the Contract Documents, shop drawings, and other submittals in good order:
  - 1. Mark and record field changes and detailed information contained in submittals and change orders.

- 2. Record actual depths, horizontal and vertical location of underground pipes, duct banks, and other buried utilities. Reference dimensions to permanent surface features.
- 3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.
- 4. Identify location 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.
- 5. Provide schedules, lists, layout drawings, and wiring diagrams.
- 6. Make annotations with erasable colored pencil conforming to the following color code:

Additions:	Red
Deletions:	Green
Comments	Blue
Dimensions:	Graphite

- B. Maintain documents separate from those used for construction:
  - 1. Label documents "RECORD DOCUMENTS."
- C. Keep documents current:
  - 1. Record required information at the time the material and equipment is installed and before permanently concealing.
- D. Deliver record documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
- E. During progress meetings, record documents will be reviewed to ascertain that changes have been recorded.

#### 5.0 GUARANTEE

The Contractor shall guarantee that the equipment, materials and workmanship furnished under this Contract, including all work and materials provided by subcontractors or manufacturers of packaged equipment components, will be as specified and will be free from defects for a one-year guarantee period, starting from the date of Substantial Completion of the Work, unless a longer period of time is prescribed by law or required by special provisions elsewhere in the Contract Documents and except as otherwise noted herein. In addition, the equipment furnished by the Contractor shall be guaranteed to be free from defects in design. The Contractor also agrees to indemnify, defend, and hold the District harmless from liability of any kind arising from damage due to said defects. The Contractor shall execute and submit a completed Warranty Form prior to the Substantial Completion date or the final acceptance of the project or within five (5) days of the occupancy or use of a portion of the Work, whichever is applicable.

If a specific item (or items) of equipment or material cannot be utilized by the District at Substantial Completion because the Work is incomplete or defective, the guarantee for that item (or items) shall begin when the District is provided beneficial use. Beneficial use for any such items shall be provided prior to Final Completion. In the event warranty work involves repair or replacement of parts, machine work, or any other work which affects the equipment or materials installed under this Contract, the Contractor's guarantee on such items and work shall be extended for a period of one year from the date of installation of said replacement items, or the performance of said repair or replacement work.

Contract Closeout 01700-3 Within the guarantee period and upon notification of the Contractor by the District, the Contractor shall promptly make all needed adjustments, repairs or replacements arising out of defects, failure or abnormalities which, in the judgment of the District, become necessary during such period. The cost of all materials, parts, labor, transportation, supervision, special tools and supplies required for correction of defects, failure or abnormalities shall be paid by the Contractor and its Surety. If, within ten (10) days, unless specified otherwise by the District, after the District gives the Contractor notice of a defect, failure, or abnormality of the Work, the Contractor neglects to make the necessary repair or adjustments, the District may make the repair or adjustments or order the Work to be done by a third party, with the cost of the Work to be paid by the Contractor and its Surety. In the event of an emergency where, in the judgment of the District, delay would cause serious loss or damage, repairs or adjustments may be made by the District, without giving notice to the Contractor, and the cost of the work shall be paid by the Contractor and its Surety.

The District and the Contractor agree that guarantee period on the parts of the work possessed and used by the District in accordance with Paragraph 00700-3.5, <u>District's Right to Use or Occupy</u>, shall commence on the date that the District takes possession of such work and so notifies the Contractor in writing. The District and Contractor further agree that such possession and use of the work shall not be deemed as Substantial Completion or acceptance of any other part of the Work.

Prior to the expiration of the guarantee period, the District reserves the right to hold a meeting and require the attendance of the Contractor. The purpose of the meeting is to review warranties, bonds and maintenance requirements and determine required repair or replacement of defective items.

For the purpose of this section, acceptance of the Work or a portion of the Work by the District, shall not extinguish any covenant or agreement on the part of the Contractor to be performed or fulfilled under this Contract which has not, in fact, been performed or fulfilled at the time of such acceptance. All covenants and agreements shall continue to be binding on the Contractor until they have been fulfilled.



# **COVERT LIFT STATION UPGRADES**

**TECHNICAL SPECIFICATIONS** 

OCTOBER 2022



Prepared by:



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## SOILS AND AGGREGATES FOR EARTHWORK

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Aggregate Base Course.
  - 2. Class 2 Permeable.
  - 3. Drain Rock.
  - 4. Gravel.
  - 5. Not used.
  - 6. Native Material.
  - 7. Sand.
  - 8. Select Material.
  - 9. Stabilization Material.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. C 117 Standard Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing.
  - 2. C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - 3. C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - 4. D 422 Standard Test Method for Particle-Size Analysis of Soils.
  - 5. D 2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
  - 6. D 2844 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils.
  - 7. D 4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - 8. D 4829 Standard Test Method for Expansion Index for Soils.
  - 9. D 5821 Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.

#### B. California Department of Transportation:

- 1. Standard Specifications.
- 2. California Test 205.
- 3. California Test 211.
- 4. California Test 217.
- 5. California Test 229.
- 6. California Test 301.

#### 1.03 SUBMITTALS

- A. Product data:
  - 1. Material source.
  - 2. Gradation.
  - 3. Testing data.
- B. Quality control for aggregate base course:
  - 1. Test reports: Reports for tests required by Sections of Standard Specifications.
  - 2. Certificates of Compliance: Certificates as required by Sections of Standard Specifications.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection: Protect from segregation and excessive moisture during delivery, storage, and handling.

## PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. General:
  - 1. Provide material having maximum particle size not exceeding 4 inches and that is free of trash, lumber, debris, leaves, grass, roots, stumps, and other organic matter.
  - 2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
- B. Aggregate Base Course:
  - 1. Class 2, 3/4-inch maximum aggregate size free from organic matter and other deleterious substances, and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
    - a. Aggregate base course for structures:
    - b. Consist of crushed or fragmented particles.
    - c. Coarse aggregate material retained in Number 4 sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.
  - 2. Aggregate shall not be treated with lime, cement, or other chemical material.
  - 3. Durability index: Not less than 35 when tested in accordance with California Test 229.
  - 4. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards or 1 day's production of material, whichever is smaller.
  - 5. Sand equivalent: Not less than 25 when tested in accordance with California Test 217.
  - 6. Resistance (R value): Not less than 78 when tested in accordance with California Test 301.
  - 7. Conform to size and grade within the limits as follows when tested in accordance with ASTM C 117 and ASTM C 136:

Sieve Sizes (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90-100
Number 4	35-60
Number 30	10-30
Number 200	2-9

- C. Class 2 Permeable:
  - 1. Consist of hard, durable particles of stone or gravel, screened, or crushed to the specified size and gradation.
  - 2. Provide free of organic matter, lumps or balls of clay, and other deleterious matter.
  - 3. Sand equivalent: Not less than 75 when tested in accordance with ASTM D 2419.
  - 4. Conform to size and grade within the limits as follows when tested in accordance with ASTM C 117 and C 136:

Sieve Size (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90-100
3/8 inch	40-100
Number 4	25-40
Number 8	18-33
Number 30	5-15
Number 50	0-7
Number 200	0-3

- D. Drain Rock:
  - 1. Durability: Percentage of wear not greater than 40 percent when tested in accordance with ASTM C 131.
  - 2. Consist of hard, durable particles of stone or gravel, screened, or crushed to specified size and gradation.
  - 3. Free from organic matter, lumps or balls of clay, or other deleterious matter.
  - 4. Crush or waste coarse material and waste fine material as required to meet gradation requirements.
  - 5. Conform to size and grade within the limits as follows when tested in accordance with ASTM C 117 and C 136:

Sieve Size (Square Openings)	Percent By Weight Passing Sieve
2 inch	100
1-1/2 inch	95-100
3/4 inch	50-100
3/8 inch	15-55
Number 200	0-2

- E. Native material:
  - 1. Sound, earthen material passing 1-inch sieve.
  - 2. Percent of material by weight passing Number 200 sieve shall not exceed 30 when tested in accordance with ASTM D 422.
  - 3. Expansion index less than 35 when tested in accordance with ASTM D 4829.
- F. Sand:
  - 1. Clean, coarse, natural sand.
  - 2. Non-plastic when tested in accordance with ASTM D 4318.
  - 3. One hundred percent shall pass a 1/2-inch screen.
  - 4. No more than 20 percent shall pass a Number 200 sieve.
- G. Select material:
  - 1. Sound earthen material for which sum of plasticity index when tested in accordance with ASTM D 4318 and the percent of material by weight passing Number 200 sieve shall not exceed 23 when tested in accordance with ASTM D 422.
  - 2. Organic content shall not be greater than 3 percent by volume.
- H. Stabilization material:
  - 1. Durability percentage of wear not greater than 40 percent when tested in accordance with California Test 211.
  - 2. Consist of clean, hard, durable particles of crushed rock or gravel screened or crushed to the specified sizes and gradations.
  - 3. Shall be free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.
  - 4. Shall be free of slaking or decomposition under the action of alternate wetting and drying.
  - 5. The portion of material retained on the 3/8-inch sieve shall contain at least 50 percent of particles having three or more fractured faces. Not over 5 percent shall be pieces that show no such faces resulting from crushing. Of that portion which passes the 3/8-inch sieve but is retained on the No. 4 sieve, not more than 10 percent shall be pieces that show no faces resulting from crushing.
  - 6. Conform to size and grade when tested in accordance with ASTM C 117 and ASTM C 136.

Sieve Size (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90-100
Number 4	0-10
Number 200	0-2

# 2.02 SOURCE QUALITY CONTROL (NOT USED)

## PART 3 EXECUTION (NOT USED)

## SITE PREPARATION

## PART 1 GENERAL

#### 1.01 DESCRIPTION

A. This Section specifies site preparation which consists of clearing, grubbing and demolition.

#### 1.02 JOB CONDITIONS

- A. Existing Conditions
  - 1. The CONTRACTOR shall determine the actual condition of the site as it affects this portion of work.
- B. Protection
  - 1. Site preparation shall not damage structures, landscaping or vegetation adjacent to the site. The CONTRACTOR shall repair, or replace any damaged property.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

- 3.01 GENERAL
  - A. The CONTRACTOR shall notify the ENGINEER when site preparation is complete.

#### 3.02 PERFORMANCE

#### A. Clearing and Grubbing

- 1. Unless otherwise specified, the CONTRACTOR shall remove obstructions such as brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger that 6-inches in any dimension, broken or old concrete and pavement, debris, and structures where the completion of the work require their removal.
- 2. Material that is removed and is not to be incorporated in the work shall be disposed of off the site.
- B. Demolition and Removal
  - 1. Structures
    - a. Demolition and removal of structures consist of removal of abandoned superstructures, foundation walls, footings, slabs and any other structures. Excavations caused by existing foundations shall be cleared of waste, debris and loose soil, and refilled as specified.
  - 2. Pavement

- a. When portions of asphalt pavements and concrete pads are to be removed and later construction is to be connected, edges shall be saw cut, on a neat line at right angles to the curb face.
- 3. Salvage
  - a. The OWNER has the right to salvage any items scheduled for removal. The CONTRACTOR shall notify the ENGINEER five (5) days prior to any salvage or demolition work to determine the disposition of items to be removed. The ENGINEER will mark items to be salvaged. Such items shall be properly disconnected, removed from their foundations, cleaned, and stored at a location on the plant site as specified.
- C. Utility Interference
  - 1. The OWNER has endeavored to determine the existence of utilities at the site of the work from the records of the owners of known utilities in the vicinity of the work. The positions of these utilities as derived from such records are shown on the drawings. No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the drawings. It shall be the responsibility of the CONTRACTOR to determine the exact location of utilities and service connections thereto. The CONTRACTOR shall make his own investigations, including exploratory excavations, to determine the locations and type of existing utilities, including service connections, prior to commencing work which could result in damage to such utilities. The CONTRACTOR shall immediately notify the ENGINEER as to any utility discovered by him in a different position than shown on the drawings or which is not shown on the drawings.
  - 2. In case it should be necessary to remove, relocate, or temporarily maintain a utility because of interference with the work, the work on the utility shall be performed and paid for as follows:
    - a. When it is necessary to remove, relocate, or temporarily maintain a service connection, the cost of which is not required to be borne by the OWNER thereof, the CONTRACTOR shall bear the expenses incidental to the work on the service connection. The work on the service connection shall be done in a manner satisfactory to the OWNER thereof; it being understood that the OWNER of the service connection has the option of doing such work with his own forces, or permitting the work to be done by the CONTRACTOR.
    - b. When it is necessary to remove, relocate, or temporarily maintain a utility which is in the position shown on the drawings, the cost of which is not required to be borne by the OWNER thereof, the CONTRACTOR shall bear the expenses incidental to the work on the utility. The work on the utility shall be done in a manner satisfactory to the OWNER thereof; it being understood that the OWNER of the utility has the option of doing such work with his own forces, or permitting the work to be done by the CONTRACTOR.
    - c. When it is necessary to remove, relocate, or temporarily maintain a utility which is not shown on the drawings or is in a position different from that shown on the drawings and were it in the position shown on the drawings would not need to be removed, relocated, or temporarily maintained, the cost of which is not required to be borne by the OWNER thereof, the ENGINEER will make arrangements with the OWNER of the utility for such work to be done at no cost to the CONTRACTOR, or will require the CONTRACTOR to do such work

in accordance with the article on changes in the work or will make changes in the alignment and grade of the work to obviate the necessity to remove, relocate, or temporarily maintain the utility.

- 3. No representations are made that the obligations to move or temporarily maintain the utility and to pay the cost thereof is or is not required to be borne by the OWNER of such utility, and it shall be the responsibility of the CONTRACTOR to investigate to find out whether or not said cost is required to be borne by the OWNER of the utility.
- 4. The right is reserved to governmental agencies and to OWNERS of utilities to enter upon streets, alleys, rights of way, or easements for the purpose of making changes in their property made necessary by the work and for the purpose of maintaining and making repairs to their property.
- D. Cleanup
  - 1. Remove and transport debris, rubbish, and excess material from the site in a manner that will prevent spillage on streets or adjacent areas. Clean up spillage from streets and adjacent areas. Comply with Federal, State, and local hauling disposal regulations. Cleanup shall be an ongoing activity throughout the contract period.
- E. Disposal of Materials
  - All materials removed shall become the property of the CONTRACTOR unless designated by the ENGINEER and shall be removed from the project site. CONTRACTOR shall make his own arrangements for disposing of materials outside the project site and shall pay all costs involved. Arrangements shall include, but not be limited to, entering into agreements with property owners and obtaining necessary permits, licenses, and environmental clearances.

## DEWATERING

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Scope
  - 1. Installation and maintenance of dewatering systems.
  - 2. Disposal of water entering excavation or other parts of the work.

#### 1.02 SYSTEM DESCRIPTION

- A. The CONTRACTOR shall furnish, install, operate and maintain all machinery, appliances, and equipment to maintain all excavations free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property, or to cause a nuisance or menace to the public.
- B. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent which would cause damage or endanger adjacent structures.
- C. The static water level shall be drawn down a minimum of 3 feet below the bottom of the excavation in order to maintain the undisturbed state of the foundation soils and to facilitate the placement of fill or backfill compacted to the required density.

#### 1.03 SUBMITTALS

- A. Dewatering plan:
  - 1. Dewatering design analysis.
  - 2. Estimated flow of dewatering discharge for all phases of the work.
  - 3. Required permits.
  - 4. Arrangement, location, and depths of dewatering system components.
  - 5. Type and sizes of filters.
  - 6. Identify proposed alignment, support, and protection for discharge pipe.
  - 7. Identify location of discharge and provide details for that location.
- B. Well construction logs. Include:
  - 1. Descriptions of actual materials encountered, categorized in accordance with Unified Soil Classification System.
  - 2. Construction details.
  - 3. Well development procedures and results.
  - 4. Deviations from original design.
- C. Flowmeter:

- 1. Product information on flowmeter and chart recorder.
- 2. Recent flowmeter calibration documentation.
- 3. Chart(s) from flowmeter chart recorder.
- D. Qualifications
  - 1. Dewatering contractor.
  - 2. Dewatering design engineer.
  - 3. Testing laboratory.
- E. Control points and schedule of measurements:
  - 1. The CONTRACTOR shall install 3 settlement monitoring control points around the perimeter of all excavations requiring dewatering.
  - 2. Location and details of control points and method and schedule of measurements.
  - 3. Within 24 hours of constructing control points, survey and submit measurements at each control point. Submit copy of field notes with measurements.
  - 4. Survey and submit measurements of control points every 7 days and submit measurements within 24 hours. For each control point:
    - a. Show current measurement and the change in measurement from first measurement taken.
    - b. Show graphical plot of movements.

#### 1.04 QUALITY ASSURANCE

- A. Dewatering plan and dewatering system analysis:
  - 1. Prepared by a qualified Civil Engineer, licensed in the state where the Project is located.
    - a. The dewatering design engineer shall have at least 5 years' experience in designing similar systems.
- B. Submit qualifications of dewatering contractor, dewatering design engineer, sampling service, and testing laboratory.
- C. The CONTRACTOR is responsible for obtaining all necessary permits and approvals for the proper disposal of the water.

#### PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. During construction, provide and maintain ample means and devices to promptly remove and properly dispose of water entering excavation or other parts of the work, whether water is surface water or underground water.
  - B. Keep excavations reasonably free of water.
  - C. Make provisions to maintain continuous dewatering:

- 1. Provide standby power to maintain dewatering during power outages and interruptions.
- 2. Provide 24-hour monitoring by personnel skilled in operation and maintenance of the system, and capable of providing or obtaining work required to maintain system operation.
- 3. Dewatering systems shall not be shut down between shifts, on holidays, on weekends, or during work stoppages.
- D. Monitoring wells:
  - 1. At each excavation, a sufficient number of temporary observation wells to continuously check the groundwater level shall be provided. Locate monitoring wells within 6 feet of excavation and mid-way between dewatering wells or well points. The final locations of the monitoring wells shall be reviewed and approved by the ENGINEER 30 days before installation.
  - 2. The CONTRACTOR shall record and report the groundwater elevation reading to the ENGINEER two (2) times per week.
  - 3. Provide temporary threaded cap, not less than 2 inches in diameter, at the top of each well.
  - 4. Protect dewatering wells in place during excavation.
  - 5. One hundred percent standby pumping capacity shall be available on site at all times and shall be connected to the dewatering system piping to permit immediate use. In addition, standby ancillary equipment and appliances for all ordinary emergencies, and competent workmen for operation and maintenance of all dewatering equipment shall be on site at all times. Standby equipment shall include emergency power generation and automatic switchover to the emergency generator when normal power fails.
- E. The CONTRACTOR shall control surface water to prevent entry into excavations. Use dikes, curb walls, ditches, pipes, sumps, or other means acceptable to ENGINEER.
- F. Release of Groundwater
  - 1. Prior to release of groundwater to its static level, confirm that all groundwater pressure relief devices for structure are fully operational, construction of structure is complete and concrete has reached its specified compressive strength, and backfill of structure is complete.
  - 2. The release of groundwater at its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill, and prevent flotation or movement of structures, pipelines and sewers.
  - 3. Water shall be de-sanded before disposal to any sewer or storm drain system. The system used for de-sanding water shall be a baffled structure and shall provide not less than five minutes detention time and shall be designed to have a flow-through velocity not exceeding 0.2 feet per second at the anticipated peak flow. The desanding box shall be cleaned as required to maintain the detention time and flow-through limitations specified above.
  - 4. The CONTRACTOR is responsible for disposing of dewatering in accordance with all local, state, and federal laws and regulations and for obtaining any necessary permits.

- G. Dewatering Flow
  - 1. A flowmeter and continuous 24-hour chart recorder for recording dewatering flow shall be provided.
  - 2. Flowmeter and recorder device shall be calibrated to provide an accuracy within 5 percent.
  - 3. Written evidence of calibration of flowmeter and recorded shall be provided.
  - 4. Flow readings shall be submitted to the ENGINEER on a weekly basis.

## **EXCAVATION SUPPORT AND PROTECTION**

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes: Requirements for designing, furnishing and installing, maintaining, and removing excavation support and protection.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.

#### 1.02 REFERENCES

- A. American Institute of Steel Construction, Inc. (AISC):
  - 1. Steel Construction Manual.
- B. American Society of Civil Engineers (ASCE):
  - 1. Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
- C. California Code of Regulations (CCR):
  - 1. Title 8 Industrial Relations.
    - a. Chapter 3.2. California Occupational Safety and Health Regulations (CAL/OSHA).
- D. California Labor Code (CLC).
- E. Department of the Navy Naval Facilities Engineering Command (NAVFAC):
  - 1. Design Manual 7.2 Foundations and Earth Structures.
  - 2. Design Manual 7.3 Soil Dynamics and Special Design Aspects
- F. State of California Department of Transportation (Caltrans):
  - 1. Caltrans California Trenching and Shoring Manual.
- G. United States Steel Corporation (USS):
  - 1. Steel Sheet Piling Design Manual.

#### 1.03 DEFINITIONS

- A. General Engineering Design Practice: General engineering design practice in area of the Project, performed in accordance with recent engineering literature on subject of shoring and stability of excavations.
- B. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes cantilevered sheet piling, internally braced sheet piling, slurry walls, soldier piles and lagging, and other similar shoring systems. Sloping of the soil is not shoring.

#### 1.04 SYSTEM DESCRIPTION

- A. Where General Engineering Design Practice is specified, provide drawings and signed calculations and have design performed by civil or structural engineer registered in State where the Project is located:
  - 1. Provide design calculations that clearly disclose assumptions made, criteria followed, and stress values used for the materials being used.
  - 2. Furnish references acceptable to ENGINEER substantiating appropriateness of design assumptions, criteria, and stress values.

#### B. Design requirements:

- 1. General:
  - a. Design means for safe and stable excavations in accordance with general engineering design practice:
    - 1) The preceding requirement shall not apply to trench excavation support conforming to standards set forth in CCR Title 8, Chapter 3.2.
  - b. Design steel members in accordance with the building code and the AISC Manual of Steel Design.
  - c. Design shoring involving materials other than steel in accordance with building code.
  - d. Perform design in accordance with soil characteristics and design recommendations contained in a written geotechnical report issued and signed by a geotechnical engineer hired by the CONTRACTOR. Geotechnical engineer shall be registered in the state where the Project is located:
    - 1) Make copy of geotechnical report available at project site for ENGINEER'S review.
    - 2) Retain and pay for geotechnical engineer's services.
    - 3) Obtain report based on soil samples, field and laboratory tests, and borings performed for the geotechnical report for the design of stability of excavations by the geotechnical engineer hired by CONTRACTOR.
  - e. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in the AISC Steel Construction Manual and the building code, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.
  - f. Minimum safety factor used for design shall not be less than 1.5.
  - g. The calculated minimum depth of penetration of shoring below the bottom of the excavation shall be increased not less than 30 percent if the full value of passive pressure is used in the design.

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- h. The maximum height of cantilever shoring above the bottom of excavation shall not exceed 15 feet.
  - 1) Use braced shoring when the height of shoring above the bottom of excavation exceeds 15 feet.
- i. The location of the point of fixity for shoring shall not be less than half the calculated minimum embedment depth below the bottom of the excavation.
- j. Generally acceptable references for the design of shoring and excavations are as follows:
  - 1) Caltrans California Trenching and Shoring Manual.
  - 2) NAVFAC Design Manual 7.2.
  - 3) NAVFAC Design Manual 7.3.
  - 4) USS Steel Sheet Piling Design Manual.
  - 5) ASCE Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
- k. The maximum total deflection at any point on the shoring shall not be more than 3/4 inch.
- 2. Soldier piles and lagging:
  - a. Provide lagging over the full face of the excavation. Joints between pieces of lagging shall be tight to prevent loss of soil.
  - b. Provide full face lagging all around penetrations through the lagging.
  - c. If the soldier piles are installed in predrilled holes, the predrilled holes shall be filled with control density backfill after the soldiers piles are installed.
  - d. The effective width of driven soldier piles for passive soil resistance shall not exceed 2 times the width of the pile.
    - 1) The effective width of concrete encased soldier piles for passive soil resistance shall not exceed 2 times the width of the concrete encasement.
  - e. Fill voids behind lagging with gravel or other material acceptable to the ENGINEER.
  - f. Apply loads from tie back soil, rock, or deadman anchors concentrically to soldier piles or wales spanning between soldier piles.
    - 1) Wales shall be back-to-back double channels or other members acceptable to the ENGINEER.
    - 2) Eccentrically loaded with section soldier piles or wales are not acceptable.
  - g. Design soldier piles for downward loads including vertical loads from tie back anchors.
- 3. Soil anchors, rock anchors, and deadmen anchors:
  - a. Design tie back anchors for a safety factor of not less than 2 times the calculated load from the shoring.
  - b. Proof load all production anchors to not less than 150 percent of the calculated load from the shoring.
    - 1) Lock off anchors at the calculated anchor load.
  - c. The length of soil anchors used to calculate resistance to load from the shoring shall not include any length within the potential active pressure soil failure zone behind the face of shoring.
  - d. Design tie rods for anchors for 130 percent of the calculated load from the shoring.

- e. Design tie rods for anchors for 150 percent of the calculated load from the shoring when tie rod couplers are used and for other conditions where stress concentrations can develop.
- C. Performance requirements:
  - 1. General:
    - a. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, and related operations.
    - b. Specified provisions:
      - 1) Complement, but do not substitute or diminish, obligations of CONTRACTOR for the furnishing of a safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of the Work, structures, and other improvements.
      - 2) Represent minimum requirement for:
        - a) Number and types of means needed to maintain soil stability.
        - b) Strength of such required means.
        - c) Methods and frequency of maintenance and observation of means used for maintaining soil stability.
  - 2. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils and rock.
  - 3. Provide support for trench excavations for protection of workers from hazard of caving ground.
  - 4. Provide shoring:
    - a. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
      - 1) Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
      - 2) Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.
    - b. For trenches 5 feet and deeper.
    - c. For trenches less than 5 feet in depth, when there is a potential for cave-in.
    - d. Where indicated on the Drawings.
  - 5. For safe and stable excavations, use appropriate design and procedures for construction and maintenance to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:
    - a. Using stiff support systems.
    - b. Following appropriate construction sequence.
    - c. Preventing soil loss through or under support system:
      - 1) Provide support system that is tight enough to prevent loss of soil and extend deep enough to prevent heave or flow of soils from supported soil mass into the excavation.
    - d. Providing surface runoff routing and discharge away from excavations.

- e. Where dewatering is necessary, recharge groundwater as necessary to prevent settlement in area surrounding excavation.
- f. Where sheet piling is used, use interlocking type sheets.
  - 1) The sheet piles shall be continuous and driven in interlock.
  - 2) If the bottom of the excavation is located below the water table, use "thumb and finger" type interlock.
- g. Not applying shoring loads to existing structures and other improvements.
- h. Not changing existing soil loading on existing structures and other improvements.

#### 1.05 SUBMITTALS

- A. Shop drawings and calculations:
  - 1. For trench excavations 5 feet or more in depth and for trenches less than 5 feet in depth when there is potential for cave-in. Submit in advance of excavation work, detailed drawings showing means for safe and stable excavations:
    - a. Where such drawings vary from excavation support standards set forth in California Code of Regulations Title 8 Construction Safety Orders, submit design calculations pursuant to general engineering design practice.
    - b. Provide means for safe and stable excavations that are not less effective than required in CCR Title 8 Construction Safety Orders.
  - 2. For excavations other than trenches, submit, in advance of excavation work, design calculations as performed pursuant to general engineering design practice, as specified in this Section, and detail drawing showing means for safe and stable excavations. In design calculations and detail drawing, cover, as a minimum:
    - a. Excavations adjacent to structures and other improvements, and
    - b. Excavations 5 feet or more in depth, or less than 5 feet in depth when there is potential for cave-in, at other locations.
  - 3. Submit following:
    - a. Provide calculations for the different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by the shoring, and sequence of removal of shoring.
    - b. Provide sketches showing the condition at various stages of installation and removal of shoring.
    - c. Show structures, pipelines, and other improvements located near the shoring, and the shoring on a plan.
    - d. When utilities penetrate the shoring, submit an elevation of all sides of the shoring showing the locations of the penetrations.
      - 1) Submit details on ground support and sealing around utility penetrations.
- B. Written geotechnical report on soil characteristics and design recommendations, as specified in this Section.
- C. Control points and schedule of measurements:
  - 1. Submit location and details of control points and method and schedule of measurements in accordance with requirements of this Section.

- 2. Promptly upon constructing control points and making measurements at such control points, as specified in this Section, submit copy of field notes with such measurements.
  - a. The field notes shall show the current measurement and the change in measurement from the first measurement taken.
- D. Detailed sequence of installation and removal of shoring:
  - 1. Consider effects of ground settlement in the sequence of installation and removal of shoring.
  - 2. Provide sketches showing the conditions at various stages in the sequence of installation and removal of shoring.
- E. Submit submittals for stability of excavations as a complete package and include all items required in this Section.
  - 1. Incomplete submittals will not be reviewed and will be returned for resubmittal as a complete package.

#### 1.06 SEQUENCING AND SCHEDULING

- A. Do not begin work on excavations, trenches, and means for providing stability of excavation and trenches until submittals have been accepted by ENGINEER and until materials necessary for installation are on site.
- B. Submit submittals a minimum of 60 days prior to the scheduled date to begin excavation work.
- C. Do not begin construction of any shoring or excavation operations until:
  - 1. Control points as specified in this Section and as indicated on the Drawings on existing structures and other improvements have been established and surveyed to document initial elevations and locations.

## PART 2 PRODUCTS (NOT USED)

#### PART 3 EXECUTION

- 3.01 INSTALLATION AND REMOVAL
  - A. Install means for providing safe and stable excavations as indicated in the submittals.
  - B. Except for concrete encased soldier piles, slurry walls, and similar shoring systems, remove shoring by completion of the Work.
    - 1. Select shoring system and method of removal, which will minimize soil that sticks to shoring from creating large voids and causing settlement.
    - 2. To prevent settlement caused by pulling shoring, fill voids with sand, pea gravel, or pressure injected grout.
    - 3. The methods used shall prevent settlement.
    - 4. Pressure preservative treated wood lagging may be left in place when acceptable to the ENGINEER.

#### 3.02 MAINTENANCE

- A. Where loss of soil occurs, plug gap in shoring and replace lost soil with fill material acceptable to ENGINEER.
- B. Where measurements and observations indicate possibility of failure or excessive movement of excavation support, determined in accordance with general engineering design practice, take appropriate action immediately.

#### 3.03 CONTROL POINTS

- A. Establish control points on shoring and on structures and other improvements in vicinity of excavation for measurement of horizontal and vertical movement:
  - 1. Set control points on shoring support system:
    - a. Set points at distances not exceeding 25 feet at each support level.
    - b. Support levels shall be levels of tie-backs, wales, bottom of excavation, and other types of supports.
  - 2. Set control points in corners of existing structures and on curbs, manholes, and other improvements indicated on the Drawings.
- B. Provide plumb bobs with horizontal targets indicating original position of plumb bobs in relation to shoring at control points located on shoring.
- C. Perform horizontal and vertical survey and measurement of control points at least once every week.

## EARTHWORK

## PART 1 GENERAL

#### 1.01 DESCRIPTION

A. This Section specifies earthwork, which consists of excavation, trenching, backfilling, grading, and excess material control.

#### 1.02 DEFINITIONS

- A. Compaction
  - 1. The degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.
- B. Excavation Slope
  - 1. Excavation slope shall be defined as an inclined surface formed by removing material from below existing grade.
- C. Embankment Slope
  - 1. Embankment slope shall be defined as an inclined surface formed by placement of material above existing grade.

#### 1.03 QUALITY ASSURANCE

- A. Related Sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the work of subconsultants, suppliers, and other individuals or entities performing or furnishing any of the CONTRACTOR'S Work.

#### B. References

1. This Section references the following documents. They are a part of this Section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	Title
AASHTO T176-80	Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test
ASTM C136-06	Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates

<u>Reference</u>	<u>Title</u>
ASTM D1556-07	Method of Test for Density of Soil in Place by the Sand- Cone Method and Nuclear Density Method
ASTM D6938-10	Method of Test for Moisture Content of Soil and Soil Aggregates in Place by Nuclear Methods (Shallow depth)

- C. Tests
  - 1. The CONTRACTOR shall contact the CONSTRUCTION INSPECTOR for the project 48 hours prior to test, to schedule a third party inspection and testing lab to perform the following tests on all imported materials from each source and native materials intended for backfill/bedding.
  - 2. The CONTRACTOR shall remove surface material at locations designated by the CONSTRUCTION MANAGER and provide such assistance, as necessary, for testing. The CONTRACTOR shall employ the services of an independent testing laboratory, subject to approval by the CONSTRUCTION MANAGER, to sample and perform all required tests (moisture content, gradation, moisture-density relationships) on each type of material used. Tests shall be repeated on backfill material each time the source and/or characteristics change. The CONTRACTOR is responsible for all testing.
  - 3. Backfill materials shall be tested in accordance with the following:

<u>Test</u>	Standard Procedure	Test Frequency
Moisture Content	ASTM D3017	Every 1,000 s.f. of fill are (per compacted layer)
Gradation	ASTM C136	Each Material Source
Density In-Place	ASTM D1556	Every 1,000 s.f. of fill area (per compacted layer)
Moisture Density Relations	ASTM D6938	Each Material Source

- D. Submittals
  - 1. All submittals shall be made in accordance with Salida Sanitary District Submittal Procedures.
  - 2. Sample backfill material with corresponding test reports shall be submitted directly to the CONSTRUCTION MANAGER from the testing laboratory a minimum of 10 days prior to beginning work utilizing the backfill material. Samples shall consist of 0.5-cubic feet of each type of material.
  - 3. Five copies and one original of the reports of the tests specified herein shall be submitted to the CONSTRUCTION MANAGER.

## PART 2 PRODUCTS

- 2.01 FILL MATERIALS
  - A. Type A

1. Type A material shall be a clean gravel-sand mixture free from organic matter and shall conform to the following gradation:

Percent by Weight Passing
100%
70% - 100%
55% - 100%
35% - 95%
20% - 80%
10% - 55%
0% - 2%

- B. Type B
  - 1. Type B material shall be a select granular material free from organic matter and of such size and gradation that the specified compaction can be readily attained.
  - 2. Material shall have a sand equivalent value of not less than 20 and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
1 inch	100%
No. 4	35% - 100%
No. 30	20% - 100%

- 3. The coefficient of uniformity shall be 3 or greater.
- 4. The material may be an imported quarry waste, clean natural sand or gravel, select trench excavation or a mixture thereof.
- C. Type C
  - 1. Type C material shall be unclassified material and may be obtained from excavation on site. The material shall be free from peat, wood, roots, bark, debris, garbage, rubbish or other extraneous material. The maximum size of stone shall not exceed 3-inches.
- D. Type D
  - 1. Type D material shall be granular material commonly known as pea gravel and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
1/4 inch	100%
No. 8	0% - 5%

- 2. Type D material shall not be used for pipeline bedding, initial backfill or subsequent backfill.
- E. Type E
  - 1. Type E material shall be crushed rock commonly known as drain rock and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
1 inch	100%
3/4 inch	30% - 75%
1/2 inch	15% - 55%
1/4 inch	0% - 5%

2. Type E material shall be composed of hard, durable, sound pieces having a specific gravity of not less than 2.65.

#### F. Type F

1. Type F material shall be crushed rock and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
1 inch	87% - 100%
3/4 inch	45% - 90%
No. 4	20% - 50%
No. 30	6% - 29%
No. 200	0% - 12%

2. Type F material shall be composed of hard, durable, sound pieces having a specific gravity of not less than 2.65.

#### G. Type G

1. Type G material shall be pervious backfill. Pervious backfill material (sand), shall conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
No. 50	100%
No. 100	0% - 8%
No. 200	0% - 4%

#### H. Type H

1. Type H material shall be 6-inch riprap. Riprap shall be graded rock having a range of individual rock weights as follows:

Weight of Stone	Percent smaller by weight
10 pounds	100%
5 pounds	80% - 100%
2 pounds	45% - 80%
1 pound	15% - 45%
.5 pound	5% - 15%
Below .5 pound	0% - 5%

- 2. Specific gravity shall be between 2.5 and 2.82.
- I. Type I
  - 1. Type I material shall be unclassified material but may be obtained from excavation on site. The material may contain extraneous material, such as demolition waste,

unsuitable material excavated from beneath structures, and clearing and grubbing debris up to 50 percent by volume. Extraneous material shall be thoroughly mixed and the maximum size of organic particles shall be 6-inches.

- J. Type J
  - 1. Type J material shall be crushed rock used for gravel roadways and shall have the following gradation:

<u>U.S. Standard Sieve Size</u>	Percent by Weight Passing	
3/4 inch	100%	
3/8 inch	61% - 90%	
No. 4	42% - 58%	
No. 16	17% - 31%	
No. 50	9% - 21%	
No. 200	4% - 8%	

2. Type J material shall be composed of hard, durable, sound pieces having a specific gravity of not less than 2.65.

## PART 3 EXECUTION

#### 3.01 GENERAL

- A. Control of Water
  - 1. The CONTRACTOR shall keep excavations reasonably free from water during construction. The static water level shall be drawn down a minimum of one foot below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any backfill to the specified density. Disposal of water shall not damage property, create a public nuisance or violate the law. The CONTRACTOR shall have on hand pumping equipment and machinery in good working condition for emergencies and shall have workmen available for its operation. Dewatering systems shall operate continuously until backfill has been completed to one foot above the normal static groundwater level.
  - Groundwater shall be controlled to prevent softening of the bottom of excavations or formation of "quick" conditions. Dewatering systems shall not remove natural soils.
  - Release of groundwater to its static level shall be controlled to prevent disturbance of the natural foundation soils or compacted backfill and to prevent flotation or movement of structures or pipelines.
- B. Overexcavation
  - Where undisturbed condition of natural soils is inadequate for support of the planned construction as determined by the CONSTRUCTION MANAGER, the CONSTRUCTION MANAGER will direct the CONTRACTOR to overexcavate to adequate supporting soils. The excavated space shall be filled to the specified elevation with backfill. The quantity and placement of such material will be paid for as extra work.
- C. Surplus Material

- 1. Unless otherwise specified, clean surplus excavated material shall be legally disposed of off-site by the CONTRACTOR. Hauling and disposal operations shall be conducted in accordance with applicable ordinances and environmental requirements. Rubbish and non-clean surplus excavated material, as determined by the CONSTRUCTION MANAGER, shall be legally disposed of off-site by the CONTRACTOR.
- 2. Material shall not be stockpiled to a depth greater than 5-feet above finished grade within 25-feet of any excavation. The CONTRACTOR shall maintain stability of the soil adjacent to any excavation.
- 3. If the quantity of surplus material is specified, the quantity specified is approximate. Shortage of material, caused by premature disposal of any material by the CONTRACTOR, shall be replaced by the CONTRACTOR.
- D. Hauling
  - 1. When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to eliminate dust.
- E. Finish Grading
  - 1. Finished surfaces shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.
  - 2. Finished grade shall be as specified by the contours plus or minus 0.10 foot except where a local change in elevation is required to match sidewalks, curbs, manholes, and catch basins, or to ensure proper drainage. Allowance for topsoil, grass cover and gravel, and subbase and pavement thickness shall be made so that the specified thickness of topsoil can be applied to attain the finished grade.
  - 3. When the work is at an intermediate stage of completion, the lines and grades shall be as specified plus or minus 0.5 foot to provide adequate drainage.
- F. Control of Erosion
  - 1. The CONTRACTOR shall maintain earthwork surfaces true and smooth and protected from erosion. Where erosion occurs, the CONTRACTOR shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

## 3.02 CLASSIFICATION OF BACKFILL

A. Backfill material shall be provided and placed in horizontal layers and compacted with power operated tampers, rollers, idlers, or vibratory equipment. Material type, maximum layer depth, relative compaction, and general application are specified in Table A. Unless otherwise specified, backfill classes shall be used where specified in Table A under general application.

Fill Class	Material Type	Maximum Uncompressed Layer Depth, Inches	Minimum Relative Compaction, Percent	General Application
A1	А	8	95	Initial and subsequent pipeline backfill
B1	В	8	95	Pipe bedding zone
C1	С	8	95	Native backfill zone
E1ª	E	8	95	Drain rock
F1	F	12	95	Structure backfill

Table A - Fill Classification

1. Compaction of layers shall be accomplished in two passes of equipment with complete coverage across the width of the fill area.

## 3.03 EARTHWORK FOR STRUCTURES

- A. Structure Excavation
  - 1. Ground shall not be dug by open tooth machinery nearer than 3-inches from any finished subgrade. The last 3-inches shall be removed without disturbing the subgrade.
  - 2. The bottom shall not be more than 0.15 foot above or below the lines and grades specified. If the elevation of structure excavation is not specified, the excavation shall be not more than 0.15 foot above or below the elevation specified for fill material below the structure. Slopes shall vary no more than 0.5 foot from specified grade unless the excavation is in rock where the maximum variation shall be 2-feet.
  - 3. Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the CONTRACTOR'S operations and require overexcavation and backfill, the CONTRACTOR shall refill such excavated space to the proper elevation in accordance with the procedure specified for backfill.
  - 4. Unless otherwise specified, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.
- B. Foundation Treatment
  - 1. Foundations for concrete or masonry footings shall be excavated to sound material. Sound material shall be imported as required.
  - 2. When swell or subsidence results, the CONTRACTOR shall excavate, or backfill the footing area to the grade of the bottom of the footing with suitable material as

specified. If material under footings is such that it would mix into the concrete during footing placement or would not support the weight of the fluid concrete, the CONTRACTOR shall replace the material with suitable material, install soffit forms or otherwise provide a suitable platform on which to cast the footing as directed by the CONSTRUCTION MANAGER. This shall not be paid for as extra work.

- 3. Whenever any structure excavation is substantially completed to grade, the CONTRACTOR shall notify the CONSTRUCTION MANAGER who will make an inspection of the foundation. No concrete or masonry shall be placed until the foundation has been inspected by the CONSTRUCTION MANAGER. The CONTRACTOR shall, if directed by the CONSTRUCTION MANAGER, dig test pits and make test borings and foundation bearing tests. If the material tested is undisturbed soil, the cost thereof will be paid for as extra work. If the material tested is backfill material, the cost thereof will be paid as extra work only if it meets all specified placement and compaction requirements.
- C. Structure Backfilling
  - 1. Unless otherwise specified, structure backfill shall be Class F1.
  - 2. After completion of construction below the elevation of the final grade, and prior to backfilling, forms shall be removed and the excavation shall be cleaned of debris.
  - 3. Structure backfill shall not be placed until the subgrade portions of the structure have been inspected by the CONSTRUCTION MANAGER. No backfill material shall be deposited against concrete structures until the concrete has developed strength of not less than 3,000 pounds per square inch in compression.
  - 4. Backfill material shall be placed in uniform layers and shall be brought up uniformly on all sides of the structure. Compaction by ponding, flooding, or jetting is not allowed.
  - 5. If the compacted surface of any layer of material is too smooth to bond properly with the succeeding layer, the surface shall be scarified. If required, the surface shall be sprinkled, or otherwise moisture conditioned before the succeeding lift is placed. Any surface crust formed on a layer of fill material that has been dumped and spread shall be broken up by harrowing and, if required, the full depth of the affected layer shall be moisture conditioned immediately prior to rolling.
  - 6. Unless otherwise specified, backfill around and above pipelines within the excavation line of any structure shall be the same as that specified for structures.

## TRENCHING

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following, including requirements for ditch crossings:
    - a. Pipes.
    - b. Direct buried electrical and control conduits.
    - c. Electrical and control duct banks.
    - d. Manholes, valves, or other accessories.
    - e. Potable water pipe appurtenances.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Section 02050 Soils and Aggregates for Earthwork.
    - b. Section 02240 Dewatering.
    - c. Section 02260 Excavation Support and Protection.
    - d. Section 02300 Earthwork.

## 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
  - 2. D 1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)).
  - 3. D 2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 4. D 3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

#### 1.03 SUBMITTALS

- A. Lab certification.
- B. Confirmation test reports.

## 1.04 QUALITY ASSURANCE

- A. Initial compaction demonstration:
  - 1. Adequacy of compaction equipment and procedures: Demonstrate adequacy of compaction equipment and procedures before exceeding any of following amounts of earthwork quantities:
    - a. 200 linear feet of trench backfill.
  - 2. Compaction sequence requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.
  - After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as specified under "FIELD QUALITY CONTROL."

## PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Soil and rock materials:
  - 1. Aggregate base course material: As specified in Section 02050 Soils and Aggregates for Earthwork.
  - 2. Gravel: As specified in Section 02050 Soils and Aggregates for Earthwork.
  - 3. Native material: As specified in Section 02050 Soils and Aggregates for Earthwork.
  - 4. Sand: As specified in Section 02050 Soils and Aggregates for Earthwork.
  - 5. Select material: As specified in Section 02050 Soils and Aggregates for Earthwork.

#### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. General:
  - 1. Embankment condition:
    - a. Exists where width of trench exceeds limits specified in this Section.
    - b. Before laying pipes in fill, place fill and compact it to not less than 2 feet above top of pipe.
    - c. After placing and compacting fill, excavate pipe trench through fill.
- B. Protection: Stabilize trench excavations as specified in Section 02260 Excavation Support and Protection.

#### 3.02 INSTALLATION

A. Trench excavation:

- 1. General requirements:
  - a. If, because of soil conditions, safety requirements, or other reasons, trench width at top of pipe is increased beyond width specified in this Section, upgrade laying conditions or install stronger pipe designed in conformance with Specifications for increased trench width, without additional cost to OWNER.
  - b. Excavate bottom of trench to depth indicated on the Drawings. The bottom of the trench excavation shall be firm and dry.
- 2. The trench may be excavated by machinery to the grade indicated on the Drawings provided that the soil material remaining in the bottom of the trench is no more than slightly disturbed. Scarify and recompact bottom of trench: Scarify bottom of trench to a depth of 6 inches. Recompact scarified material to 95 percent of maximum density.
- 3. Rock:
  - a. Pipe: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of fine grading material. Backfill overcut with aggregate base course material compacted to 95 percent of maximum density up to bottom of fine grading material.
  - b. Direct buried electrical and control conduits: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of conduit bedding material. Backfill overcut with aggregate base course material up to bottom of conduit bedding material.
  - c. Electrical and control ductbanks: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of concrete ductbank. Backfill overcut with aggregate base course material up to bottom of concrete ductbank.
- 4. Overcut of trench bottom: Where the bottom of the trench is excavated below the depth indicated on the Drawings, restore trench bottom to proper grade by back filling with aggregate base course material compacted to 95 percent of maximum density, at no additional cost to OWNER.
- 5. Soft or unstable material:
  - a. If bottom of excavation is found to consist of soft or unstable material which is incapable of providing proper support, remove such material to a depth and for the length required, as determined by the ENGINEER. Backfill trench to bottom of fine grading material with aggregate base course material compacted to 90 percent of maximum density.
- 6. Trench widths:
  - a. Minimum clear width of trench for pipe (measured at top of pipe):
    - 1) For pipe sizes 4 inches to and including 24 inches: Not less than outside diameter of pipe plus 18 inches.
    - 2) For pipe sizes larger than 24 inches: Not less than outside diameter of pipe plus 24 inches.
  - b. Maximum clear width of trench for pipe (measured at top of pipe):

- 1) For pipe sizes 4 inches to and including 24 inches: Not to exceed outside diameter of pipe plus 24 inches.
- 2) For pipe sizes larger than 24 inches: Not to exceed outside diameter of pipe plus 36 inches.
- 7. For manholes, valves, or other accessories:
  - a. Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and sides of trench or shoring.
  - b. Backfilling of manhole excavation: Conform to backfilling requirements as specified for trenches in this Section.
  - c. Backfill under manholes, vaults, tanks, or valves with aggregate base course material. Do not backfill with soil.
  - d. Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with aggregate base course material at no additional cost to OWNER.
- 8. Potable water pipe appurtenances:
  - a. Lay in trenches separate from those used for sewers.
  - b. Unless otherwise specified or indicated on the Drawings, lay in trenches having cover of not less than 3 feet below surface of ground and located at distance of not less than 10 feet from any parallel sewer trench.
- 9. At road crossings or existing driveways:
  - a. Make provision for trench crossings at these points, either by means of backfills, tunnels, or temporary bridges.
- B. Dewatering: As specified in Section 02240 Dewatering.
- C. Pipe fine grading:
  - 1. Schedule fine grading material as specified in this Section.
  - 2. For pipes 16 inches in nominal diameter and under.
    - a. Place 4 inches of fine grading material below bottom of pipe.
    - b. Place fine grading material at uniform density, with minimum possible compaction.
  - 3. For pipe over 16 inches in diameter.
    - a. Place 4 inches, or 1/12 the outside diameter of pipe, whichever is greater, of fine grading material below bottom of pipe.
    - b. Place fine grading material at uniform density, with minimum possible compaction.
  - 4. Bell or coupling holes:
    - a. Dig holes after trench bottom has been graded.
    - b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
    - c. Excavate holes only as necessary for making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
  - 5. Depressions for joints, other than bell-and-spigot:
    - a. Make in accordance with recommendations of joint manufacturer for particular joint used.
- D. Pipe bedding:
  - 1. Schedule bedding material as specified in this Section.

- 2. After pipe laid:
  - a. Place bedding material under and around pipe in 6-inch maximum lifts of bedding material, to level 12 inches above top of pipe. Compact to 90 percent of maximum density.
- 3. Pipe displacement:
  - a. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.
  - b. In event there is movement or floating of the piping, re-excavate, re-lay, and backfill the pipe.
- E. Trench backfill above pipe bedding, electrical and control conduit bedding, and electrical and control ductbanks:
  - 1. Under structures:
    - a. Backfill trench up to underside of structure with aggregate base course material as specified in Section 02050 Soils and Aggregates for Earthwork compacted to 95 percent of maximum density.
  - 2. Cuts across roadways and paved streets:
    - a. Backfill trench to underside of pavement with aggregate base course material as specified in Section 02050 Soils and Aggregates for Earthwork compacted to 95 percent of maximum density.
  - 3. Under and parallel to roadways, paved areas, or storage areas:
    - a. Backfill trench up to within 2 feet of finish grade with native material compacted to 95 percent of maximum density.
    - b. Then backfill from 2 feet below finish grade to finish grade, or underside of aggregate base course or pavement as indicated on the Drawings with aggregate base course material as specified in Section 02050 Soils and Aggregates for Earthwork, compacted to 95 percent of maximum density.
  - 4. In areas outside the improved section of roadways or in open country:
    - a. Backfill to finish grade with native material as specified in Section 02050 Soils and Aggregates for Earthwork compacted to 90 percent of maximum density.
  - 5. Through earth slopes adjacent to, or supporting structures:
    - a. Backfill to finish grade with aggregate base course material or select material compacted to 95 percent of maximum density.
- F. Under existing intersecting pipes or conduits larger than 3 inches in diameter:
  - 1. Backfill from bottom of new pipe trench to spring line of intersecting pipe or conduit with aggregate base course material, as specified in Section 02050 Soils and Aggregates for Earthwork, compacted to 90 percent of maximum density.
  - 2. Extend aggregate base course material as specified in Section 02050 Soils and Aggregates for Earthwork two feet on either side of intersecting pipe or conduit to ensure that material remains in place while other backfill is being placed.
  - 3. Backfill remainder of trench as specified in "Trench backfill above pipe bedding and for conduits and duck banks" above.
- G. Compaction:
  - 1. In-place density of compacted trench backfill, and bedding determined in accordance with ASTM D 1556, or with ASTM D 2922 and ASTM D 3017.
  - 2. Maximum density obtained in laboratory when tested in accordance with ASTM D 1557.

- 3. Consolidation:
  - a. Do not use water settling methods such as flooding, poling, or jetting.
- H. Excess material:
  - 1. Remove excess excavated material from the Project site as specified in Section 02300 Earthwork and dispose of legally off site.

## 3.03 FIELD QUALITY CONTROL

- A. Tests:
  - 1. Confirmation tests:
    - a. CONTRACTOR'S responsibilities:
      - 1) Accomplish specified compaction of trench backfill.
      - 2) Control operations by confirmation tests to verify and confirm that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
      - 3) Cost of confirmation tests: Paid for by the CONTRACTOR.
      - 4) Qualifications of CONTRACTOR'S testing laboratory: Acceptable to ENGINEER. Provide lab certification.
      - 5) Copies of confirmation test reports: Submit promptly to the ENGINEER.
    - b. Frequency of Confirmation testing:
      - 1) Perform testing not less than as follows:
        - a) For trenches: At each test location include tests for each type or class of backfill from bedding to finish grade.
        - b) For each length of water main between structures: two (2) locations as determined by the inspector.
        - c) For storm drain line: two (2) locations for each size of pipe.
        - d) Crossing paved roads: two (2) locations along each crossing.
        - e) For sewer lateral: two (2) locations outside of the public right-ofway.
  - 2. Compliance tests:
    - a. Frequency of testing: Periodic compliance tests will be made by the ENGINEER to verify that compaction is meeting requirements previously specified.
    - b. If compaction fails to meet specified requirements: Perform remedial work by one of the following methods:
      - 1) Remove and replace backfill at proper density.
      - 2) Bring density up to specified level by other means acceptable to the ENGINEER.
  - 3. Retesting:
    - a. Costs of retesting: CONTRACTOR is responsible for the costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements.
    - b. CONTRACTOR'S confirmation tests during performance of remedial work:
      - 1) Performance: Perform tests in manner acceptable to the ENGINEER.
      - 2) Frequency: Double amount specified for initial confirmation tests.
    - c. Piping system testing:
      - 1) As specified in Section 15956 Piping Systems Testing.

#### 3.04 SCHEDULES

- A. Pipe fine grading materials:
  - 1. Fine grading material shall be the same as bedding material.
- B. Bedding materials:
  - 1. Pipes:
    - a. For pipe less than 16-inch nominal size: Except as otherwise specified, use sand or aggregate base course material.
    - b. For pipe from 16- inch to 48-inch nominal size: Except as otherwise specified, use sand or aggregate base course material.
    - c. For pipe over 48 inches: Aggregate base course material.
  - d. For polyvinyl chloride or other plastic pipe less than 2 inches in diameter: Sand.
  - 2. Direct buried electrical and control conduits: Sand.

## ASPHALT CONCRETE PAVEMENT AND BASE

#### PART 1 GENERAL

#### 1.01 REQUIREMENT

A. The CONTRACTOR shall perform all work associated with Asphalt Concrete (AC) Pavement and Base, as shown and as specified herein including all labor, materials, equipment supplies, and facilities associated with providing a finished product satisfying all the requirements of the Contract Documents.

#### 1.02 SUMMARY

- A. Section includes the restoration of surface as well as the addition of new surface improvements.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed work complies accurately with the Contract Documents.
    - a. Section 02300 Earthwork.

#### 1.03 REFERENCES

A. This Section references the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

<u>Reference</u>	Title
CALTRANS	Standard Specification, State of California Business Transportation Agency, Department of Transportation L start Edition
	Department of Transportation, Latest Edition

- 1.04 CONTRACTOR SUBMITTALS
  - A. The CONTRACTOR shall submit, in writing, materials testing reports, job-mix formulas, and other pertinent information satisfactory to the ENGINEER demonstrating the materials and methods the CONTRACTOR proposes to utilize will comply with the

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provisions of this Section. Submittals shall be in accordance with Salida Sanitary District Submittal Procedures.

B. Suitability Tests of Proposed Materials: Tests for conformance with the Specifications shall be performed prior to start of the Work. The samples shall be identified to show the name of the material, aggregate source, name of the supplier, contract number, and the segment of the Work where the material represented by the sample is to be used. Results of all tests shall be submitted to the ENGINEER for approval. Materials to be tested shall include aggregate base, coarse and fine aggregate for paving mixtures, mineral filler, and asphalt cement.

# PART 2 PRODUCTS

# 2.01 AGGREGATE BASE

- A. Materials for aggregate base shall be Class 2 Aggregate Base, as specified in Section 02300 Earthwork.
- 2.02 PRIME COAT
  - A. Prime coat shall be Grade SC-70 liquid asphalt complying with the requirements of Caltrans Section 93. Grade SC-250 liquid asphalt may be used when acceptable to the ENGINEER.
- 2.03 TACK COAT
  - A. Tack coat shall be emulsified asphalt Grade SS-1h or undiluted asphalt Grade RS- 1. Emulsified asphalt shall comply with the requirements of Caltrans Section 94; paving asphalt shall comply with the requirements of Caltrans Section 92.
- 2.04 ASPHALT CEMENT
  - A. Aggregate shall be Type B, 2-inch maximum medium grading, conforming to Caltrans Section 39. Asphalt binder shall be paving asphalt, Grade PG 64-10, and shall comply with Caltrans Section 92. Asphalt concrete mixing and proportioning shall comply with Caltrans Section 39. The minimum acceptable asphalt content shall be 5.3 percent of the dry aggregate weight.

# PART 3 EXECUTION

#### 3.01 SUBGRADE PREPARATION

A. The subgrade shall be prepared as specified in the Section 02300 Earthwork as applicable to roadways and embankments. The surface of the subgrade after compaction shall be hard, uniform, smooth, and true to grade and cross-section. Subgrade for pavement shall not vary more than 0.02 foot from the specified grade and cross-section. Subgrade for base material shall not vary more than 0.04-foot from the specified grade and cross-section.

#### 3.02 AGGREGATE BASE

A. Aggregate base shall be provided where shown and to the thickness shown. Imported aggregate bases shall be delivered to the job site as uniform mixtures and each layer shall be spread in one operation. Segregation shall be avoided, and the base shall be free of pockets of coarse or fine material. Where the required thickness is 6-inches or less, the base materials may be spread and compacted in one layer. Where the required thickness is more than 6-inches, the base material shall be spread and compacted in two or more layers of approximately equal thickness and the maximum compacted thickness of any one layer shall not exceed 6-inches. The relative compaction of each layer of aggregate base shall be not less than 95 percent of maximum density when measured in accordance with California Test 231. The compacted surface of the finished aggregate shall be hard, uniform, smooth, and at any point shall not vary more than 0.05 foot from the specified grade or cross-section.

# 3.03 PRIME COAT

A. Prior to placing of pavement, a prime coat of liquid asphalt shall be applied to the compacted base or subgrade at a rate between 0.10 and 0.25 gal/sq yd. As much prime coat shall be applied to the prepared base as will soak in during a twenty-four (24) hour period without puddling. Sand cover shall be applied at driveways, intersections, and to roadbed surface where continuous traffic access must be maintained.

# 3.04 TACK COAT

A. A tack coat shall be applied to existing paved surfaces where new asphalt concrete is to be placed on existing pavement. It shall also be applied to the contact surfaces of all cold pavement joints, curbs, gutters, manholes and the like immediately before the adjoining asphalt pavement is placed. Care shall be taken to prevent the application of tack coat material to surfaces that will not be in contact with the new asphalt concrete pavement. Diluted emulsified asphalt shall be applied at the rate of 0.05 to 0.15 gal/sq yd. Undiluted emulsified asphalt shall be applied at the rate of 0.025 to 0.075 gal/sq yd. Paving asphalt shall be applied at the rate of approximately 0.05 gal/sq yd.

# 3.05 ASPHALT CONCRETE

- A. At the time of delivery to the Work site, the temperature of the mixture shall not be lower than 260 degrees Fahrenheit or higher than 320 degrees Fahrenheit, the lower limit to be approached in warm weather and the higher in cold weather.
- B. Asphalt concrete shall not be placed when the atmospheric temperature is below 50 degrees F or during unsuitable weather.
- C. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be of the specified cross-section and grade of the course being constructed.

- D. The depositing, distributing, and spreading of the asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled mechanical spreading and finishing machine designed especially for that purpose. The machine shall be equipped with a screed or strike-off assembly capable of being accurately regulated and adjusted to distribute a layer of the material to a definite predetermined thickness. When paving is of a size or in a location that use of a self-propelled mechanice is impractical the ENGINEER may waive the self-propelled requirement.
- E. Spreading, once commenced, must be continued without interruption.
- F. The mix shall be compacted immediately after placing. Initial rolling with a steelwheeled tandem roller, steel three-wheeled roller, vibratory roller, or a pneumatic-tired roller shall follow the paver as closely as possible. If needed, intermediate rolling with a pneumatic-tired roller shall be done immediately behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In areas too small for the roller a vibrating plate compactor or a hand tamper shall be used to achieve thorough compaction.
  - 1. Refer to Drawings for required dimensions and thicknesses of trench pavement restoration.
- G. Upon completion, the pavement shall be true to grade and cross-section. When a 10foot straightedge is laid on the finished surface parallel to the center of the roadway, the surface shall not vary from the edge of the straightedge more than 1/8-inch except at intersections or changes of grade. In the transverse direction, the surface shall not vary from the edge of the straightedge more than 1/4-inch.
- H. The relative density after compaction shall be 95 percent of the density obtained by using California Test 375. A properly calibrated nuclear asphalt testing device shall be used for determining the field density of compacted asphalt concrete, or the density shall be obtained using California Test 308, Method A.
- I. CONTRACTOR shall restore all pavement markings (paint and thermoplastic) and lane divider marks (dots) to original location and condition in kind.

END OF SECTION

# SECTION 02480

# **EROSION CONTROL**

# PART 1 GENERAL

## 1.01 SCOPE

A. This Section specifies erosion control work for embankment slopes 4:1 or steeper and embankment slopes flatter than 4:1, and excavation slopes.

#### 1.02 QUALITY CONTROL

- A. REFERENCES
  - 1. This Section references the following documents in their latest edition. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	<u>Title</u>
CALTRANS	
Section 20-3	Erosion Control
Section 20-2	Materials
Section 20-2.11	Stabilizing Emulsion

# PART 2 PRODUCTS

- 2.01 SEED
  - A. Seed shall conform to provisions in Caltrans Section 20-2.10 (Seed) of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code shall be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts, or a seed technologist certified by the Society of Commercial Seed Technologists. Seed shall have been tested for purity and germination not more than one year prior to application of seed or seed shall be retested at the CONTRACTOR'S expense. Test results shall be furnished to the ENGINEER prior to seed application.
  - B. Non-legume seed shall consist of the following mix.

#### NON-LEGUME SEED

Botanical Name <u>(Common Name)</u>	Percent (Minimum) <u>Purity</u>	Percent (Minimum) <u>Germination</u>	Pounds per Acre <u>(Slope</u> <u>Measurement)</u>
Bromus carinatus (California Brome)	95	85	20
Bromus mollis (Blando Brome)	95	85	20
Vulpia myuros (Zorro Fescue)	90	80	15
Elymus glaucus (Blue Wild Rye)	90	80	10
Hordeum brachyantherum (Meadow Barley)	90	80	10
Exchscholzia californica (California Poppy)	98	75	3

A sample of approximately one ounce of non-legume seed may be taken from each seed container for inspection by the ENGINEER.

#### 2.02 STABILIZING EMULSION

A. Stabilizing emulsion (solids) shall conform to the provisions in Section 20-2.11. (Stabilizing Emulsion) of the Caltrans Standard Specifications, except that the requirement for an effective life of at least one year shall not apply. Stabilizing emulsion shall be in a dry power dorm, may be re-emulsifible and shall be a processed organic adhesive used as a soil binder. Stabilizing emulsion mixture shall apply hydro-seeding equipment in the following proportions:

<u>Material</u>	Pounds per Acre (Slope Measurement)
Fiber	400
Stabilizing Emulsion (Solids)	100

#### PART 3 EXECUTION

- 3.01 EROSION CONTROL EMBANKMENT SLOPES 4:1 OR STEEPER
  - A. Erosion control materials shall be applied in three separate applications and the following sequence:

- 1. Straw shall be applied and incorporated into the soil at the rate of two tons per acre (slope measurement).
- 2. Non-legume seed and commercial fertilizer shall be applied at the rates indicated as follows:

	<u>Pounds per Acre (Slope</u>
<u>Material</u>	Measurement)
Non-legume seed	78
Commercial Fertilizer	500

If hydroseeding equipment is used to apply seed and commercial fertilizer, the mixture shall be applied within 30 minutes after the seed has been added to the mixture.

- 3. A second application of straw shall be applied and incorporated into the soil at the rate of two tons per acre (Slope measurement). Before applying the first application of straw, CONTRACTOR shall demonstrate to the ENGINEER that the soil is in a condition that it will permit the roller studs to penetrate the slope sufficiently to incorporate straw into the soil without cultivation. When straw cannot be incorporated into the soil without cultivation, CONTRACTOR shall obtain written approval from the ENGINEER prior to anchoring straw with a stabilizing emulsion as follows:
  - a. One application of straw instead of two applications shall be applied and spread at the rate of two tons per acre (Slope measurement) over the seed and commercial fertilizer applications.
  - b. A stabilizing emulsion shall be applied.

# 3.02 EROSION CONTROL EMBANKMENT SLOPES LESS THAN 4:1 AND EXCAVATION SLOPES

- A. Erosion control shall consist of applying two separate applications of erosion control materials to embankment slopes flatter than 4:1, and excavation slopes, consisting of the following applied in sequence:
  - 1. Fiber, seed and water.
  - 2. Stabilizing emulsion, commercial fertilizer, fiber, and water.
- B. Erosion control material shall be applied in two separate applications as follows:
  - 1. The following mixture shall be applied with hydroseeding equipment within 30 minutes after the seed has been added to the mixture:

	<u>Pounds per Acre (Slope</u>
<u>Material</u>	Measurement)
Fiber	500
Non-legume Seed	78

2. When pre-mixed seed from containers is added to hydroseeding equipment, the entire contents of the container shall be used in preparing the hydroseeding

mixture. Partial use of the container of pre-mixed seed will not be permitted in a hydroseeding mixture.

- C. Straw shall be applied at the rate of two tons per acre (slope measurement) and need not be incorporated.
- D. The following mixtures shall be applied with hydroseeding equipment:

<u>Material</u>	Pounds per Acre (Slope Measurement)
Fiber	1,500
Stabilizing Emulsion (Solids)	110
Commercial Fertilizer	500

E. Once the first application of erosion control materials has been applied to an area, all applications shall be completed in that area on the same working day. Erosion control work shall take place during the month of September and shall be completed by October 1 of the year.

# 3.03 INSPECTION

A. Seed areas shall be inspected no more than 30 days after planting and no more than 30 days after the first rain. Follow-up inspections shall be completed between 60 and 90 days after the first inspection and once again the following spring. The spring inspection shall establish any corrective measures necessary before the next rainy season.

# END OF SECTION

# **SECTION 02530**

# SANITARY SEWERAGE

# PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes: Furnish and install all piping as shown on the Drawings, described in the Specifications and as required for a complete and operable system.
- B. Related Sections:
  - 1. Section 02300 Earthwork.

## 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
  - 2. D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - 3. D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
  - 4. F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

#### 1.03 SUBMITTALS

- A. Submit the following to the ENGINEER for review:
  - 1. Data to show that the products specified in this Section conform to the Specification requirements.
  - 2. Leakage testing plan.
  - 3. Test results as required herein.

## 1.04 QUALITY ASSURANCE

- A. All materials and equipment furnished under this Section shall be of a manufacturer who has been regularly engaged in the design and manufacture of the materials and equipment for a period of at least five years.
- B. Factory Quality Control: The CONTRACTOR shall test all products as required herein and by the reference specifications.
- C. Field Quality Control:
  - 1. The OWNER will inspect the work and witness testing.
  - 2. The CONTRACTOR shall:
    - a. Perform leakage tests.

- b. Perform mandrel tests.
- c. Be responsible for the costs of additional inspection by the OWNER from noncompliance.
- 1.05 POTHOLING (NOT USED)

# PART 2 PRODUCTS

- 2.01 GENERAL
  - A. Pipe sizes are nominal diameter unless otherwise noted.
  - B. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.
  - C. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

#### 2.02 POLYVINYL CHLORIDE PIPE (PVC)

- A. Pipe and Fittings:
  - 1. Gravity Sewer: Polyvinyl chloride sewer pipe; ASTM D3034, SDR 35.
  - 2. Pressure Sewer: Polyvinyl chloride sewer pipe; ANSI/AWWA C900.
- B. Joints:
  - 1. Gravity Sewer: Elastomeric gasket joints; ASTM D3212, ASTM F477.
  - 2. Pressure Sewer: Integral Bell Joint; ASTM D3139, Gasket; ASTM F477.
- 2.03 REINFORCED CONCRETE PIPE (NOT USED)
- 2.04 DUCTILE IRON PIPE (DIP)
  - A. Pipe and Fittings:
    - 1. Gravity Sewer: Ductile iron sewer pipe; ASTM A746
    - 2. Pressure Sewer: Ductile iron sewer pipe; ASTM A377, ANSI/AWWA C110/A21.10
  - B. Joints:
    - 1. Gravity Sewer: Rubber Gasket Joints; AWWA C111-12
    - 2. Pressure Sewer: Rubber Gasket Joints; AWWA C111-12
- 2.05 VITRIFIED CLAY PIPE (NOT USED)
- 2.06 CONNECTION DEVICES
  - A. Flexible and Transition Couplings for Gravity Sewer: Flexible and transition couplings shall be elastomeric plastic or synthetic rubber resistant to sewage and grease, chemicals and normal sewer gases. Couplings shall be designed to slip over the outside of the pipes being connected with a snug fit. Coupling shall be held in place and sealed with full circle stainless steel shear band and two stainless steel band

clamps, one around each end. Couplings shall be specifically manufactured for making the transition between various types of pipe with different outside diameters. Couplings shall meet the requirements of the Uniform Plumbing Code. No concentric coupling reducers or donut transition couplings will be allowed. The following are acceptable couplers:

- 1. PVC SDR-35 Slip Couplers.
- 2. Romac 1000 Series and/or 5000 Series "Shear" coupler (or approved equal).
- 3. Romac SSI Full Circle Clamp (or approved equal).
- B. Flexible and Transition Couplings for Pressure Sewer:
  - 1. Mechanical Joint Sleeve.
  - 2. Fernco with stainless steel bands.
- C. Other Devices: Other equivalent connection devices will be considered provided that they are made of elastomers resistant to sewage and grease, chemicals and normal sewer gases. Metallic parts shall be stainless steel.

#### 2.07 APPURTENANCES

A. Furnish and install all necessary guides, inserts, anchors and assembly bolts; washers and nuts, hangers, supports, gaskets, and flanges; all other appurtenant items shown on the Drawings, specified or required for the proper installation and operation of the piping; devices included in or on the piping equipment; and piping accessories.

# PART 3 EXECUTION

#### 3.01 FLOW CONTROL

- A. Divert sewage flows and storm water around all sewer and drain replacement work areas, including building connection sewer replacement. Furnish, install, and operate pumps, plugs, conduits, and other equipment as needed to divert the flow of sewage around the pipeline reach in which work is to be performed. Plugs shall be designed so that all or any portion of the sewage can be released. The plug shall be provided with a tag line. The pumping system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm. If pumping is required on a 24-hour basis and engine drives are required, engines shall be equipped in a manner to keep noise to a minimum. Standby pumps shall be provided as required. Pumping shall be done in such manner as will not damage public or private property or create a nuisance or health menace. After the work has been completed, flow shall be restored to normal. Existing sewers to be abandoned shall be disconnected after the new service is operating.
- B. Notify residents of the impending work and request their cooperation to minimize flows shortly before working in each area.

# 3.02 BUILDING CONNECTION REPLACEMENT (NOT USED)

## 3.03 PIPING INSTALLATION

- A. Storage and Handling:
  - Great care shall be exercised to prevent damage to the pipe during handling, transportation or storage. Pipe shall not be stored on rough ground and rolling of the pipe on the coating will not be permitted. Any damaged pipe sections shall be repaired or replaced at the expense of the CONTRACTOR to the satisfaction of the ENGINEER.
  - 2. Store polyvinyl chloride pipe under opaque covers which do not transmit ultraviolet light.
  - 3. Each pipe section shall be carefully inspected before installation, and all damaged areas replaced to the satisfaction of the ENGINEER. All costs associated with the removal and/or replacement of damaged or defective pipe as determined by the ENGINEER shall be borne by the CONTRACTOR.
- B. General Piping Installation:
  - 1. Trenching, bedding, and backfill for buried piping shall be as shown on the Drawings and as specified in Section 02300 Earthwork.
  - 2. Lay each length of pipe on a firm bed with a true bearing for its entire length between bell holes. Excavate holes of only sufficient size to accommodate the bell at each joint location. Adjust line and grade by scraping away, filling in and tamping the earth to provide true grade to fit the barrel of the pipe. No wedging or blocking up of the pipe shall be permitted. The trench and bell holes shall be kept free from water during the laying of the pipe.
  - 3. Except when noted specifically otherwise on the Drawings, whenever piping leaves a structure, concrete encasement, or concrete bedding, a joint capable of angular deflection shall be provided within 12 inches of the structure, encasement or bedding.
  - 4. All dirt and foreign matter shall be removed from the pipe interior prior to installation and all joints shall be thoroughly cleaned before joining.
  - 5. Plug open ends of pipe when construction is not underway.
  - 6. Lay pipe upgrade with bell end uphill, unless specifically shown otherwise.
  - 7. After making each joint, rigidly secure the pipe in place by backfilling to the top of the pipe at the center, but not as to fill the bell hole nor interfere with the next jointing operation. Use appropriate compaction equipment (e.g., hand held powder puff, etc.) to work the pipe bedding underneath the haunches of the pipe, along the side of the pipe, and over the top of the pipe as shown on the Drawings to receive the required compaction.
- C. Installation Specifics:
  - 1. Polyvinyl chloride pipe for sewer mains and laterals:
    - a. Install pipe in accordance with the manufacturer's instructions, except that the minimum radius of curvature for a pipeline shall be no less than twice the minimum radius published in the pipe manufacturer's instructions and deflection angles within fittings shall be no more than half of the maximum deflection angle published in the manufacturer's instructions.

- b. Place pipe within the installation areas at least 24 hours prior to installation to permit temperature equalization.
- c. Pipe ends shall be cut squarely, reamed and deburred inside and out.
- d. Clean pipe ends and bells of dirt, grease and other foreign materials prior to making the joint.
- 2. Comply with Standard Specifications for Public Works Construction maximum deviation from line and grade.

## 3.04 CLEANING

A. Prior to testing, and before connecting new sewer to existing sewer system, the inside of each sewer main and public sewer lateral shall be thoroughly cleaned of all dirt, loose scale, sand and other foreign material. Cleaning shall be by flushing with water or bailing as appropriate for the size and type of the pipe and method of cleaning shall be favorably reviewed by the ENGINEER. Do not allow dirt and debris to enter existing sewer system. CONTRACTOR shall be responsible for collecting discharge cleaning water and disposing of it at the OWNER'S wastewater treatment plant ponds. CONTRACTOR shall not discharge cleaning water into existing sewer unless otherwise approved by the OWNER. The OWNER will provide water for sewer cleaning at no additional cost to the CONTRACTOR. CONTRACTOR shall provide valving and backflow protecting per OWNER'S approval at temporary water connection(s).

#### 3.05 PERMANENT PLUGS

A. Clean interior contact surfaces of all pipes to be cut off or abandoned. Construct a non-shrink grout plug in the end of all pipes unless otherwise specified. Minimum length of non-shrink grout plugs shall be 6 inches. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage.

# 3.06 LEAKAGE TESTS

# A. General:

- 1. Perform leakage tests on all sewer mains and public sewer laterals installed in this Project.
- 2. Furnish all equipment, materials, personnel, and supplies to perform the tests.
- Pressure gauges and metering devices shall be of a type, accuracy and calibration acceptable to the ENGINEER. The ENGINEER may require certification of the gauges and meters by an independent testing firm at the CONTRACTOR'S expense.
- 4. Leakage tests shall be performed on all piping at a time agreed upon and in the presence of the ENGINEER.
- B. The leakage test shall be made after all pipe is installed and backfilled. If testing is not completed prior to placing permanent resurfacing or other surface restoration, the CONTRACTOR shall be responsible for the cost to remove and replace pavement or other restored surface features to correct the sewer pipelines or manholes due to a failed test. The CONTRACTOR may conduct preliminary tests prior to backfill at no additional cost to the OWNER. If the CONTRACTOR elects to conduct preliminary

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tests, he shall provide any necessary temporary thrust restraint, and shall retest as set forth herein.

- C. Test Procedure for Gravity Sewer: Leakage tests shall be air pressure tests conducted as follows:
  - 1. Furnish all materials, equipment and labor for making an air test. Air test equipment shall be favorably reviewed by the ENGINEER.
  - 2. The CONTRACTOR may conduct at his expense an initial air test of the sewer main after densification of the backfill, but prior to installation of the public sewer laterals. Such tests will be considered to be for the CONTRACTOR'S information and need not be performed in the presence of the ENGINEER.
  - 3. Each section of sewer mains and public sewer laterals shall be tested between successive manholes, or in sections if favorably reviewed by the ENGINEER, by plugging and bracing all openings in the sewer main and the upper ends of all sewer laterals. Prior to any air pressure testing, all pipe plugs shall be checked with a soap solution to detect any air leakage. If any leaks are found, the air pressure shall be released, the leaks eliminated, and the test procedure started over again. The CONTRACTOR has the option of wetting the interior of the pipe prior to the test.
  - 4. The final leakage test of the sewer main and public sewer laterals shall be conducted in the presence of the ENGINEER as per 5 through 6 below.
  - 5. Air shall be introduced into the pipeline until 4.0 psi (27kPa) gage pressure has been reached; or if groundwater is present, 4.0 psi (27kPa) above the computed pressure exerted by the average adjacent groundwater. Reduce the flow of air and maintain the air pressure within plus or minus 0.5 psi (3kPa) for at least two minutes to allow the internal air temperature to reach equilibrium. Terminate flow of air into the pipeline. Pressure in the pipeline shall be constantly monitored by a gage and hose arrangement separate from hose used to introduce air into the line. A blowoff valve shall be provided on the test apparatus to prevent over pressurizing the pipeline.
  - 6. After the temperature has stabilized and no air leaks at the plugs have been found, the air pressure shall be permitted to drop until the internal pressure has reached 3.0 psi (21kPa) gage pressure; or when groundwater is present, 3.0 psi (21kPa) above the computed pressure exerted by the average adjacent groundwater. A stopwatch or sweep-second-hand watch shall be used to determine the time lapse required for the air pressure to <u>decrease an additional 1.0 psi (7kPa)</u>.
  - 7. If the time lapse (in seconds) required for the air pressure to decrease <u>the additional 1.0 psi (7kPa)</u> exceeds that shown in the Table, Low Pressure Air Test for Sewers, in the Standard Specifications for Public Works Construction, the pipe shall be presumed to be within acceptance limits for leakage.
  - 8. If the time lapse is less than that shown in this table, the CONTRACTOR shall make the necessary corrections to reduce the leakage to acceptance limits without additional compensation.

T = Time in seconds for pressure to drop to 2.5 psi (17kPa) gage pressure. D = Inside diameter of pipe in inches (mm).

- D maide diameter of pipe in mones (m
- D. Test Procedure for Pressure Sewer:

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- 1. General: Perform leakage tests on the inlet pipe, outlet pipe and interconnected piping. Furnish all equipment, material, personnel, test media and supplies to perform the tests and make all taps and other necessary temporary connections. The test pressure, allowable leakage and test medium shall be as specified. Perform leakage tests on all piping at a time agreed upon and in the presence of the ENGINEER or INSPECTOR.
- 2. Buried Piping: Perform the leakage test for buried piping after all pipe is installed and backfilled. However, preliminary tests may be conducted prior to backfill. If preliminary tests are conducted, provide any necessary temporary thrust restraint.
- 3. Accessories: It is the responsibility of the CONTRACTOR to block off or remove equipment, valves, gauges, etc., which are not designed to withstand the full test pressure.
- 4. Testing Apparatus: Provide pipe taps, nozzles and connections as necessary in piping to permit testing, addition of test media, and draining lines and disposal of water, as is necessary. Plug these openings in a manner favorably reviewed by the ENGINEER or INSPECTOR after use. Provide all required temporary bulkheads.
- 5. Correction of Defects: If leakage exceeds the allowable, repair or replace the installation and repeat leakage tests as necessary until conformance to the leakage test requirements specified herein have been fulfilled. All visible leaks shall be repaired even if the pipeline passes the allowable leakage test.
- 6. Reports: Keep records of each piping test, including:
  - a. Description and identification of piping tested.
    - b. Test pressure.
    - c. Date of test.
    - d. Witnessing by CONTRACTOR and ENGINEER/INSPECTOR.
    - e. Test evaluation.
- 7. Testing Specifications:
  - a. Method: AWWA C600, as modified herein.
  - b. Duration: Four hours.
  - c. Pressure: 150psi measured at lowest point of section of pipeline being tested.
  - d. Medium: Potable water.
  - e. Allowable Leakage: Leakage shall be defined as the quantity of test medium that must be added to the section of pipeline being tested to maintain the specified test pressure for the specified test duration. Maximum allowable leakage shall be as specified in AWWA C600.

# 3.07 MANDREL TEST OF POLYVINYL CHLORIDE PIPE

A. Deflection Testing: Maximum allowable deflection (reduction in vertical inside diameter) of the installed pipe shall not exceed 5%. The CONTRACTOR shall provide acceptable 9-prong mandrel, or other approved device to check the maximum allowable deflection of pipes 21 inches in diameter and smaller thirty (30) days after installation. Testing must be performed by hand pulling a nine-point mandrel a diameter of 95% of the average inside diameter. The allowable limits shall be:

Pipe Diameter	Maximum Allowable Sag
4-inch	1/4-inch
6-inch	3/8-inch
8-inch to 10-inch	1/2-inch
12-inch	3/4-inch
15-inch	1-inch

B. At any location where the pipe deflection is determined to exceed the allowable limits by the ENGINEER, the CONTRACTOR shall remove, re-bed, restore the surface (e.g., paving or landscaping) and if required, replace the pipe at no additional cost to the OWNER. No rerounding of the pipe shall be allowed. The CONTRACTOR shall reduce the pipe deflection to 5% or less, as determined by the ENGINEER. The pipeline shall then be re-tested after thirty (30) days of installation for deflection, CCTV inspection, and air tightness.

END OF SECTION

# SECTION 02722

# **CRUSHED AGGREGATE BASE COURSE**

# PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes: Furnishing, placing and compacting crushed aggregate on a prepared surface.

#### 1.02 SUBMITTALS

- A. General: Submittals shall be according to Salida Sanitary District Submittal Procedures.
- B. Test Data: Submit three (3) copies of test data for the CONTRACTOR furnished aggregate to be used on this Project.
- C. Certificates of Conformance: Submit three (3) copies of written certification from the supplier of the CONTRACTOR-furnished aggregate to be used on this Project that it conforms to the requirements of this Specification Section.
- 1.03 DELIVERY, STORAGE AND HANDLING
  - A. Delivery: Mitigate spillage or damage that occurs during delivery.
- 1.04 PROJECT/SITE CONDITIONS
  - A. Excess Materials: Shall be removed from the site.
- 1.05 WARRANTY
  - A. Requirements: Aggregate base found to be defective within 12 months after work completion, shall be replaced at the CONTRACTOR'S expense. Overlaying material that must be replaced because of defective base material shall also be replaced at the CONTRACTOR'S expense.

#### PART 2 PRODUCTS

- 2.01 MATERIALS
  - A. Crushed Aggregate: Furnish hard, durable particles or fragments of crushed stone or gravel conforming to the size and quality requirements for crushed aggregate material normally used locally in construction and maintenance of highways by federal or state agencies. Furnish crushed aggregate with a maximum size of 1 inch as determined by

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AASHTO T27 and T11. Furnish crushed aggregate uniformly graded from coarse to fine and free of organic matter, lumps or balls of clay and other deleterious matter.

# PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General: The material shall be placed on the prepared surface and compacted in layers of the thickness shown on the drawings. When more than one layer is required, each layer shall be shaped and compacted before the succeeding layer is placed.
  - 1. Placing shall be from vehicles equipped to distribute the material in a continuous uniform layer or windrow. The layer or windrow shall be of such size that when spread and compacted, the finished layer shall have the required thickness.
  - 2. When hauling is done over previously placed material, hauling equipment shall be routed uniformly as possible over the entire surface of the constructed layers.
- B. Spreading: When uniformly mixed, the mixture shall be spread smoothly for compaction to the required thickness.
- C. Compacting: Immediately following final spreading and smoothing, each layer shall be compacted to the full width by approved compaction equipment. Rolling shall progress gradually from the sides to the center, parallel to the centerline of the road, or parking area, and shall continue until the surface has been rolled. Irregularities or depressions that develop shall be corrected by loosening the material at these places. Add or remove material until the surface is smooth and uniform. Along curbs and at places not accessible to the roller, the base material shall be compacted thoroughly with approved tampers or compactors.
- D. Watering: Provide water and watering equipment to control dust and obtain required compaction.

# 3.02 FIELD QUALITY CONTROL

- A. Testing: Testing shall be conducted in the presence of the Contracting Officer who shall be given 48 hour notice before a test is to be conducted. The CONTRACTOR shall make arrangements for a certified independent testing laboratory, according to the requirements of Salida Sanitary District, to perform the required testing, recording, and distributing of the results.
- B. Density:
  - 1. Compaction of each layer shall continue until a density of not less than 100 percent of the maximum density determined according to AASHTO T 180 Method D, or other method approved in writing by the Contracting Officer, has been achieved.
  - 2. In-place field density determinations are made according to AASHTO T 191, AASHTO T 205, or other approved method. The use of AASHTO T 224 to correct for oversize particles may be required.
  - 3. Test holes are made at random during the work to determine the depth of uncompacted layers required to produce the designated depth of material after compacting to the specified density.

- 4. Cutting of the test holes and refilling with materials properly compacted shall be done by the CONTRACTOR and approved in writing by the Contracting Officer.
- C. Completed Course Thickness: Shall not vary more than 1/2-inch from the thickness required.
- D. Surface: Shall be tested for acceptance by the CONTRACTOR with a 10-foot straight edge after the base has been bladed and rolled into a smooth surface. Areas where the surface variation exceeds 1/2-inch in 10 feet shall be reworked until the variation falls within this limit.

# 3.03 PROTECTION

A. Traffic Control: The CONTRACTOR shall provide the controls to prevent unauthorized traffic in or on work areas until those areas are suitably prepared for traffic.

# END OF SECTION

# SECTION 02742

# ASPHALTIC CONCRETE PAVING

# PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes: Asphalt pavement on prepared subgrade or aggregate base course to lines, grades and compacted thickness as indicated on the Drawings.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Section 02050 Soils and Aggregates for Earthwork.
    - b. Section 02722 Crushed Aggregate Base Course.

#### 1.02 REFERENCES

- A. ASTM International (ASTM):
  - D 1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft. lbf/f<sub>4</sub>^3)(2,700 kN-m/m<sup>3</sup>).
  - 2. D 1561 Standard Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor.
- B. Caltrans Standard Test Methods:
  - 1. Calif Test 202 Sieve Analysis of Fine and Coarse Aggregates.
  - 2. Calif Test 304 Preparation of Bituminous Mixtures for Testing.
  - 3. Calif Test 362 Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction.
  - 4. Calif Test 375 Determining the In-Place Density and Relative Compaction of AC Pavement.
  - 5. Calif Test 379 Determining Asphalt Content in Bituminous Mixtures (Troxler Nuclear Gauge Model 3241).
- C. State of California Department of Transportation Standard Specifications, latest edition (Caltrans Standard Specifications):
  - 1. Section 37 Bituminous Seals.
  - 2. Section 39 Asphalt Concrete.

- 3. Section 88 Engineering Fabrics.
- 4. Section 92 Asphalts.
- 5. Section 93 Liquid Asphalts.
- 6. Section 94 Asphaltic Emulsions.

# 1.03 SYSTEM DESCRIPTION

- A. This Work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compaction of the mixture as specified and as indicated on the Drawings.
- B. In general, asphalt concrete and asphalt concrete base shall conform to Section 39 "Asphalt Concrete," and all applicable referenced sections, of the Caltrans Standard Specifications:
  - 1. Where conflicts exist, this specification shall govern.

# 1.04 DEFINITIONS

- A. "Asphalt Concrete" as used by Caltrans shall be considered the "Surface Course," or the final lift of the pavement section.
- B. "Asphalt Concrete Base" as used by Caltrans shall be the remaining portion of the asphalt pavement section excluding the final lift.
- C. "Asphalt Pavement" shall be the total pavement section of asphalt including Asphalt Concrete and Asphalt Concrete Base.

# 1.05 SUBMITTALS

- A. Mix design.
- B. Shop drawings.
- C. Product Data:
  - 1. Asphalt.
  - 2. Asphalt aggregate.
  - 3. Pavement reinforcing fabric.
- D. Quality control submittals:
  - 1. Test results.
  - 2. Certificate of Compliance.
  - 3. Certificate of Competence.
- E. Equipment list.

# 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Asphalt pavement delivery:
  - 1. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of all foreign materials.

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- 2. Treat bodies as necessary to prevent material from sticking to the bodies.
- 3. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.

# 1.07 PROJECT CONDITIONS

- A. Environmental requirements:
  - 1. Asphalt concrete:
    - a. Place asphalt concrete only when surface is dry, when atmospheric temperature in the shade is 40 degrees Fahrenheit and rising, or above 50 degrees Fahrenheit if falling.
    - b. Do not place asphalt concrete when weather is foggy or rainy nor when base on which material is to be placed is in wet or frozen conditions or when, in the opinion of the ENGINEER, weather conditions will prevent proper handling, finishing, compaction of the mixtures.
  - 2. Prime coat:
    - a. Do not apply prime coat when atmospheric temperature is below 60 degrees Fahrenheit.
    - b. Apply prime coat only when base course is dry or contains moisture not in excess of that which will permit uniform distribution and desired penetration.

# PART 2 PRODUCTS

# 2.01 ASPHALT PAVEMENT MATERIALS

- A. Asphalts:
  - 1. Asphalt binder: Steam-refined paving asphalt, PG 64-10, conforming to Section 92-1.02 "Grades" of the Caltrans Standard Specifications.
  - 2. Prime coat and tack coat: Grade SC-70, conforming to Section 93 1.01 of the Caltrans Standard Specifications.
- B. Asphalt aggregate:
  - 1. Aggregate for asphalt concrete shall conform to Section 39-2.02 of the Caltrans Standard Specifications for Type B grading, 1/2-inch maximum, medium.
  - 2. Aggregate for asphalt concrete base shall conform to Section 39-2.02 of the Caltrans Standard Specifications for Type B grading.
- C. Asphalt pavement shall be produced in a batch mixing plant, a continuous pugmill mixing plant, or drier-drum mixing plant:
  - 1. Storage shall conform to Section 39-3.01 and Section 39-3.05 of the Caltrans Standard Specifications.
  - 2. Drying shall conform to Section 39-3.02 of the Caltrans Standard Specifications.
  - 3. Proportioning shall conform to Section 39-3.03 of the Caltrans Standard Specifications.
  - 4. Mixing shall conform to Section 39-3.04 of the Caltrans Standard Specifications.

## 2.02 AGGREGATE BASE COURSE

- A. Aggregate base course: As specified in Section 02050 Soils and Aggregates for Earthwork.
- B. Aggregate base course shall be placed at the following locations:
  - 1. At all locations indicated on the Drawings.
  - 2. All asphalt pavement.
- C. Compacted thickness of aggregate base course shall be as indicated on the Drawings.

#### 2.03 EQUIPMENT

- A. Spreading and compacting equipment:
  - 1. Spreading equipment shall conform to Section 39-5.01 and all applicable referenced sections, of the Caltrans Standard Specifications:
    - a. Only in areas inaccessible to the machine, by approval of the ENGINEER, will hand spreading be permitted.
  - 2. Compaction equipment shall conform to Section 39-5.02 and all applicable referenced sections, of the Caltrans Standard Specifications.

#### 2.04 SOURCE QUALITY CONTROL

A. The ENGINEER will perform sampling and tests of materials in accordance with California Test Method Number 304 and California Test Method Number 362 or 379, as applicable. Samples will be taken from materials as delivered to the site.

# PART 3 EXECUTION

# 3.01 EXAMINATION

A. Verification of conditions: Verify surfaces and site conditions are ready to receive work. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning application means acceptance of existing conditions.

# 3.02 PREPARATION

- A. Protection:
  - 1. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials.
  - 2. Building and other surfaces shall be covered with paper or other protection, when required.
  - 3. CONTRACTOR shall be responsible for any damage caused by CONTRACTOR'S employees. All damage caused by the CONTRACTOR'S operations shall be repaired to the satisfaction of the ENGINEER at no additional cost to OWNER.
- B. Subgrade preparation:
  - 1. Immediately prior to applying tack coat, or immediately prior to placing the asphalt pavement when tack coat is not required, the subgrade to receive asphalt

pavement shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be cleaned to remove any loose or extraneous material.

2. If the asphalt pavement is to be placed on an existing base or pavement which was not constructed as part of the contract, the CONTRACTOR shall clean the surface by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the tack coat.

# 3.03 PRIME COAT AND TACK COAT

- A. Prime coat:
  - 1. A prime coat of liquid asphalt shall be applied on all surfaces of base course material to be paved.
  - 2. Prime coat shall be applied at a rate of 0.25 gallons per square yard, and shall conform to Section 93-1.03 of the Caltrans Standard Specifications for the distributor application of the grade of liquid asphalt being used.
- B. Tack coat:
  - 1. A tack coat of asphaltic emulsion shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, or as otherwise specified in this Section.
  - 2. Tack coat shall be applied in one application at a rate of 0.1 gallons per square yard of surface covered.

# 3.04 ASPHALT PAVEMENT

- A. Placing materials in a windrow, then picking it up and placing it in the asphalt paver with loading equipment will be permitted provided that:
  - 1. The asphalt paver is of such design that the material will fall into a hopper which has a movable bottom conveyor to feed and screed.
  - 2. The loader is constructed and operated so that substantially all of the material deposited into windrows is picked up and deposited into the paving machine.
  - 3. The windrow is deposited only so far in advance of the paver to provide for continuous operation of the paver and not so far as to allow the temperature of the asphalt pavement in the windrow to fall below 260 degrees Fahrenheit.
- B. Unless lower temperatures are directed by the ENGINEER, asphalt concrete shall be spread, and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees Fahrenheit, and all breakdown compaction shall be completed before the temperature of the mixture drops below 205 degrees Fahrenheit.
- C. Open graded asphalt concrete shall be spread at a temperature of not less than 205 degrees Fahrenheit, and not more than 250 degrees Fahrenheit, measured in the hopper of the paving machine. Open graded asphalt concrete shall be compacted as soon as possible after spreading.

- D. Asphalt pavement shall be spread and compacted in the number of layers and of the thicknesses indicated in the following table:
  - 1. A thickness tolerance of within 0.1 inches is allowed for asphalt concrete.
  - 2. A total thickness tolerance of within 0.2 inches is allowed for asphalt concrete base.

Total Thickness Indicated on Drawings <sup>a</sup>	Number of Lifts	Top I Thick	Layer	Next Lov Thick	ver Layer (ness	All Othe La Thickr	er Lower yer nesses
		Min	Max	Min	Max	Min	Max
< 2-3/4"	1						
3" <sup>b</sup>	2	1-1/4"	1-1/2"	1-1/4"	1-1/2"		
3-1/4" - 4-3/4"	2	1-3/4"	2-1/4"	1-3/4"	3"		
> 5"	с	1-3/4"	2-1/4"	1-3/4"	3"	1-3/4"	4-3/4"

Notes:

<sup>a</sup> When pavement reinforcing fabric is shown to be placed between layers of asphalt pavement, the thickness of asphalt pavement above the pavement reinforcing fabric shall be considered to be the "Total Thickness Indicated on the Drawings" for the purpose of spreading and compacting the asphalt pavement above the pavement reinforcing fabric.

<sup>b</sup> If approved by the Engineer, one lift of 3 inches may be placed.

<sup>c</sup> At least 2 layers shall be placed if the total thickness is less than 5 inches. At least 3 layers shall be placed if the total thickness is more than 5 inches, and less than 10 1/2 inches. At least 4 layers shall be placed if the total thickness is greater than 10 1/2 inches.

- E. A layer shall not be placed over another layer which exceeds 3 inches in compacted thickness until the temperature of the layer which exceeds 3 inches in compacted thickness is less than 160 degrees Fahrenheit at mid depth:
  - 1. If the temperature of any layer drops below 140 degrees Fahrenheit, or if directed by the ENGINEER, apply tack coat before placing next layer.
- F. Unless otherwise indicated on the Drawings, asphalt mixtures shall not be handled, spread, or windrowed in a manner that will stain the finished surface of any pavement or other improvements.
- G. The completed mixture shall be deposited on the prepared subgrade at a uniform quantity per linear foot, as necessary to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.

- H. Spreading:
  - 1. All layers of asphalt pavement shall be spread with an asphalt paver and shall conform to Section 39-6.02 and all applicable referenced sections of the Caltrans Standard Specifications.
  - 2. At locations where the asphalt pavement is to be placed over areas inaccessible to spreading and rolling equipment, all layers of asphalt pavement shall be distributed directly out of the back of the dump truck and spread by hand:
    - a. Asphalt pavement spread by hand shall be compacted thoroughly to the required lines, grades, and cross-sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.
- I. Compaction:
  - 1. Compaction of asphalt pavement shall conform to Section 39-6.03 and all applicable referenced sections of the Caltrans Standard Specifications.
  - 2. Minimum required density for each layer of asphalt pavement shall be 95 percent of that obtained in the laboratory in accordance with ASTM Test Method D 1561.
- J. Segregation shall be avoided and the surfacing shall be free of pockets of coarse or fine material. Asphalt pavement containing hardened lumps shall not be used:
  - 1. In areas inaccessible to paving and compacting equipment where spreading is done by hand, minimize the amount of segregation.
- K. Location of longitudinal joints in the top layer will be determined by the ENGINEER and shall not adversely affect the quality of the finished product.
- L. At all locations, or as directed by the ENGINEER, the asphalt concrete shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

# 3.05 FIELD QUALITY CONTROL

- A. The CONTRACTOR shall control the quality of Work and shall provide adequate testing to assure compliance with these Specifications:
  - 1. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum of 1 sample for every 4,000 square feet of asphalt pavement placed.
- B. All asphalt pavement shall match the grades indicated on the Drawings and shall be completely free from unintended hollows and high spots:
  - 1. After completion of paving work, all paving shall be flooded with water. Any ponding that results in standing water greater than 3/4 inch in depth shall be ringed with chalk. Such hollows shall be corrected by removing and replacing the asphalt concrete. The asphalt concrete patch shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

- C. CONTRACTOR shall perform in-place density and compaction tests of the completed pavement in accordance with California Test Method Number 375, to determine compliance with the specified requirements. Submit test results to ENGINEER for approval.
- D. Cracks, settling of surface, improper drainage, improper compaction, and sloppy connection to previously laid surfaces will be construed as improper workmanship and will not be accepted.

#### 3.06 MAINTENANCE OF PAVEMENT

- A. Upon completion of final rolling, traffic shall not be permitted on the finished pavement for at least 6 hours, or until the asphalt pavement has cooled sufficiently to withstand traffic without being deformed.
- 3.07 WORKMANSHIP AND WARRANTY
  - A. CONTRACTOR shall provide written warranty against defects in materials or workmanship for a period of not less than 1 year upon completion of Work.

END OF SECTION

# SECTION 02952

# PAVEMENT RESTORATION AND REHABILITATION

# PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Resurfacing roads and paved surfaces in which surface is removed or damaged by installation of new work.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of the CONTRACTOR'S Work.
  - 3. The following sections are related to the work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed work complies accurately with the Contract Documents.
    - a. Section 02460 Asphalt Concrete Pavement and Base.

# 1.02 SYSTEM DESCRIPTION

- A. Performance requirements:
  - 1. Limiting dimensions:
    - a. Determine the exact lengths and dimensions of such roads, pavements, parking areas, and walks that will require removal and replacement for new work.
    - b. Join existing surfaces to terminals of new surfacing in smooth juncture.

# 1.03 SUBMITTALS

- A. Mix designs:
  - 1. Prior to placement of asphalt concrete submit full details, including design and calculations for the asphalt concrete mix proposed.
  - 2. Submit gradation of aggregate base.
  - 3. Submit proposed mix design of portland cement concrete.

# PART 2 PRODUCTS

## 2.01 MATERIALS

A. Aggregate base course and asphalt pavement: As specified in Section 02460 Asphalt Concrete Pavement and Base.

#### 2.02 EQUIPMENT

- A. Roads, pavements, parking areas, and walks:
  - 1. Equipment requirements: Good condition, capable of performing work intended in satisfactory manner.

#### 2.03 ACCESSORIES

A. Material for painting asphalt concrete pavement: Tack coat as specified in Section 02460 Asphalt Concrete Pavement and Base.

# PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Aggregate surface removal replacement:
  - 1. When trench cut is in aggregate surfaced areas, replace aggregate base course material with material matching existing material compacted to 95 percent of its maximum density.
- B. Pavement removal and temporary asphalt replacement:
  - 1. Install temporary asphalt pavement or first course of permanent pavement replacement immediately following backfilling and compaction of trenches that have been cut through existing pavement.
  - 2. Except as otherwise provided, maintain this temporary pavement in safe and reasonably smooth condition until required permanent pavement is installed.
  - 3. Remove and dispose of temporary paving from project site.
  - 4. Where longitudinal trench is partly in pavement, replace pavement to original pavement edge, on a straight line, parallel to centerline of roadway.
  - 5. Where no part of longitudinal trench is in pavement, surfacing replacement shall only be required where existing surfacing materials have been removed.
- C. Asphalt pavement replacement:
  - 1. Replace asphalt pavement to same thickness as adjacent pavement and match as nearly as possible adjacent pavement in texture, unless otherwise indicated on the Drawings.
  - 2. Cut existing asphalt pavements to be removed for trenches or other underground construction by wheel cutter, clay spade, or other device capable of making neat, reasonably straight and smooth cut without damaging adjacent pavement. Cutting device operation shall be subject to acceptance of ENGINEER.
  - 3. Cut and trim existing pavement after placement of required aggregate base course and just prior to placement of asphalt concrete for pavement replacement, and

paint trimmed edges with material for painting asphalt concrete pavement immediately prior to constructing new abutting asphalt pavements. No extra payment will be made for these items, and all costs incurred in performing this work shall be incidental to pipe laying or pavement replacement.

- 4. Conform replacement of asphalt pavement to contour of original pavement.
- D. Portland cement concrete pavement replacement:
  - 1. Where trenches lie within portland cement concrete section of streets, alleys, sidewalks, and similar concrete construction, saw cut such concrete (to a depth of not less than 1-1/2-inches) to neat, vertical, true lines in such manner adjoining surfaces are not damaged.
  - 2. Place portland cement concrete replacement material to dimension as indicated on the Drawings.
  - 3. Provide expansion joints that match existing.
  - 4. Before placing replacement concrete, thoroughly clean edges of existing pavement and wash with neat cement and water.
  - 5. Surface finish: Wood float finish.
- E. Curb, gutter, and sidewalk replacement:
  - 1. Where any concrete curb, gutter, or sidewalk has been removed or displaced, replace to nearest construction joints with new Class A curb, gutter, or sidewalk to same dimensions and finish as original construction that was removed:
    - a. Provide expansion joints of same spacing and thickness as original construction.

## 3.02 FIELD QUALITY CONTROL

- A. Tests:
  - 1. Asphalt concrete as specified in Section 02460 Asphalt Concrete Pavement and Base.

#### B. Inspection:

- 1. Asphalt concrete:
  - a. Lay 10-foot straightedge parallel to centerline of trench when the trenches run parallel to street, and across pavement replacement when trench crosses street at angle.
  - b. Remove and correct any deviation in cut pavement replacement greater than 1/4-inch in 10-feet.
- 2. Portland cement concrete replacement pavement:
  - a. Lay 10-foot straightedge either across pavement replacement or longitudinal with centerline of gutter or ditch.
  - b. Remove and correct any deviation in cut pavement replacement greater than 1/4-inch in 10-feet.

# END OF SECTION

# SECTION 05120

# STRUCTURAL STEEL

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Structural steel shapes and plate.
  - 2. Fasteners:
    - a. All thread rods.
    - b. Anchor bolts.
    - c. Assembly bolts.
    - d. Chemical anchors.
    - e. Concrete anchors.
    - f. Eyebolts.
    - g. High strength bolts.
    - h. Powder actuated fasteners.
    - i. Sleeve anchors.
    - j. Welded studs.
  - 3. Isolation sleeves and washers.
  - 4. Thread coating.
  - 5. Welding.

#### B. Related Sections:

- 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
- 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
  - a. Section 03055 Epoxy Bonding Reinforcing Bars and All Thread Rods in Concrete.

#### 1.02 REFERENCES

- A. American Institute of Steel Construction (AISC):
  - 1. Specification for Structural Steel Buildings.
- B. American National Standards Institute (ANSI):
  - 1. B212-15 Cutting Tools Carbide-tipped Masonry Drills and Blanks for Carbidetipped Masonry Drills.

- C. American Society for Testing and Materials (ASTM):
  - 1. A 29 Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements.
  - 2. A 36/A 36M Standard Specification for Carbon Structural Steel.
  - 3. A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded, and Seamless.
  - 4. A 108 Standard Specification for Steel Bars, Carbon, Cold Finished.
  - 5. A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 6. A 153/A 153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 7. A 240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 8. A 276 Standard Specification for Stainless Steel Bars and Shapes.
  - 9. A 307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  - 10. A 325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - 11. A 489 Standard Specification for Carbon Steel Lifting Eyes.
  - 12. A 490 Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
  - 13. A 496 Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
  - 14. A 500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 15. A 501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - 16. A 992/A 992M Standard Specification for Structural Steel Shapes.
  - 17. F 593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
  - 18. F 959 Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
- D. American Welding Society (AWS):
  - 1. A 5.1 Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
  - 2. A 5.17 Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.
  - 3. A 5.20 Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.
  - 4. D 1.1 Structural Welding Code Steel.
  - 5. D 10.4 Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing.

# 1.03 SUBMITTALS

- A. Quality Control Submittals:
  - 1. Submit shop drawings of members to be fabricated before starting their fabrication.
  - 2. Welder's certificates.
- B. Test Reports:

- 1. Certified copies of mill tests and analyses made in accordance with applicable ASTM standards, or reports from a recognized commercial laboratory, including chemical and tensile properties of each shipment of structural steel or part thereof having common properties.
- 2. Current International Code Council ES Report for chemical anchors.

# 1.04 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Perform welding of structural metals with welders who have current American Welding Society certificate for the type of welding to be performed.
  - Steel fabricators shall be certified by the American Institute of Steel Construction (AISC) or other certification as recognized and accepted by the local building official having jurisdiction.
  - 3. Notify ENGINEER 24 hours minimum before starting shop or field welding.
  - 4. ENGINEER may check materials, equipment, and qualifications of welders.
  - 5. Remove welders performing unsatisfactory work, or require to requalify.
  - 6. ENGINEER may use gamma ray, magnetic particle, dye penetrant, trepanning, or other aids to visual inspection to examine any part of welds or all welds.
  - 7. CONTRACTOR shall bear costs of retests on defective welds.
  - 8. CONTRACTOR shall also bear costs in connection with qualifying welders.

# 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver structural steel free from mill scale, rust, and pitting.
- B. Storage and Protection: Until erection and painting, protect from weather items not galvanized or protected by a shop coat of paint.

# PART 2 PRODUCTS

- 2.01 MATERIALS
  - A. Unless otherwise specified or indicated on the Drawings, materials shall conform to the following:

ltem	ASTM Standard	Class, Grade, Type, or Alloy Number	
Steel			
Plate, bars, rolled shapes (except W and WT shapes), and miscellaneous items	A 36		
Rolled W and WT shapes	A 992	Grade 50	
Hollow structural sections (HSS): round, square, or rectangular	A 500	Grade B	
Tubing, hot-formed	A 501		
Round HSS	A 500	Grade B	
Steel pipe	A 53	Grade B	
Stainless steel			
Plate, sheet, and strip	A 240	Type 304* or 316**	
Bars and shapes	A 276	Type 304* or 316**	
* Use Type 304L if material will be welded.			
** Use Type 316L if material will be welded.			

B. Where stainless steel is welded, use low-carbon stainless steel.

# 2.02 FASTENERS

- A. General: Furnish threaded fasteners, except high strength bolts, with flat washers, and self-locking nuts, or lock washers and nuts:
  - 1. Bolt Heads and Nuts: Hex-type.
  - 2. Bolts, Nuts, and Washers: Of domestic manufacture.
  - 3. Where bolts, including anchor bolts, nuts, washers, and similar fasteners are specified to be galvanized, galvanize in accordance with ASTM A 153.
- B. All Thread Rods:
  - 1. Type 316 Stainless Steel in Accordance with ASTM F 593 for use in Wet and Moist Locations, Including:
    - a. Water-Containing Structures:
      - 1) Below and at water level.

- 2) Above Water Level:
  - a) Below top of walls of water-containing structures.
  - b) Under the roof, slab, beam, or walkway of enclosed watercontaining structures.
- 3) Dry side of walls of water-containing structures.

b. Pump bases.

- 2. Type 304 or Type 316 stainless steel in accordance with ASTM F 593 for aluminum assemblies.
- 3. ASTM A 36 meeting the mechanical requirements of ASTM A 307. Hot-dip galvanize for galvanized assemblies and for applications other than those specified.
- C. Anchor Bolts:
  - 1. Anchor Bolts, Nuts, and Washers: Type 316 Stainless Steel in Accordance with ASTM F 593 for use in Wet and Moist Locations, Including:
    - a. Water-Containing Structures:
      - 1) Below and at water level.
      - 2) Above Water Level:
        - a) Below top of walls of water-containing structures.
        - b) Under the roof, slab, beam, or walkway of enclosed water containing structures.
        - c) Dry side of walls of water-containing structures.
    - b. Pump bases.
  - 2. Anchor Bolts, Nuts, and Washers: Type 304 or Type 316 stainless steel for fastening aluminum to concrete or steel.
  - 3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized ASTM A 307 steel bolt or hot-dip galvanized ASTM A 36 steel, for applications other than those specified.
- D. Assembly Bolts:
  - 1. Bolts, Nuts, and Washers for Field-Assembled Construction: Type 316 stainless steel in accordance with ASTM F 593 for use in wet and moist locations, including:
    - a. Water-Containing Structures:
      - 1) Below and at water level.
      - 2) Above Water Level:
        - a) Below top of walls of water-containing structures.
        - b) Under the roof, slab, beam, or walkway of enclosed water containing structures.
        - c) Dry side of walls of water-containing structures.
    - b. Pump bases.
  - 2. Type 304 or Type 316 stainless steel in accordance with ASTM F 593 for aluminum assemblies.
  - 3. Hot-dip galvanized ASTM A 307 steel for galvanized assemblies and for applications other than those specified.
- E. Chemical Anchors:
  - 1. Not allowed.
- F. Concrete Anchors:
  - 1. Manufacturers: One of the following or equal:

- a. Hilti Incorporated, Kwik Bolt TZ Anchor.
- b. Simpson Strong Tie, Strong Bolt Wedge Anchor.
- 2. Concrete Anchor's Integral Threaded Stud, Wedge, Washer, and Nut: Type 304 or Type 316 stainless steel in accordance with ASTM F 593. For use in wet and moist locations, including:
  - a. Water-Containing Structures:
    - 1) Below and at water level.
    - 2) Above Water Level:
      - a) Below top of walls of water-containing structures.
      - b) Under the roof, slab, beam, or walkway of enclosed watercontaining structures.
    - 3) Dry side of walls of water-containing structures.
  - b. Pump bases.
- 3. Concrete Anchor's Integral Threaded Stud, Wedge, Washer, and Nut: Type 304 or 316 stainless steel in accordance with ASTM F 593 for fastening aluminum to concrete or steel.
- 4. Concrete Anchor's Integral Threaded Stud, Wedge, Washer, and Nut: Hot-dip galvanized carbon steel, for applications other than those specified.
- 5. Do not use Slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
- G. Eyebolts:
  - 1. Welded or forged, when manufactured of materials other than carbon steel.
  - 2. Having geometric and strength characteristics of eyebolts specified in ASTM A 489, Type 1. The strength characteristics include proof load requirements, breaking strength requirements, tensile strength requirements, bend test, and impact strength.
- H. Flush Shells:
  - 1. Manufacturers: One of the following or equal:
    - a. ITW Red Head, Multi-Set II Drop-In.
    - b. Hilti Incorporated, HDI Drop-In.
  - 2. Bolts, Flush Shells, Threaded Rods, Washers, and Nuts: Type 303 stainless steel in accordance with ASTM F 593.
- I. High Strength Bolts: High strength bolts, nuts, and hardened flat washers shall be in accordance with ASTM A 325 or ASTM A 490, as indicated on the Drawings.
- J. Powder Actuated Fasteners:
  - 1. For Installation in Concrete or Steel: Zinc coated, heat-treated, alloy steel.
  - 2. Fasteners Not Sufficiently Protected against Corrosion from Exposure to Corrosive Conditions: Coat as necessary to make suitable for such conditions.
  - 3. Pins: Furnish with head or threaded stud capable of transmitting loads to shank.
  - 4. Pins Connected to Steel: Furnish with longitudinal serrations around circumference of shank.
- K. Sleeve Anchors:
  - 1. Manufacturers: One of the following or equal:
    - a. Hilti Incorporated, HSL Heavy Duty Sleeve Anchor.

- b. Simpson Strong Tie, Pleasanton, CA, Sleeve-All Sleeve Anchors
- 2. Use stainless material for aluminum and stainless attachments and carbon steel for steel attachments.
- 3. For use in wet and moist locations, including locations listed below. Use Type 304 stainless steel in accordance with ASTM F 593 for sleeve anchor's internal bolt, expansion sleeve, extension sleeve, and washer. Use Type 303 stainless steel in accordance with ASTM F 593 for sleeve anchors expansion cone.
  - a. Water-Containing Structures:
    - 1) Below and at water level.
    - 2) Above Water Level:
      - a) Below top of walls of water-containing structures.
      - b) Under the roof, slab, beam, or walkway of enclosed watercontaining structures.
    - 3) Dry side of walls of water-containing structures.
  - b. Pump bases.
- 4. For fastening aluminum to concrete or steel, use Type 304 stainless steel in accordance with ASTM F 593 for sleeve anchor's internal bolt, expansion sleeve, extension sleeve. Use Type 303 stainless steel in accordance with ASTM F 593 for sleeve anchor's expansion cone.
- 5. For applications other than those specified above, use hot-dip galvanized carbon steel for sleeve anchor's internal bolt, expansion sleeve, expansion cone, extension sleeve, and washer.
- 6. The sleeve anchor shall have a nylon compression ring which compresses to ensure that the material being fastened is tightly secured against the concrete.
- 7. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
- L. Welded Studs:
  - 1. ASTM A 108 with 50,000-pounds per square inch minimum yield strength, and 60,000-pounds per square inch minimum tensile strength.
  - 2. Headed Studs: Manufacturers: One of the following or equal:
    - a. Nelson Stud Welding Company, S3L Shear Connectors or H4L Concrete Anchors.
    - b. Stud Welding Products, Headed Concrete Anchors or Shear Connectors.

# 2.03 ISOLATING SLEEVES AND WASHERS

- A. Manufacturers: One of the following or equal:
  - 1. Central Plastics Company, Shawnee, Oklahoma.
  - 2. Corrosion Control Products, PSI Inc., Gardena, CA.
- B. Sleeves: Mylar, 1/32 inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending halfway into both steel washers.
  - 1. One sleeve required for each bolt.
- C. Washers: The inside diameter of all washer shall fit over the isolating sleeve and both the steel and isolating washers shall have the same inside diameter and outside diameter:
  - 1. Proper size to fit bolts. Two insulating washers are required for each bolt.

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- 2. Two 1/8-inch thick steel washers for each bolt.
- 3. G3 Phenolic:
  - a. Thickness: 1/8 inch.
  - b. Base Material: Glass.
  - c. Resin: Phenolic.
  - d. Water Absorption: 2 percent.
  - e. Hardness (Rockwell): 100.
  - f. Dielectric Strength: 450 volts per mil.
  - g. Compression Strength: 50,000 pounds per square inch.
  - h. Tensile Strength: 20,000 pounds per square inch.
  - i. Maximum Operating Temperature: 350 degrees Fahrenheit.

#### 2.04 GALVANIZED SURFACE REPAIR

- A. Manufacturers: One of the following or equal:
  - 1. Galvinox.
  - 2. Galvo-Weld.

#### 2.05 THREAD COATING

- A. Manufacturers: One of the following or equal:
  - 1. Never Seez Compound Corporation, Never-Seez.
  - 2. Oil Research, Inc., WLR No. 111.

#### 2.06 SUPPLEMENTARY PARTS

A. Furnish as required for complete structural steel erection, whether or not such parts and Work are specified or indicated on the Drawings.

#### 2.07 FABRICATION

- A. Shop Assembly:
  - 1. Fabricate structural steel in conformance with AISC "Specification for the Structural Steel Buildings Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.
  - 2. Where anchors, connections, or other details of structural steel are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.
  - 3. For Structural members such as W shapes, S shapes, channels, angles, and similar members not available in quantity, size, and type of stainless steel specified or indicated on the Drawings:
    - a. Fabricate by welding together pieces of low carbon stainless steel plate, such as Type 316L.
    - b. Make full penetration welds between pieces of plate to attain same or higher section modulus and moment of inertia as members indicated on the Drawings.
  - 4. Where galvanizing is required, hot-dip galvanize structural steel after fabrication in accordance with ASTM A 123:
    - a. Do not electro-galvanize or mechanically-galvanize unless specified or accepted by ENGINEER.

- b. Restraighten galvanized items that bend or twist during galvanizing.
- 5. Round off sharp and hazardous projections and grind smooth.
- 6. Take measurements necessary to properly fit work in the field. Take responsibility for and be governed by the measurements and proper working out of all the details.
- 7. Take responsibility for correct fitting of all metal work.

# PART 3 EXECUTION

#### 3.01 EXAMINATION

A. Verification of Conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

#### 3.02 ERECTION

- A. General:
  - 1. Fabricate structural and foundry items to true dimensions without warp or twist.
  - 2. Form welded closures neatly and grind off smooth where weld material interferes with fit or is unsightly.
  - 3. Install structural items accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.
  - 4. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.
  - 5. Place anchor bolts or other anchoring devices accurately and make surfaces that bear against structural items smooth and level.
  - 6. Rigidly support and brace structural items needing special alignment to preserve straight, level, even, and smooth lines. Keep structural items braced until concrete, grout, or dry pack mortar has hardened for 48 hours minimum.
  - 7. Erect structural steel in conformance with AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.
  - 8. Where anchors, connections, and other details of structural steel erection are not specifically indicated on the Drawings or specified, form, locate, and attach with equivalent in quality and workmanship to items specified.
  - 9. Round off sharp or hazardous projections and grind smooth.
- B. Welding General:
  - 1. Make welds full penetration type, unless otherwise indicated on the Drawings.
  - 2. Remove backing bars and weld tabs after completion of weld. Repair defective welds observed after removal of backing bars and weld tabs.
- C. Welding Stainless Steel:
  - 1. General: Comply with AWS D1.1.
    - a. Perform with electrodes and techniques in accordance with AWS D10.4.
- D. Welding Carbon Steel:
  - 1. General: Comply with AWS D1.1:

- a. Weld ASTM A 36 and A 992 structural steel, ASTM A 500 and A 501 structural tubing, and ASTM A 53 pipe with electrodes conforming to AWS A5.1, using E70XX electrodes; AWS A5.17, using F7X-EXXX electrodes; or AWS A5.20, using E7XT-X electrodes:
  - 1) Field repair cut or otherwise damaged galvanized surfaces to equivalent original condition using a galvanized surface repair.
- E. Interface With Other Products:
  - 1. Where steel fasteners come in contact with aluminum or other dissimilar metals, bolt with stainless steel bolts and separate or isolate from dissimilar metals with isolating sleeves and washers:
    - a. Prior to installing nuts, coat threads of stainless-steel fasteners with thread coating to prevent galling of threads.
- F. Fasteners:
  - 1. General:
    - a. Install bolts, including anchor bolts and concrete anchors, to project 2 threads minimum, but 1/2 inch maximum beyond nut.
    - b. Unless otherwise specified, tighten bolts, including anchor bolts and concrete anchors, to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
  - 2. Anchor Bolts:
    - a. Cast-in-place when concrete is placed.
    - b. Accurately locate anchor bolts embedded in concrete with bolts perpendicular to surface from which they project.
    - c. Do not allow anchor bolts to touch reinforcing steel.
    - d. Where anchor bolts are within 1/4 inch of reinforcing steel, isolate with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
    - e. In anchoring machinery bases subject to heavy vibration, use 2 nuts, with 1 serving as a locknut.
    - f. Where bolts are indicated on the Drawings for future use, first coat thoroughly with nonoxidizing wax, then turn nuts down full depth of thread and neatly wrap exposed thread with waterproof polyvinyl tape.
    - g. Furnish anchor bolts with standard hex bolt head or an equivalent head acceptable to ENGINEER unless otherwise indicated on the Drawings. "L" or "J" anchor bolts are not equivalent to an anchor bolt with a hex bolt head.
    - h. Minimum Anchor Bolt Embedment: 10-bolt diameters, unless longer embedment is indicated on the Drawings.
    - i. Where indicated on the Drawings, set anchor bolts in metal sleeves having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long. Fill sleeves with grout when a machine or other equipment is grouted in place.
    - j. Anchor bolts may be cast in concrete in lieu of using concrete anchors.
  - 3. Concrete Anchors:
    - a. Do not use concrete anchors in lieu of anchor bolts.
    - b. Accurately locate concrete anchors and set perpendicular to surfaces from which they project.

c. Minimum Embedment Lengths:

Diameter Inches	Embedment Length Inches
1/4	2
3/8	2-1/2
1/2	4-1/8
5/8	4-1/2
3/4	6-1/2

- d. Drilling Holes:
  - 1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
  - 2) Determine location of reinforcing bars, or other obstructions with a nondestructive indicator device.
  - 3) Remove dust and debris from hole using compressed air.
- e. Hole Drilling Equipment:
  - 1) Electric or pneumatic rotary type with light or medium impact.
  - 2) Drill Bits: Carbide-tipped in accordance with ANSI B212-15.
  - 3) Hollow drills with flushing air systems are preferred.
  - 4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
- 4. Deformed Bar Anchors:
  - a. Butt weld with automatic stud welding gun as recommended by manufacturer.
  - b. Ensure butt weld develops full strength of the anchor.
- 5. High Strength Bolts:
  - a. Consider connections with high strength bolts to be pretensioned type connections, unless otherwise indicated on the Drawings.
  - b. Connections with high strength bolts shall conform to AISC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
  - c. Furnish Hardened Flat Washer:
    - 1) Under element, nut, or bolt head, turned in tightening.
    - 2) On outer plies for short slotted holes.
- 6. Powder Actuated Fasteners: Use powder actuated fasteners only for applications indicated on the Drawings or specified.
- 7. Sleeve Anchors:
  - a. Do not use sleeve anchors in lieu of anchor bolts.
  - b. The sleeve anchor bolt shall be removable, and the expansion sleeve shall be flush with the concrete surface when installed.
  - c. Accurately locate sleeve anchors and set perpendicular to surfaces from which they project.
  - d. Minimum Embedment Lengths:

Diameter Inches	Embedment Length Inches
1/4	1-3/4
3/8	2-1/2
1/2	3-1/2
5/8	4
3/4	4-1/2

- e. Drilling Holes:
  - 1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
  - 2) Determine location of reinforcing bars, or other obstructions with a nondestructive indicator device.
  - 3) Remove dust and debris from hole using compressed air.
- f. Hole Drilling Equipment:
  - 1) Electric or pneumatic rotary type with light or medium impact.
  - 2) Drill Bits: Carbide-tipped in accordance with ANSI B212-15.
  - 3) Hollow drills with flushing air systems are preferred.
  - 4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
- 8. Welded Studs:
  - a. Butt weld with automatic stud welding gun as recommended by the manufacturer.
  - b. Ensure butt weld develops full strength of the stud.

### END OF SECTION

# SECTION 09960A

# HIGH-PERFORMANCE COATINGS: VOC LIMIT 250 GRAMS PER LITER

# PART 1 GENERAL

## 1.01 SUMMARY

- A. Section includes: Field applied coatings.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Division 1 General Conditions.
    - b. Section 15075 Equipment Identification.
    - c. Division 16 Electrical.

# 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. D 16 Standard Terminology for Paint, Related Coatings, Materials, and Applications.
  - 2. D 4541 Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
- B. NACE International (NACE):
  - 1. SP0178 Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
  - 2. SP0188-06 Discontinuity (Holiday) Testing of Protective Coatings.
- C. National Association of Pipe Fabricators (NAPF):
  - 1. 500-03 Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
- D. NSF International (NSF):
  - 1. 61 Drinking Water System Components Health Effects.
- E. Society for Protective Coatings (SSPC):
  - 1. SP COM Surface Preparation Commentary for Steel and Concrete Substrates.

- 2. SP-1 Solvent Cleaning.
- 3. SP-2 Hand Tool Cleaning.
- 4. SP-3 Power Tool Cleaning.
- 5. SP-5 White Metal Blast Cleaning.
- 6. SP-6 Commercial Blast Cleaning.
- 7. SP-7 Brush-Off Blast Cleaning.
- 8. SP-10 Near-White Blast Cleaning.
- F. U.S. Environment Protection Agency (EPA):
  - 1. Method 24 Surface Coatings.
- 1.03 DEFINITIONS
  - A. Submerged metal: Steel or iron surfaces below tops of channel or structure walls which will contain water even when above expected water level.
  - B. Submerged concrete and masonry surfaces: Surfaces which are or will be:
    - 1. Underwater.
    - 2. In structures which normally contain water.
    - 3. Below tops of walls of water containing structures.
  - C. Exposed surface: Any metal or concrete surface, indoors or outdoors that is exposed to view.
  - D. Dry film thickness (DFT): Thickness of fully cured coating, measured in mils.
  - E. Volatile organic compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon, as determined by EPA Method 24.
  - F. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
  - G. Where SSPC surface preparation standards are specified or implied for ductile iron pipe or fittings, the equivalent NAPF surface preparation standard shall be substituted for the SSPC standard.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Coating materials shall be especially adapted for use in water treat pump stations.
- B. Coating materials used in contact with potable water supply systems shall be certified to NSF 61.
- 1.05 SUBMITTALS
  - A. General: Submit in accordance with Division 1 General Conditions.
  - B. Shop drawings:
    - 1. Schedule of proposed coating materials.
    - 2. Schedule of surfaces to be coated with each coating material.

- C. Product Data: Include description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips:
  - 1. Regulatory requirements: Submit data concerning the following:
    - a. Volatile organic compound limitations.
    - b. Coatings containing lead compounds and PCBs.
    - c. Abrasives and abrasive blast cleaning techniques, and disposal.
    - d. NSF certification of coatings for use in potable water supply systems.
- D. Samples: Include 8-inch square drawdowns or brush-outs of topcoat finish when requested. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.
- E. Certificates: Submit in accordance with requirements for Product Data.
- F. Manufacturer's Instructions: Include the following:
  - 1. Special requirements for transportation and storage.
  - 2. Mixing instructions.
  - 3. Shelf life.
  - 4. Pot life of material.
  - 5. Precautions for applications free of defects.
  - 6. Surface preparation.
  - 7. Method of application.
  - 8. Recommended number of coats.
  - 9. Recommended dry film thickness (DFT) of each coat.
  - 10. Recommended total dry film thickness (DFT).
  - 11. Drying time of each coat, including prime coat.
  - 12. Required prime coat.
  - 13. Compatible and non-compatible prime coats.
  - 14. Recommended thinners, when recommended.
  - 15. Limits of ambient conditions during and after application.
  - 16. Time allowed between coats (minimum and maximum).
  - 17. Required protection from sun, wind, and other conditions.
  - 18. Touch-up requirements and limitations.
  - 19. Minimum adhesion of each system submitted in accordance with ASTM D 4541.
- G. Manufacturer's Representative's Field Reports.
- H. Operations and Maintenance Data: Submit as specified in Division 1 General Conditions.
  - 1. Reports on visits to project site to view and approve surface preparation of structures to be coated.
  - 2. Reports on visits to project site to observe and approve coating application procedures.
  - 3. Reports on visits to coating plants to observe and approve surface preparation and coating application on items that are "shop coated."
- I. Quality Assurance Submittals:
  - 1. Quality Assurance plan.

- 2. Qualifications of coating applicator including List of Similar Projects.
- J. California certifications:
  - 1. Submit notarized certificate that:
    - a. All paints and coatings to be used on this project comply with the State of California Air Resources Board Rule 1113 VOC Regulations effective as of January 1, 2004; and that
    - b. All paints and coatings to be used on this project comply with the VOC regulations of the State of California Air Management District in which the coatings will be used, effective January 1, 2004.

#### 1.06 QUALITY ASSURANCE

- A. Applicator qualifications:
  - 1. Minimum of 5 years' experience applying specified type or types of coatings under conditions similar to those of the Work:
    - a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 2 years.
  - 2. Manufacturer approved applicator when manufacturer has approved applicator program.
- B. Regulatory requirements: Comply with governing agencies regulations by using coatings that do not exceed permissible volatile organic compound limits and do not contain lead:
  - 1. Do not use coal tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
- C. Field samples: Prepare and coat a minimum 10 square foot area between corners or limits such as control or construction joints of each system. Approved field sample may be part of Work.
- D. Pre-installation conference: Conduct as specified in Division 1 General Conditions.
- E. Compatibility of coatings: Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.
- F. Services of coating manufacturer's representative: Arrange for coating manufacturer's representative to attend pre-installation conferences. Make periodic visits to the project site to provide consultation and inspection services during surface preparation and application of coatings, and to make visits to coating plants to observe and approve surface preparation procedures and coating application of items to be "shop primed and coated."

### 1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products as specified in Division 1 General Conditions.
- B. Remove unspecified and unapproved paints from Project site immediately.

- C. Deliver new unopened containers with labels identifying the manufacturer's name, brand name, product type, batch number, date of manufacturer, expiration date or shelf life, color, and mixing and reducing instructions.
  - 1. Do not deliver materials aged more than 12 months from manufacturing date.
- D. Store coatings in well-ventilated facility that provides protection from the sun weather, and fire hazards. Maintain ambient storage temperature between 45 and 90 degrees Fahrenheit, unless otherwise recommended by the manufacturer.
- E. Take precautions to prevent fire and spontaneous combustion.

## 1.08 PROJECT CONDITIONS

- A. Surface moisture contents: Do not coat surfaces that exceed manufacturer specified moisture contents, or when not specified by the manufacturer, the following moisture contents:
  - 1. Plaster and gypsum wallboard: 12 percent.
  - 2. Masonry, concrete, and concrete block: 12 percent.
  - 3. Interior located wood: 15 percent.
  - 4. Concrete floors: 7 percent.
- B. Do not apply coatings:
  - 1. Under dusty conditions or adverse environmental conditions, unless tenting, covers, or other such protection is provided for structures to be coated.
  - 2. When light on surfaces measures less than 15 foot-candles.
  - 3. When ambient or surface temperature is less than 55 degrees Fahrenheit unless manufacturer allows a lower temperature.
  - 4. When relative humidity is higher than 85 percent.
  - 5. When surface temperature is less than 5 degrees Fahrenheit above dew point.
  - 6. When surface temperature exceeds the manufacturer's recommendation.
  - 7. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
  - 8. Apply clear finishes at minimum 65 degrees Fahrenheit.
- C. Provide fans, heating devices, dehumidifiers, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 55 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.

### 1.09 SEQUENCING AND SCHEDULING

A. Sequence and Schedule: As specified in Division 1 General Conditions.

#### 1.10 MAINTENANCE

- A. Extra materials: Deliver as specified in Division 1 General Conditions. Include minimum 1 gallon of each type and color of coating applied:
  - 1. When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory.
  - 2. When manufacturer does not package material in gallon cans, deliver material in new gallon containers, properly sealed and identified with typed labels indicating brand, type, and color.

## PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Special coatings: One of the following or equal:
  - 1. Carboline: Carboline, St. Louis, MO.
  - 2. Ceilcote: Ceilcote Corrosion Control, Berea, OH.
  - 3. Dampney: The Dampney Company, Everett, MA.
  - 4. Devoe: ICI Devoe Coatings, Louisville, KY.
  - 5. Dudick: Dudick, Inc., Streetsboro, OH.
  - 6. GET: Global Eco Technologies, Pittsburg, CA.
  - 7. Henkel: Henkel North America, Madison Heights MI.
  - 8. IET: Integrated Environmental Technologies, Santa Barbara, CA.
  - 9. PPG Amercoat: PPG Protective & Marine Coatings, Brea, CA.
  - 10. Sanchem: Sanchem, Chicago, IL.
  - 11. Superior: Superior Environmental Products, Inc., Addison, TX.
  - 12. S-W: Sherwin-Williams Co., Cleveland, OH.
  - 13. Tnemec: Tnemec Co., Kansas City, MO.
  - 14. Wasser: Wasser High Tech Coatings, Kent, WA.

#### 2.02 PREPARATION AND PRETREATMENT MATERIALS

- A. Metal pretreatment: As manufactured by one of the following or equal:
  - 1. Henkel: Galvaprep 5.
  - 2. International: AWLGrip Alumiprep 33.
  - 3. S-W: Macropoxy 646 Fast Cure.
  - 4. Tnemec: Series N69 Hi-Build Epoxoline.
- B. Surface cleaner and degreaser: As manufactured by one of the following or equal:
  - 1. Carboline Surface Cleaner No.3.
  - 2. Devoe: Devprep 88.
  - 3. S-W: Clean and Etch.

## 2.03 COATING MATERIALS

- A. High solids epoxy (self-priming) not less than 72 percent solids by volume: As manufactured by one of the following or equal:
  - 1. Carboline: Carboguard 891.
  - 2. Devoe: Bar Rust 233H.

- 3. PPG Amercoat: Amerlock 2.
- 4. S-W: Macropoxy 646.
- B. Aliphatic or aliphatic-acrylic polyurethane: As manufactured by one of the following or equal:
  - 1. Carboline: Carbothane 134 VOC.
  - 2. Devoe: Devthane 379.
  - 3. PPG Amercoat: Amershield VOC.
  - 4. S-W: High Solids Polyurethane CA.
  - 5. Tnemec: Endura-Shield II Series 1075 (U).
- C. High temperature coating 150 to 350 degrees Fahrenheit: As manufactured by one of the following or equal:
  - 1. Carboline: Thermaline 4900.
  - 2. Dampney: Thermalox 245 Silicone Zinc Dust.
  - 3. PPG Amercoat: Amerlock 2/400 GFK.
- D. High temperature coating 400 to 1,000 degrees Fahrenheit (dry): As manufactured by one of the following or equal:
  - 1. Carboline: Thermaline 4700.
  - 2. Dampney: Thermolox 230C Series Silicone.
  - 3. Devoe: HT-12, High Heat Silicone.
- E. High temperature coating up to 1,400 degrees Fahrenheit: As manufactured by the following or equal:
  - 1. Dampney: Thermalox 240 Silicone Ceramix.
- F. Asphalt varnish: AWWA C 500.
- G. Vinyl ester: Glass mat reinforced, total system 125 mils DFT. As manufactured by one of the following or equal:
  - 1. Carboline: Semstone 870.
  - 2. Dudick: Protecto-Flex 800.
- H. Waterborne acrylic emulsion: As manufactured by one of the following or equal:
  - 1. S-W: DTM Acrylic B66W1.
  - 2. Tnemec: Tneme-Cryl Series 6.

### 2.04 MIXES

A. Mix epoxy parts in accordance with manufacturer's instructions.

# PART 3 EXECUTION

- 3.01 GENERAL PROTECTION
  - A. Protect adjacent surfaces from coatings and damage. Repair damage resulting from inadequate or unsuitable protection:

- B. Protect adjacent surfaces not to be coated from spatter and droppings with drop cloths and other coverings:
  - 1. Mask off surfaces of items not to be coated or remove items from area.
- C. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and in particular, surfaces within storage and preparation area.
- D. Place cotton waste, cloths, and material which may constitute fire hazard in closed metal containers and remove daily from site.
- E. Remove electrical plates, surface hardware, fittings, and fastenings, prior to application of coating operations. Carefully store, clean, and replace on completion of coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

## 3.02 GENERAL PREPARATION

- A. Prepare surfaces in accordance with coating manufacturer's instructions, unless more stringent requirements are specified in this Section.
- B. Protect following surfaces from abrasive blasting by masking, or other means:
  - 1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
  - 2. Machined surfaces for sliding contact.
  - 3. Surfaces to be assembled against gaskets.
  - 4. Surfaces of shafting on which sprockets are to fit.
  - 5. Surfaces of shafting on which bearings are to fit.
  - 6. Machined surfaces of bronze trim, including those slide gates.
  - 7. Cadmium-plated items except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.
  - 8. Galvanized items, unless scheduled to be coated.
- C. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.
- D. Concrete:
  - 1. Allow new concrete to cure for minimum of 28 days before coating.
  - 2. Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Etch or brush off-blast clean in accordance with SSPC SP-7 to provide surface profile equal to 40 to 60-grit sandpaper, or as recommended by coating manufacturer. All concrete surfaces shall be vacuumed clean prior to coating application.
- E. Ferrous metal surfaces:
  - 1. Remove grease and oil in accordance with SSPC SP-1.
  - 2. Remove rust, scale, and welding slag and spatter, and prepare surfaces in accordance with appropriate SSPC standard as specified.
  - 3. Abrasive blast surfaces prior to coating.

- 4. When abrasive blasted surfaces rust or discolor before coating, abrasive blast surfaces again to remove rust and discoloration.
- 5. When metal surfaces are exposed because of coating damage, abrasive blast surfaces and feather into a smooth transition before touching up.
- 6. All abrasive blast cleaned surfaces shall be blown down with clean dry air and or vacuumed.
- F. Ferrous metal surfaces not to be submerged: Abrasive blast in accordance with SSPC SP-10, unless blasting may damage adjacent surfaces, prohibited or specified otherwise. Where not possible to abrasive blast, power tool clean surfaces in accordance with SSPC SP-3.
- G. Ferrous metal surfaces to be submerged: Unless specified otherwise, abrasive blast in accordance with SSPC SP-5 to clean and provide roughened surface profile of not less than 2 mils and not more than 4 mils in depth when measured with Elcometer 123, or as recommended by the coating manufacturer.
- H. Ductile iron pipe and fittings to be lined or coated: Abrasive blast clean in accordance with NAPF 500-03.
- I. Sherardized, aluminum, copper, and bronze surfaces: Prepare in accordance with coating manufacturer's instructions.
- J. Galvanized surface:
  - 1. Degrease or solvent clean (SSPC SP-1) to remove oily residue.
  - 2. Power tool or hand tool clean or whip abrasive blast.
  - 3. Test surface for contaminants using copper sulfate solution.
  - 4. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded physically, such as bolts, nuts, or preformed channels.
- K. Shop primed metal:
  - 1. Certify that primers applied to metal surfaces in the shop are compatible with coatings to be applied over such primers in the field.
  - 2. Remove shop primer from metal to be submerged by abrasive blasting in accordance with SSPC SP-10, unless greater degree of surface preparation is required by coating manufacturer's representative.
  - 3. Correct abraded, scratched, or otherwise damaged areas of prime coat by sanding or abrasive blasting to bare metal in accordance with SSPC SP-2, SP 3, or SP-6, as directed by the ENGINEER.
  - 4. When entire shop priming fails or has weathered excessively (more than 25 percent of the item), or when recommended by coating manufacturer's representative, abrasive blast shop prime coat to remove entire coat and prepare surface in accordance with SSPC SP-10.
  - 5. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting in accordance with SSPC SP-10.
  - 6. When prime coat not authorized by ENGINEER is applied, remove unauthorized prime coat by abrasive blasting in accordance with SSPC SP-10.

- 7. Shop applied bituminous paint or asphalt varnish: Abrasive blast clean shop applied bituminous paint or asphalt varnish from surfaces scheduled to receive non-bituminous coatings.
- L. Abrasive blast cadmium-plated, zinc-plated, or sherardized fasteners in same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.
- M. Abrasive blast components to be attached to surfaces which cannot be abrasive blasted before components are attached.
- N. Grind sharp edges to approximately 1/16-inch radius before abrasive blast cleaning.
- O. Remove and grind smooth all excessive weld material and weld spatter before blast cleaning in accordance with NACE SP0178.
- P. PVC and FRP Surfaces:
  - 1. Prepare surfaces to be coated by light sanding (de-gloss) and wipe-down with clean cloths, or by solvent cleaning in strict accordance with coating manufacturer's instructions.
- Q. Cleaning of previously coated surfaces:
  - 1. Utilize cleaning agent to remove soluble salts such as chlorides and sulfates from concrete and metal surfaces:
    - a. Cleaning agent: Biodegradable non-flammable and containing no volatile organic compounds.
    - b. Manufacturer: The following or equal:
      - 1) Chlor-Rid International, Inc.
  - 2. Steam clean and degrease surfaces to be coated to remove oils and grease.
  - 3. Cleaning of surfaces utilizing the decontamination cleaning agent may be accomplished in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing as approved by the coating manufacturer's representative and the ENGINEER.
  - 4. Test cleaned surfaces in accordance with the cleaning agent manufacturer's instructions to ensure all soluble salts have been removed. Additional cleaning shall be carried out as necessary.
  - 5. Final surface preparation prior to application of new coating system shall be made in strict accordance with coating manufacturer's printed instructions.

### 3.03 MECHANICAL AND ELECTRICAL EQUIPMENT PREPARATION

- A. Identify equipment, ducting, piping, and conduit as specified in Section 15075 Equipment Identification and Division 16 Electrical.
- B. Remove grilles, covers, and access panels for mechanical and electrical system from location and coat separately.
- C. Prepare and finish coat-primed equipment with color selected by the ENGINEER.

- D. Prepare and prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
- F. Prepare and coat interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
- G. Prepare and coat dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
- H. Prepare and coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
- I. Prepare and coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- J. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming and numbering, in accordance with Contract Documents.

### 3.04 GENERAL APPLICATION REQUIREMENTS

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Coat metal unless specified otherwise:
  - 1. Aboveground piping to be coated shall be empty of contents during application of coatings.
- C. Verify metal surface preparation immediately before applying coating in accordance with SSPC SP COM.
- D. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
- E. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
- F. Prime shop primed metal surfaces. Spot prime exposed metal of shop primed surfaces before applying primer over entire surface.
- G. Apply minimum number of specified coats.
- H. Apply coats to thicknesses specified, especially at edges and corners.
- I. Apply additional coats when necessary to achieve specified thicknesses.

- J. Coat surfaces without drops, overspray, dry spray, runs, ridges, waves, holidays, laps, or brush marks.
- K. Remove spatter and droppings after completion of coating.
- L. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.
- M. Dust coatings between coats. Lightly sand and dust surfaces to receive high gloss finishes, unless instructed otherwise by coating manufacturer.
- N. Apply coating by brush, roller, trowel, or spray, unless particular method of application is required by coating manufacturer's instructions or these Specifications.
- O. Plural component application: Drums shall be premixed each day. All gauges shall be working order prior to the start of application. Ratio checks shall be completed prior to each application. A spray sample shall be sprayed on plastic sheeting to ensure set time is complete prior to each application. Hardness testing shall be preformed after each application.
- P. Spray application:
  - 1. Stripe coat edges, welds, nuts, bolts, difficult to reach areas by brush before beginning spray application, as necessary, to ensure specified coating thickness along edges.
  - 2. When using spray application, apply coating to thickness not greater than that recommended in coating manufacturer's instructions for spray application.
  - 3. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these Specifications.
  - 4. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
- Q. Drying and recoating:
  - 1. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
  - 2. Limit drying time to that required by these Specifications or coating manufacturer's instructions.
  - 3. Do not allow excessive drying time or exposure which may impair bond between coats.
  - 4. Recoat epoxies within time limits recommended by coating manufacturer.
  - 5. When time limits are exceeded, abrasive blast clean and de-gloss clean prior to applying another coat.
  - 6. When limitation on time between abrasive blasting and coating cannot be met before attachment of components to surfaces which cannot be abrasive blasted, coat components before attachment.
  - 7. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.
  - 8. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.

- 9. Leave no holidays.
- 10. Sand and feather into a smooth transition and recoat and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to naked eye.
- R. Concrete:
  - 1. Apply first coat (primer) only when surface temperature of concrete is decreasing in order to eliminate effects of off-gassing on coating.

#### 3.05 HIGH SOLIDS EPOXY SYSTEM

#### A. Preparation:

- 1. Prepare surfaces in accordance with general preparation requirements and as follows:
  - a. Abrasive blast ferrous metal surfaces to be submerged at jobsite in accordance with SSPC SP-5 prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP-10.
  - b. Abrasive blast non-submerged ferrous metal surfaces at jobsite in accordance with SSPC SP-10, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP 6.
  - c. Abrasive blast clean ductile iron surfaces at jobsite in accordance with SSPC SP-7.

#### B. Application:

- 1. Apply coatings in accordance with general application requirements and as follows:
  - a. Apply minimum 2-coat system with minimum total dry film thickness (DFT) of 12 mils.
  - b. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating in accordance with manufacturer's instructions.
  - c. Coat metal to be submerged before installation, when necessary, to obtain acceptable finish and to prevent damage to other surfaces.
  - d. Coat entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.
  - e. Coat surface of items to be exposed and adjacent 1 inch to be concealed when embedded in concrete or masonry.

## 3.06 HIGH SOLIDS EPOXY AND POLYURETHANE COATING SYSTEM

- A. Preparation:
  - 1. Prepare surfaces in accordance with general preparation requirements and as follows:
    - a. Prepare concrete surfaces in accordance with general preparation requirements.
    - b. Touch up shop primed steel and miscellaneous iron.
    - c. Abrasive blast ferrous metal surfaces at jobsite in accordance with SSPC SP 6, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP 6.

- d. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.
- e. Lightly sand (de-gloss) fiberglass and poly vinyl chloride (PVC) pipe to be coated and wipe clean with dry cloths, or solvent clean in accordance with coating manufacturer's instructions.
- f. Abrasive blast clean ductile iron surfaces.
- B. Application:
  - 1. Apply coatings in accordance with general application requirements and as follows:
    - a. Apply 3 coat system consisting of:
      - 1) Primer: 4 to 5 mils dry film thickness high solids epoxy.
      - 2) Intermediate coat: 4 to 5 mils dry film thickness high solids epoxy.
      - 3) Topcoat: 2.5 to 3.5 mils dry film thickness aliphatic or aliphatic-acrylic polyurethane topcoat.
  - 2. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating in accordance with manufacturer's instructions.

# 3.07 HIGH TEMPERATURE COATING

- A. Preparation:
  - 1. Prepare surfaces in accordance with general preparation requirements and as follows:
    - a. Abrasive blast surface in accordance with SSPC SP-10.
- B. Application:
  - 1. Apply coatings in accordance with general application requirements and as follows:
    - a. Apply number of coats in accordance with manufacturer's instructions.

# 3.08 VINYL ESTER

- A. Preparation:
  - 1. Prepare surfaces in accordance with coating manufacturer's recommendations and as directed and approved by coating manufacturer's representative.
- B. Application:
  - 1. Apply prime coat, as required by coating manufacturer, base coat, glass mat, and topcoat to total dry film thickness of 125 mils minimum:
    - a. Final topcoat on floors shall include non-skid surface, applied in accordance with manufacturer's instructions.
  - 2. Perform high voltage holiday detection test in accordance with SP0188-06, over 100 percent of coated surface areas to ensure pinhole free finished coating system.
  - 3. All work shall be accomplished in strict accordance with coating manufacturer's instructions and under direction of coating manufacturer's representative.

## 3.09 WATERBORNE ACRYLIC EMULSION

## A. Preparation:

- 1. Remove all oil, grease, dirt, and other foreign material by Solvent Cleaning in accordance with SSPC SP-1.
- 2. Lightly sand all surfaces and wipe thoroughly with clean cotton cloths before applying coating.

## B. Application:

1. Apply 2 or more coats to obtain a minimum dry film thickness (DFT) of 5.0 mils.

## 3.10 FIELD QUALITY CONTROL

- A. Each coat will be inspected. Strip and remove defective coats, prepare surfaces and recoat. When approved, apply next coat.
- B. Control and check dry film thicknesses and integrity of coatings.
- C. Measure dry film thickness with calibrated thickness gauge.
- D. Dry film thicknesses on ferrous-based substrates may be checked with Elcometer Type 1 Magnetic Pull-Off Gage or Positector 6000.
- E. Verify coat integrity with low-voltage holiday detector, in accordance with SP0188 06. Allow ENGINEER to use detector for additional checking.
- F. Check wet film thickness before coal tar epoxy coating cures on concrete or nonferrous metal substrates.
- G. Arrange for services of coating manufacturer's field representative to provide periodic field consultation and inspection services to ensure proper surface preparation of facilities and items to be coated, and to ensure proper application and curing:
  - 1. Notify ENGINEER 24 hours in advance of each visit by coating manufacturer's representative.
  - 2. Provide ENGINEER with a written report by coating manufacturer's representative within 48 hours following each visit.

# 3.11 SCHEDULE OF ITEMS NOT REQUIRING COATING

- A. General: Unless specified otherwise, the following items do not require coating:
  - 1. Items that have received final coat at factory and not listed to receive coating in field.
  - 2. Aluminum, brass, bronze, copper, plastic (except PVC pipe), rubber, stainless steel, chrome, Everdur, or lead.
  - 3. Buried or encased piping or conduit.
  - 4. Exterior concrete.
  - 5. Galvanized steel wall framing, galvanized electrical conduits, galvanized pipe trays, galvanized cable trays, and other galvanized items:

- a. Areas on galvanized items or parts where galvanizing has been damaged during handling or construction shall be repaired as follows:
  - 1) Clean damaged areas by SSPC SP-1, SP-2, SP-3, or SP-7 as required.
  - 2) Apply 2 coats of a cold galvanizing zinc compound such as ZRC World Wide Inovatie Zinc Technologies of Mansfield, MA or accepted equal, in strict accordance with manufacturer's instructions.
- 6. Grease fittings.
- 7. Fiberglass ducting or tanks in concealed locations.
- 8. Steel to be encased in concrete or masonry.

### 3.12 SCHEDULE OF SURFACES TO BE COATED IN THE FIELD

- A. In general, apply coatings to steel, iron, galvanized surfaces, and wood surfaces unless specified or otherwise indicated on the Drawings. Coat concrete surfaces and anodized aluminum only when specified or indicated on the Drawings. Color coat all piping as specified in Section 15075 Equipment Identification.
- B. Following schedule is incomplete. Coat unlisted surfaces with same coating system as similar listed surfaces. Verify questionable surfaces.
- C. Concrete:
  - 1. High solids epoxy:
    - a. Safety markings.
  - 2. Vinyl ester:
    - a. Secondary containment: All concrete surfaces inside chemical containment areas including inside wall surfaces, top of wall surfaces, sump area, tank fill area, including equipment pads, and tank pads. See Drawings for area to be coated in Hypochlorite Room.
    - b. Suitable for 72 hours submerged in:
      - 1) 12 percent to 15 percent sodium hypochlorite.
    - c. Concrete floor surfaces in chemical containment areas shall have a non-skid surface.

### D. Metals:

- 1. High solids epoxy and polyurethane system: Interior and exterior non-immersed ferrous metal surfaces including:
  - a. Doors, doorframes, ventilators, louvers, grilles, exposed sheet metal, and flashing.
  - b. Pipe, valves, pipe hangers, supports and saddles, conduit, cable tray hangers, and supports.
  - c. Motors and motor accessory equipment.
  - d. Drive gear, drive housing, coupling housings, and miscellaneous gear drive equipment.
  - e. Valve and gate operators and stands.
  - f. Structural steel including galvanized structural steel.
    - 1) Exposed metal decking.
  - g. Crane and hoist rails.
  - h. Mechanical equipment supports, drive units, and accessories.
  - i. Pumps not submerged.

- j. Other miscellaneous metals.
- 2. High solids epoxy system:
  - a. Field priming of ferrous metal surfaces with defective shop prime coat where no other prime coat is specified, for non-submerged service.
  - b. Bell rings, underside of manhole covers and frames.
  - c. Sump pumps, including underside of base plates and submerged suction and discharge piping.
  - d. Stem guides.
  - e. Other submerged iron and steel metal unless specified otherwise.
  - f. Interior surface of suction inlet and volute of submersible influent pumps. Apply coating prior to pump testing.
- 3. High temperature coating 400 to 1,000 degrees Fahrenheit:
  - a. Generator Exhaust.
- E. Fiberglass and PVC pipe surfaces:
  - 1. Waterborne acrylic emulsion.
  - 2. Exterior of fiberglass ducting and fan housings.
  - 3. Fiberglass expose to sunlight.
  - 4. PVC piping exposed to view.
  - 5. ABS piping as determined by ENGINEER.

END OF SECTION

# SECTION 14655

## PORTABLE DAVIT CRANE WITH HAND OR ELECTRIC WINCH FIRST MATE 500 (5PF5 SERIES) OR SIMILAR

#### PART 1 GENERAL

- 1.01 TECHNICAL SPECIFICATIONS
  - A. Manufacturer: Thern, First Mate 500 5PF5 Series
  - B. Lift Capacity: 500 to 850 lb (226 to 385 kg)
  - C. Hook Reach: 24 to 42 inches (609 to 1066 mm)
  - D. Hook Height: 70 inches maximum (1778 mm)

#### 1.02 FUNCTIONALITY

- A. Lift Capacity: davit crane shall have a variable lift capacity based on boom position, to vary between 850 pounds (385 kg) lift capacity with the boom positioned at 50 degrees from horizontal, and 500 pounds (226 kg) with the boom in the horizontal position.
- B. Hook Reach: boom shall be adjustable to 3 different positions with a minimum hook reach of 24 inches (609 mm) in the shortest position when the boom is 50 degrees from horizontal and a maximum hook reach of 42 inches (1066 mm) with the boom in the horizontal position, measured from mast center to hook center.
- C. Hook Height: hook height shall be adjustable by moving the boom up or down between horizontal and 50 degrees from horizontal, with a minimum of 30 inches (762 mm) between the lowest position and the highest position.
- D. Boom Angle: boom angle shall be adjustable with 3 different pin positions, allowing the boom to be positioned between horizontal and 50 degrees from horizontal.
- E. Boom Sheave: wire rope shall pass over a sheave at the end of the boom. Sheave shall have a bearing, and shall be supported by a machined clevis pin which shall be keyed to the boom to keep the pin from rotating.
- F. Rotation: mast and boom shall rotate 360 degrees in the base on a Nylatron bushing in the bottom of the mast, with a rotational handle attached to the mast to facilitate rotation. Crane shall include a Nylatron bearing sleeve to support the mast at the top of the base.

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- G. Fastening Pins: crane components shall be fastened together using stainless steel clevis style pins, secured with lynch pins with lanyards fastening the lynch pins to primary structural components.
- H. Portability: davit crane shall break down into portable components with no single component weighing more than 30 pounds (14 kg). Carrying handle shall be welded to the mast.
- I. Winch Location: lifting winches shall be located such that the center point of the drive shaft is behind the centerline of the mast.
- J. Winch Mounting Bracket: crane shall be equipped with a winch mounting bracket that connects to the crane with a pin allowing the winch with bracket to be attached or removed without tools. Winch shall attach to the bracket using standard fasteners.
- K. Identification: davit crane shall be labeled with a non-corrosive metal identification plate labeled or imprinted with the manufacturer's name, model number and serial number.
- L. Design Factor: yield design factor shall be a minimum of 1.5 under static conditions for all crane components including winch and base. Breaking strength safety factor shall be a minimum of 2.5 under static conditions.

## PART 2 MATERIALS

## 2.01 SCOPE OF SUPPLY

- A. Crane: First Mate 500, 5PF5 Series Portable Davit Crane.
- B. Winch: winch shall have a quick-disconnect cable anchor, and a positive load holding mechanical brake able to stop and hold the load automatically when operation is halted. M4022PB-K zinc plated spur gear hand winch, M4042PBSS-K stainless steel spur gear hand winch, 4WM2-K worm gear hand winch (drill drivable), or 4WP2-K electric winch, or 4777-K electric winch.
- C. Base: 5BP5 Pedestal Base, 5BF5 Flush Mount Base, or 5BW5 Wall Mount Base.
- D. Material and Finish for Crane and Base: steel meeting ASTM standards. Finish powder coated, hot-dipped galvanized, AISI 304/304L stainless steel, AISI 316/316L stainless steel, or 3-part epoxy.
- E. Wire Rope: wire rope assembly including swivel hook with latch. 3/16 inch and 1/4 inch diameter wire ropes include quick-disconnect swaged ball fitting. Wire rope construction shall be 7x19 galvanized aircraft cable, 7x19 type 304 stainless steel cable, or 7x19 type 316 stainless steel cable.

## 2.02 ACCESSORIES

A. Base Extension: to extend mast to provide additional 15 inch (380 mm) hook height and maintain lift capacity.

- B. Positional Lock: to provide multi-position lock to keep crane from rotating.
- C. Drill Motor: heavy duty drill kit, 400 rpm maximum, to drive worm gear hand winch.
- D. Headache Ball: to apply tension to wire rope when crane is not under load.
- E. Cable Spool: used with quick-disconnect feature. This is best used when a no-slack condition is required for the application. The cable spool is provided with a spring load ratchet pawl, this allows the wire rope to be held on the cable spool which prevents wire rope slack. Available finish 316 stainless steel.
- F. Wire Rope Keeper: used with quick-disconnect feature. The swaged ball fitting on the wire rope (the end that attaches to the drum of the winch) can be inserted into the slot on the wire rope keeper to allow the wire rope to remain attached to the load when the crane is moved to another base location.
- G. Limit Switch: upper travel limit switch kit to be used with -KL series electric winches.

END OF SECTION

# **SECTION 15061**

# PIPE SUPPORTS

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes: Supports for pipe, fittings, valves, and appurtenances.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Division 1 General Conditions.

## 1.02 REFERENCES

- A. ASTM International (ASTM):
  - 1. A 380 Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
  - 2. A 967 Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.
- B. Manufacturer's Standardization Society (MSS):
  - 1. SP-58 Pipe Hangers and Supports Materials, Design, and Manufacture.
  - 2. SP-69 Pipe Hangers and Supports Selection and Application.

#### 1.03 SUBMITTALS

A. Shop drawings: Include schedule, indicating where supports will be installed, and drawings of pipe support system components.

### PART 2 PRODUCTS

- 2.01 PIPE SUPPORTS
  - A. Standard U-bolt: MSS SP-69, Type 24:
    - 1. Manufacturers: One of the following or equal:
      - a. For stainless steel piping:

- 1) Nibco-Tolco, Figure 110.
- 2) Cooper B-Line Systems, Inc., Figure B3188.
- 3) FM Stainless Fasteners, Figure 37.
- b. For all other piping, unless indicated on the Drawings:
  - 1) Anvil International, Figure 137.
  - 2) Bergen-Power, Figure 283.
  - 3) Cooper B-Line Systems, Inc., Figure B3188.
- B. Pipe clamps: MSS SP-69, Type 4:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 4.
      - 2) Cooper B-Line Systems, Inc., Figure 3140.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 212.
      - 2) Bergen-Power, Figure 175.
      - 3) Cooper B-Line Systems, Inc., Figure B3140.
- C. Adjustable offset pipe clamp:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 4.
      - 2) Cooper B-Line Systems, Inc., Figure B3149.
      - 3) FM Stainless Fasteners, Figure 63.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 100.
      - 2) Cooper B-Line Systems, Inc., Figure B3149.
- D. Offset pipe clamp:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 8.
      - 2) Cooper B-Line Systems, Inc., Figure 3148.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 103.
      - 2) Cooper B-Line Systems, Inc., Figure B3148.
- E. Floor stand or stanchion saddles: MSS SP-69, Type 37. Provided with U-bolt hold down yokes:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 318.
      - 2) FM Stainless Fasteners, Figure 59.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 259.
      - 2) Bergen-Power, Figure 125.
      - 3) Cooper B-Line Systems, Inc., Figure B3090.
- F. Spring hangers:

- 1. Manufacturers: One of the following or equal:
  - a. For stainless steel piping:
    - 1) Bergen-Power, Figure 920.
  - b. For all other piping, unless indicated on the Drawings:
    - 1) Anvil International, Figure B-268, Type G.
    - 2) Bergen-Power, Figure 920.
- G. Welded beam attachment: MSS SP-69, Type 22:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 304.
      - 2) Cooper B-Line Systems, Inc., Figure 3083.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 66.
      - 2) Bergen-Power, Figure 113A or 113B.
      - 3) Cooper B-Line Systems, Inc., Figure B3083.
- H. Heavy pipe clamp: MSS SP-69, Type 4:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 4H.
    - b. For all other piping, unless called out otherwise on the Drawings:
      - 1) Anvil International, Figure 216.
      - 2) Bergen-Power, Figure 298.
- I. PTFE pipe slide assembly: MSS SP-58, Type 35 with lateral and vertical restraint:
  - 1. Manufacturers: One of the following or equal:
    - a. For stainless steel piping:
      - 1) Nibco-Tolco, Figure 426.
    - b. For all other piping, unless indicated on the Drawings:
      - 1) Anvil International, Figure 257, Type 3.
      - 2) Cooper B-Line Systems, Inc., Figure B3893.
- J. Anchor bolts, concrete anchors, concrete inserts, powder-actuated fasteners, and sleeve anchors: As specified in Section 05120 Structural Steel.

### 2.02 MATERIALS

- A. Pipe supports:
  - 1. Stainless steel (Type 304 or 316):
    - a. Use in the following applications:
      - 1) All submerged locations, above water level but below top of wall inside water bearing structures;
      - 2) Support for stainless steel piping systems;
      - 3) Where specifically indicated on the Drawings.
    - b. Field welding and fabrication of supports is prohibited.
    - c. Shop-fabricated supports:
      - 1) Finish requirements: Remove free iron, heat tint oxides, weld scale, and other impurities, and obtain a passive finished surface.

- 2) At the shop, perform pickling and passivation on all surfaces inside and out in accordance with ASTM A 380 or A 967.
  - a) Passivation treatments using citric acid are not allowed.
- 2. Hot-dip galvanized steel: Use in areas other than above and where specifically indicated on the Drawings. Hot-dip galvanize pipe supports after fabrication.
- 3. Plastic, aluminum, FRP, and other miscellaneous materials: Use where specifically indicated on the Drawings.
- B. Fasteners:
  - 1. As specified in Section 05120 Structural Steel.

#### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Properly support, suspend, or anchor exposed pipe, fittings, valves, and appurtenances to prevent sagging, overstressing, or movement of piping; and to prevent thrusts or loads on or against connected pumps, blowers, and other equipment.
- B. Field verify support location, orientation, and configuration to eliminate interferences prior to fabrication of supports.
- C. Carefully determine locations of inserts. Anchor to formwork prior to placing concrete.
- D. Use flush shells only where indicated on the Drawings.
- E. Do not use anchors relying on deformation of lead alloy.
- F. Do not use powder-actuated fasteners for securing metallic conduit or steel pipe larger than 1 inch to concrete, masonry, or wood.
- G. Suspend pipe hangers from hanger rods and secure with double nuts.
- H. Install continuously threaded hanger rods only where indicated on the Drawings.
- I. Use adjustable ring hangers or adjustable clevis hangers, for 4 inch and smaller diameter pipe.
- J. Use adjustable clevis hangers for pipe larger than 4 inches in diameter.
- K. Secure pipes with double nutted U-bolts or suspend pipes from hanger rods and hangers.
  - 1. For stainless steel piping, use stainless steel U-bolts.
  - 2. For all other piping, use galvanized U-bolts.

- L. Support spacing:
  - 1. Support 2-inch and smaller piping on horizontal and vertical runs at maximum 5 feet on center, unless otherwise specified.
  - 2. Support larger than 2-inch piping on horizontal and vertical runs at maximum 10 feet on center, unless otherwise specified.
  - 3. Support exposed polyvinyl chloride and other plastic pipes at maximum 5 feet on center, regardless of size.
  - 4. Support tubing, copper pipe and tubing, fiber-reinforced plastic pipe or duct, and rubber hose and tubing at intervals close enough to prevent sagging greater than 1/4 inch between supports.
- M. Install supports at:
  - 1. Any change in direction.
  - 2. Both sides of flexible pipe connections.
  - 3. Base of risers.
  - 4. Floor penetrations.
  - 5. Connections to pumps, blowers, and other equipment.
  - 6. Valves and appurtenances.
- N. Securely anchor plastic pipe, valves, and headers to prevent movement during operation of valves.
- O. Anchor plastic pipe between expansion loops and direction changes to prevent axial movement through anchors.
- P. Provide elbows or tees supported from floors with base fittings where indicated on the Drawings.
- Q. Support base fittings with metal supports or when indicated on the Drawings support on concrete piers.
- R. Do not use chains, plumbers' straps, wire, or similar devices for permanently suspending, supporting, or restraining pipes.
- S. Support plumbing drainage and vents in accordance with plumbing code as specified in Division 1 General Conditions.
- T. Supports, clamps, brackets, and portions of support system bearing against copper pipe: Copper plated, copper throughout, or isolated with neoprene or polyvinyl chloride tape.
- U. Where pipe is insulated, install over-sized supports and hangers.
- V. Install insulation shield in accordance with MSS SP-69, Type 40. Shield shall be galvanized steel unless otherwise specified or indicated on the Drawings.
- W. Install riser clamps at floor penetrations and where indicated on the Drawings.

X. Coat support system components as specified in Section 09960A High-Performance Coatings.

END OF SECTION

# SECTION 15075

# EQUIPMENT IDENTIFICATION

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Equipment nameplates.
  - 2. Special items.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - The following sections are related to the Work described in this Section. This list
    of related sections is provided for convenience only and is not intended to excuse
    or otherwise diminish the duty of the CONTRACTOR to see that the completed
    Work complies accurately with the Contract Documents.

     a. Division 1 General Conditions.
- 1.02 SUBMITTALS
  - A. Submit as specified in Division 1 General Conditions.
  - B. Submit following:
    - 1. Product data.
    - 2. Samples.
    - 3. Manufacturer's installation instructions.
    - 4. Submit following as specified in Division 1 General Conditions:
      - a. Operation and Maintenance Data.
      - b. Warranty.

### PART 2 PRODUCTS

- 2.01 EQUIPMENT NAMEPLATES
  - A. Material and fabrication:
    - 1. Stainless steel sheet engraved or stamped with text, holes drilled, or punch for fasteners.
  - B. Fasteners:
    - 1. Number 4 or larger oval head stainless steel screws or drive pins.

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- C. Text:
  - 1. Manufacturer's name, equipment model number and serial number, identification tag number; and when appropriate, drive speed, motor horsepower with rated capacity, pump rated total dynamic head, and impeller size.

## 2.02 SPECIAL ITEMS

A. In addition, special coating of following items will be required:

Item	Color
Valve handwheels and levers	Red
Hoist hooks and blocks	Yellow and black stripes
Steel guard posts	In accordance with standard details

B. Paint minimum 2 inches high numbers on or adjacent to accessible valves, pumps, flowmeters, and other items of equipment which are indicated on the Drawings or in Specifications by number.

## PART 3 EXECUTION

- 3.01 EXAMINATION
  - A. Verify satisfactory conditions of substrate for applying identification.
  - B. Verify that conditions are satisfactory for installation and application of products as specified in Division 1 General Conditions.

### 3.02 PREPARATION

- A. Prepare and coat surfaces as specified in Section 09960A High-Performance Coatings.
- B. Prepare surface in accordance with product manufacturer's instructions.

# END OF SECTION

# SECTION 15110

# COMMON WORK RESULTS FOR PROCESS VALVES

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes: basic requirements for valves.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Division 1 General Conditions.

## 1.02 REFERENCES

- A. American Water Works Association (AWWA):
  - 1. C111/A21.11 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe Fittings.
- B. ASTM International (ASTM):
  - 1. A 126 Standard Specification for Gray Iron Casting for Valves, Flanges, and Pipe Fittings.
  - 2. A 167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 3. A 536 Standard Specification for Ductile Iron Castings.
- C. NSF International (NSF):
  - 1. 61 Drinking Water System Components Health Effects.
- D. Society for Protective Coatings (SSPC):
  - 1. SP 7 Brush-Off Blast Cleaning.
  - 2. SP 10 Near-White Blast Cleaning.

#### 1.03 DESIGN REQUIREMENTS

A. Pressure rating:

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- 1. Suitable for service under minimum working pressures of 150 pounds per square inch gauge.
- 2. When a piping system is specified in the Piping Schedule to be tested at a pressure greater than 150 pounds per square inch gauge, provide valves for that piping system with design working pressure which is sufficient to withstand the test pressure.
- B. Valve to piping connections:
  - 1. Valves 3-inch nominal size and larger: Flanged ends.
  - 2. Valves less than 3-inch nominal size: Screwed ends.
  - 3. Plastic valves in plastic piping:
    - a. Up to 2.5 inches: Provide solvent or heat welded unions.
    - b. 3 inches and above: Provide solvent or heat welded flanges.

### 1.04 SUBMITTALS

- A. Submit as specified in Division 1 General Conditions.
- B. Product data:
  - 1. Submit the following information for each valve:
    - a. Valve type, size, pressure rating, Cv factor.
    - b. Coatings.
    - c. Manual valve actuators:
      - 1) Information on valve actuator including size, manufacturer, model number.
        - a) Certified drawings with description of component parts, dimensions, weights, and materials of construction.
    - d. Certifications of reference standard compliance:
      - 1) Submit certification that the valves and coatings are suitable in potable water applications in accordance with NSF 61.
        - a) Clearly mark submittal information to show specific items, materials, and accessories or options being furnished.
- C. Operation and maintenance data:
  - 1. Furnish bound sets of installation, operation, and maintenance instructions for each type of manual valve 4 inch in nominal size and larger, and all non-manual valves. Include information on valve operators in operation and maintenance instruction manual.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications:
  - 1. Valves manufactured by manufacturers whose valves have had successful operational experience in comparable service.

### 1.06 DELIVERY, STORAGE AND HANDLING

A. Protect valves and protective coatings from damage during handling and installation; repair coating where damaged.

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# PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Stainless steel: In accordance with ASTM A 167, Type 316, or Type 304, UNS Alloy S31600 or S30400.
- B. Valve and operator bolts and nuts:
  - 1. Fabricated of stainless steel for the following installation conditions:
    - a. Submerged in water.
    - b. In an enclosed space above water.
    - c. In structures containing water, below top of walls.
    - d. At openings in concrete or metal decks.
  - 2. Where dissimilar metals are being bolted, use stainless steel bolts with isolation bushings and washers.
  - 3. Underground bolts: Low-alloy steel in accordance with AWWA C111/A21.11.
- C. Bronze and brass alloys: Use bronze and brass alloys with not more than 6 percent zinc and not more than 2 percent aluminum in the manufacture of valve parts; UNS Alloy C83600 or C92200 unless specified otherwise.
- D. Valve bodies: Cast iron in accordance with ASTM A 126, Class 30 minimum or ductile iron in accordance with ASTM A 536, Grade 65-45-12 minimum unless specified otherwise.

### 2.02 INTERIOR PROTECTIVE LINING

- A. When specified in the particular valve specification, provide valves with type of protective lining specified in the particular valve Specification.
- B. Apply protective lining to interior, non-working surfaces, except stainless steel surfaces.

### C. Lining types:

- 1. Fusion bonded epoxy:
  - a. Manufacturers: One of the following or equal:
    - 1) 3-M Company, ScotchKote 134; certified to NSF 61 for drinking water use.
  - b. Clean surfaces in accordance with SSPC SP 7 or SP 10, as recommended by epoxy manufacturer.
  - c. Apply in accordance with manufacturer's published instructions.
  - d. Lining thickness: 0.010 to 0.012 inches except that:
    - 1) Lining thickness in grooves for gaskets: 0.005 inches.
    - 2) Do not coat seat grooves in valves with bonded seat.
  - e. Quality control:
    - 1) Lining thickness: Measured with a non-destructive magnetic type thickness gauge.
    - 2) Verify lining integrity with a wet sponge-testing unit operating at approximately 60 volts, or as recommended by the lining manufacturer.
- 3) Consider tests successful when lining thickness meets specified requirements and when no pinholes are found.
- 4) Correct defective lining disclosed by unsuccessful tests, and repeat test.
- 5) Repair pinholes with liquid epoxy recommended by manufacturer of the epoxy used for lining.
- 2. High solids epoxy:
  - a. Product equivalent to high solids epoxy specified in Section 09960A High-Performance Coatings.
    - 1) Certified in accordance with NSF 61 for drinking water use.
    - 2) Interior: Coat valve interior with manufacturer's equivalent high performance high solids epoxy coating system with a certifiable performance history for the service conditions and as approved by the ENGINEER. Manufacturer shall provide for approval, coating information sufficient to allow ENGINEER to assess equivalence to the specified high solids epoxy coating specified in Section 09960A High-Performance Coatings.
  - b. Clean surfaces to meet SP-7 or SP-10, or as recommended by coating manufacturer.
  - c. Quality control: After coating is cured, check coated surface for porosity with a holiday detector set at 1,800 volts, or as recommended by coating manufacturer.
    - 1) Repair holidays and other irregularities and retest coating.
    - 2) Repeat procedure until holidays and other irregularities are corrected.

### 2.03 UNDERGROUND VALVES

- A. Provide underground valves with flanged, mechanical, or other type of joint required for the type of pipe to which the valve is to be connected.
- B. Coating and wrapping:
  - 1. After installation, encase valves in 2 layers of linear low-density polyethylene (LLDPE) film, minimum thickness of 8 mils in accordance with AWWA C105.
    - a. Ascertain that polyethylene wrapping does not affect operation of valve.

## 2.04 VALVE BOXES

- A. Provide cast-iron valve boxes at each buried valve to access valve and valve operators.
- B. Do not support boxes on valve, valve operator, or pipe.
- C. Boxes:
  - 1. 2-piece, fabricated of cast iron; provide cover, with asphalt varnish or enamel protective coating.
  - 2. Adjustable to grade, install centered around the upper portions of the valve and valve operator.
- D. Manufacturers: One of the following or equal:

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- 1. Tyler Pipe Industries, Inc.
- 2. Neenah Foundry Company.

## 2.05 VALVE OPERATORS

- A. Valve operator "Open" direction: Open counterclockwise.
- B. Provide valves located below operating level or deck with extensions for key operation or floor stands and handwheels.
- C. Provide manually operated valves located not more than 6 feet above the operating level with tee handles, wrenches, or handwheels.
  - 1. Make the valve operator more conveniently accessible by rolling valves, located more than 5 feet but less than 6 feet above the operating level, toward the operating side.
  - 2. Secure tee handles and wrenches to the valve head or stem, except where a handle or wrench so secured constitutes a hazard to personnel; in which case, stow handle or wrench immediately adjacent to the valve on or in a suitable hanger, bracket, or receptacle.
- D. Fit valves located more than 6 feet above operating level with chain operated handles or valve wheels.
  - 1. Chains: Sufficient length to reach approximately 4 feet above the operating level.
  - 2. Where chains constitute a nuisance or hazard to operating personnel, provide holdbacks or other means for keeping the chains out of the way.
- E. Provide an operator shaft extension from valve or valve operator to finished grade or deck level when buried valves, and other valves located below the operating deck or level, are specified or indicated on the Drawings to be key operated; provide 2-inch square AWWA operating nut, and box and cover as specified, or a cover where a box is not required.

# PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Preparation prior to installation:
  - 1. Install valves after the required submittal on installation has been accepted.
  - 2. Determine after flanged valves and flanged check valves are selected, the faceto-face dimensions of flanged valves and flanged check valves.
- B. Fabricate piping to lengths taking into account the dimensions of flanged valves and flanged check valves.

## 3.02 INSTALLATION

A. Provide incidental work and materials necessary for installation of valves including flange gaskets, flange bolts and nuts, valve boxes and covers, concrete bases, blocking, and protective coating.

- B. Where needed, furnish and install additional valves for proper operation and maintenance of equipment and plant facilities under the following circumstances:
  - 1. Where such additional valves are required for operation and maintenance of the particular equipment furnished by CONTRACTOR.
  - 2. Where such additional valves are required as a result of a substitution or change initiated by CONTRACTOR.
- C. Install valves with their stems in vertical position above the pipe, except as follows:
  - 1. Butterfly valves, gate valves aboveground, globe valves, ball valves, and angle valves may be installed with their stems in the horizontal position.
  - 2. Install buried plug valves with geared operators with their stems in a horizontal position.
- D. Install valves so that handles clear obstructions when the valves are operated from fully open to fully closed.
- E. Place top of valve boxes flush with finished grade or as otherwise indicated on the Drawings.
- F. Valves with threaded connections:
  - 1. Install valves by applying wrench on end of valve nearest the joint to prevent distortion of the valve body.
  - 2. Apply pipe joint compound or Teflon tape on external (male) threads to prevent forcing compound into valve seat area.
- G. Valves with flanged connections:
  - 1. Align flanges and gasket carefully before tightening flange bolts.
  - 2. When flanges are aligned, install bolts and hand tighten.
  - 3. Tighten nuts opposite each other with equal tension before moving to next pair of nuts.
- H. Valves with soldered connections:
  - 1. Do not overheat connection to prevent damage to resilient seats and metal seat rings.
  - 2. Position valves in full open position before starting soldering procedure.
  - 3. Apply heat to piping rather than to valve body.

# END OF SECTION

# SECTION 15114

# CHECK VALVES

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Center guide (silent).
  - 2. Plastic ball check valves.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.

#### 1.02 REFERENCES

- A. American Water Works Association (AWWA):
  - 1. C508 Standard for Swing-Check Valves for Waterworks Service 2-inch through 24-inch (50-mm through 600-mm) NPS.
- B. American Society of Mechanical Engineers (ASME):
  - 1. B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- C. ASTM International (ASTM):
  - 1. A 126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 2. A 313 Standard Specification for Stainless Steel Spring Wire.
  - 3. B 582 Standard Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip.
  - 4. B 584 Standard Specification for Copper Alloy Sand Castings for General Applications.

#### 1.03 SYSTEM DESCRIPTION

- A. Design requirements:
  - 1. Check valves: When not otherwise specified as indicated on the Drawings, provide check valves suitable for service as follows:
    - a. In either horizontal or vertical position.
    - b. Under pressures equal and less than 150 pounds per square inch gauge.

### 1.04 SUBMITTALS

- A. Submit the following information as specified in Division 1 General Conditions and Section 15110 Common Work Results for Process Valves:
  - 1. Product data.
  - 2. Certificates:
    - a. General purpose AWWA check valves:
      - 1) Affidavit of compliance attesting valves provided comply with all provisions in accordance with AWWA C508.
  - 3. Operation and maintenance data.

## PART 2 PRODUCTS

### 2.01 CENTER GUIDE (SILENT) CHECK VALVES

- A. Manufacturers: One of the following or equal:
  - 1. APCO, Model Number 600.
  - 2. Crispin, Series GC.
  - 3. Mueller, A2600-6-02
- B. Valve design:
  - 1. Center guided, spring-loaded plug.
  - 2. Replaceable seat and plug.
  - 3. Shaft guide bushing.
  - 4. Non-slam, silent shut-off.
  - 5. Flanged body.

### C. Materials:

- 1. Body: Cast iron, ASTM A 126 Grade B.
- 2. Plug and seat: Bronze, ASTM B 584 C83600.
- 3. Spring: Stainless steel, ASTM A 313 Type 316.
- 4. Shaft and bushing: Bronze, ASTM B 584 C83600.

### 2.02 PLASTIC BALL CHECK VALVES

- A. Manufacturers: One of the following or equal:
  - 1. Chemtrol Division of Nibco.
  - 2. R. G. Sloane Company, Inc.
- B. Valves: Ball type:
  - 1. Polyvinyl chloride.
  - 2. Double or single union-type end connections.
  - 3. Seals: EPDM.

### PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. Install valves per manufacturer's instructions.

# END OF SECTION

## SECTION 15116

## PLUG VALVES

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Non-lubricated.

#### B. Related sections:

- 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
- 3. The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
  - a. Section 09960A High-Performance Coatings.
  - b. Section 15110 Common Work Results for Process Valves.

### 1.02 REFERENCES

- A. American Water Works Association (AWWA):
  - 1. C517 Resilient-Seated Cast Iron Eccentric Plug Valves.
- B. ASTM International (ASTM):
  - 1. A 126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 2. A 536 Standard Specification for Ductile Iron Castings.

#### 1.03 SUBMITTALS

- A. Shop drawings: Submit the following information as specified in Division 1 and Section 15110 Common Work Results for Process Valves:
  - 1. Product data.
  - 2. Operation and maintenance data.

### PART 2 PRODUCTS

- 2.01 NON-LUBRICATED PLUG VALVES
  - A. Manufacturers: One of the following or equal:

- 1. DeZurik, "PEC."
- 2. Clow Valve.
- B. Design:
  - 1. Type: Non-lubricated eccentric type, in accordance with AWWA C517.
  - 2. Plug face: Resilient material which operates satisfactorily at a temperature of 180 degrees Fahrenheit continuous and 215 degrees Fahrenheit intermittent.
  - 3. Compression washer: Provide flat compression washer made of Teflon, or of a material having equal physical characteristics on valve stem between plug and bonnet.
  - 4. Stem seals: Provide stem seals serviceable without unbolting the valve bonnet assembly.
  - 5. Clearly mark valves to indicate their open and closed positions.
  - 6. Provide valves with ends as required by piping details indicated on the Drawings.
- C. Materials:
  - 1. Body and plug: ASTM A 126, Class B, cast-iron, with plug face of EPDM material suitable for the intended service as specified under paragraph "Design" above.
  - 2. Body seats in valves 3-inch size and larger: Provide with overlay of not less than 90 percent nickel and minimum thickness of 1/8 inch on surfaces contacting the plug face.
  - 3. Stem bearing and bottom bearing: Type 316 stainless steel backed TFE bearings.
  - 4. Internal parts, except the body and plug: Type 316 stainless steel.
  - 5. Exposed nuts, bolts, and washers: Zinc plated. Exception: Exposed nuts, bolts, and washers for buried service: Stainless steel.

### 2.02 VALVE OPERATORS

- A. Furnish valves with an operating wrench or worm gear operator:
  - 1. Equip valves 4-inch nominal size and smaller with a lever operator.
  - 2. Equip valves 6-inch nominal size and larger with a worm gear operator.

#### 2.03 COATING

- A. Coat interior metal surfaces as specified in Section 15110 Common Work Results for Process Valves.
- B. Coat exterior metal surfaces as specified in Section 09960A High-Performance Coatings.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install valves as specified in Section 15110 Common Work Results for Process Valves and the manufacturer's instructions.
- B. Install valves so that in the closed position the pressure in the pipeline applies a seating head on the valves.

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C. Install valves so that in the open position the plug is located in the top half of the valve body.

END OF SECTION

# SECTION 15956

# **PIPING SYSTEM TESTING**

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes: Test requirements for piping systems.
- B. Related sections:
  - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 2. It is the CONTRACTOR'S responsibility for scheduling and coordinating the work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 3. The following sections are related to the work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed work complies accurately with the Contract Documents.

### 1.02 TESTING REQUIREMENTS

- A. General requirements:
  - 1. Testing requirements are stipulated in Laws and Regulations.
  - 2. Requirements in Laws and Regulations supersede other requirements of Contract Documents, except where requirements of Contract Documents are more stringent, including higher test pressures, longer test times, and lower leakage allowances.
  - 3. Test plumbing piping in accordance with Laws and Regulations, the plumbing code, and UL requirements.
- B. Furnish necessary personnel, materials, and equipment, including bulkheads, restraints, anchors, temporary connections, pumps, water, pressure gauges, and other means and facilities required to perform tests.
- C. Pipes to be tested: Test only those portions of pipes that have been installed as part of this Contract. Test new pipe sections prior to making final connections to existing piping. Furnish and install test plugs, bulkheads, and restraints required to isolate new pipe sections. Do not use existing valves as test plug or bulkhead.
- D. Unsuccessful tests:
  - 1. Where tests are not successful, correct defects or remove defective piping and appurtenances and install piping and appurtenances that comply with the specified requirements.
  - 2. Repeat testing until tests are successful.

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- E. Test completion: Drain and leave piping clean after successful testing.
- F. Test water disposal: CONTRACTOR is responsible for properly disposing of test water.

### 1.03 SUBMITTALS

- A. Schedule and notification of tests:
  - 1. Submit a list of scheduled piping tests by noon of the working day preceding the date of the scheduled tests.
  - 2. Notification of readiness to test: Immediately before testing, notify ENGINEER in writing of readiness, not just intention, to test piping.
  - 3. Have personnel, materials, and equipment specified in place before submitting notification of readiness.

### 1.04 SEQUENCE

- A. Clean piping before pressure or leak tests.
- B. Underground pressure piping may be tested before or after backfilling when not indicated or specified otherwise.
- C. Backfill and compact trench, or provide blocking that prevents pipe movement before testing underground piping with a maximum leakage allowance.
- D. Test underground piping before encasing piping in concrete or covering piping with slab, structure, or permanent improvement.

# PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

- 3.01 TESTING GRAVITY FLOW PIPING
  - A. Test gravity flow piping indicated with "GR" in the Piping Schedule, as follows:
    - 1. Unless specified otherwise, subject gravity flow piping to the following tests:
      - a. Alignment and grade.
      - b. For plastic piping, test for deflection.
      - c. Visible leaks and pressure with maximum leakage allowance, except for storm drains and culverts.
    - 2. Inspect piping for visible leaks before backfilling.
    - 3. Provide temporary restraints when needed to prevent movement of piping.
    - 4. Pressure test piping with maximum leakage allowance after backfilling.
    - 5. With the lower end plugged, fill piping slowly with water while allowing air to escape from high points. Keep piping full under a slight head for at least 24 hours:
      - a. Examine piping for visible leaks. Consider examination complete when no visible leaks are observed.
      - b. Maintain piping full of water or allow a new water absorption period of 24 hours prior to performance of the pressure test with maximum leakage allowance.

- c. After successful completion of the test for visible leaks and after the piping has been restrained and backfilled, subject piping to the test pressure for a minimum of 4 hours while accurately measuring the volume of water added to maintain the test pressure:
  - 1) Consider the test complete when leakage is equal to or less than the following maximum leakage allowances:
    - a) For polyvinyl chloride (PVC) gravy sewer pipe: 25 gallons per day per inch diameter per mile of piping under test.
    - b) For other piping: 80 gallons per day per inch diameter per mile of piping under test.

## 3.02 TESTING HIGH-HEAD PRESSURE PIPING

- A. Test piping for which the specified test pressure in the Piping Schedule is 20 pounds per square inch gauge or greater, by the high head pressure test method.
- B. General:
  - 1. Test connections, valves, blowoffs, and closure pieces with the piping.
  - 2. Do not use installed valves for shutoff when the specified test pressure exceeds the valve's maximum allowable seat differential pressure. Provide blinds or other means to isolate test sections.
  - 3. Do not include valves, equipment, or piping specialties in test sections if test pressure exceeds the valve, equipment, or piping specialty safe test pressure allowed by the item's manufacturer.
  - 4. During the performance of the tests, test pressure shall not vary more than plus or minus 5 pounds per square inch gauge with respect to the specified test pressure.
  - 5. Select the limits of testing to sections of piping. Select sections that have the same piping material and test pressure.
  - 6. When test results indicate failure of selected sections, limit tests to piping:
    - a. Between valves.
    - b. Between a valve and the end of the piping.
    - c. Less than 500-feet long.
  - 7. Test piping for minimum 2 hours for visible leaks test and minimum 2 hours for the pressure test with maximum leakage allowance.
- C. Testing procedures:
  - 1. Fill piping section under test slowly with water while venting air:
    - a. Use potable water for all potable waterlines and where noted on the Piping Schedule.
  - 2. Before pressurizing for the tests, retain water in piping under slight pressure for a water absorption period of minimum 24 hours.
  - Raise pressure to the specified test pressure and inspect piping visually for leaks:
    a. Consider visible leakage testing complete when no visible leaks are observed.
- D. Pressure test with maximum leakage allowance:
  - 1. Leakage allowance is zero for piping systems using flanged, National Pipe Thread threaded and welded joints.
  - 2. Pressure test piping after completion of visible leaks test.

- 3. For piping systems using joint designs other than flanged, threaded, or welded joints, accurately measure the makeup water necessary to maintain the pressure in the piping section under test during the pressure test period:
  - a. Consider the pressure test to be complete when makeup water added is less than the allowable leakage and no damage to piping and appurtenances has occurred.
  - b. Successful completion of the pressure test with maximum leakage allowance shall have been achieved when the observed leakage during the test period is equal or less than the allowable leakage and no damage to piping and appurtenances has occurred.
  - c. When leakage is allowed, calculate the allowable leakage by the following formula:

 $L = S \times D \times P1/2 \times 133,200-1$ 

wherein the terms shall mean:

- L = Allowable leakage in gallons per hour.
- S = Length of the test section in feet.
- D = Nominal diameter of the piping in inches.

P = Average observed test pressure in pounds per square inches gauge, at the lowest point of the test section, corrected for elevation of the pressure gauge.

x = The multiplication symbol.

END OF SECTION

# SECTION 15958

# MECHANICAL EQUIPMENT TESTING

## PART 1 GENERAL

### 1.01 SUMMARY

- A. Section includes: Testing of mechanical equipment and systems.
- B. Related sections: The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
  - 1. It is the CONTRACTOR'S responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR'S Work.
  - 2. The following sections are related to the Work described in this Section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the CONTRACTOR to see that the completed Work complies accurately with the Contract Documents.
    - a. Division 1 General Conditions.
    - b. Division 2 Site Construction.
    - c. Section 15956 Piping System Testing.
    - d. Division 17 Instrumentation.

### 1.02 REFERENCES

- A. American National Standards Institute (ANSI):
  - 1. S1.4 Specification for Sound Level Meters.
- B. Hydraulic Institute (HI).

#### 1.03 SUBMITTALS

- A. Schedule of factory tests and field tests as specified in Division 1 General Conditions and this Section.
- B. Test instrumentation calibration data.
- C. Start-up plan as specified in Division 1 General Conditions.
- D. Test plan specified in this Section.
- E. Test result reports.

# PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 QUALITY CONTROL TESTING AND REPORTING

- A. Scheduling and notification:
  - 1. Witnessed source quality control tests: Schedule test date and notify ENGINEER at least 30 days prior to start of test.
  - 2. Field quality control tests: Schedule test date and notify ENGINEER at least 7 days prior to start of test.
- B. Testing levels:
  - 1. Test equipment based on test levels specified in the equipment section of this Project.
  - 2. Requirements for Test Levels 1 to 4 are defined below.
  - 3. Test levels apply for both Source (Factory) Quality Control Tests and Field Quality Control Tests as specified in the equipment sections of this Project.
  - 4. If testing is not specified in the equipment section, provide Level 1 testing.
  - 5. Requirements of Division 1 General Conditions apply to Test Levels.
- C. Witnessing: Source Quality Control Tests not witnessed unless specified otherwise in the equipment section or Division 1 General Conditions; Field Quality Control Tests shall be witnessed.
- D. Instrumentation: Provide necessary test instrumentation which has been calibrated within 1 year from date of test to recognized test standards traceable to the National Institute of Standards and Technology, Washington, D.C. or approved source. Properly calibrated field instrumentation permanently installed as a part of the Work may be utilized for Field Quality Control Tests.
- E. Temporary facilities and labor: Provide necessary fluids, utilities, temporary piping, temporary supports, temporary access platforms or access means and other temporary facilities and labor necessary to safely operate the equipment and accomplish the specified testing. With OWNER'S permission, some utilities may be provided by fully tested permanently installed utilities that are part of the Work.
- F. Test fluids:
  - 1. Factory tests: Use water or air as appropriate at ambient conditions unless specified otherwise in the equipment section.
  - 2. Field tests: Use specified process fluid at available conditions.
- G. Pressure testing: Hydrostatically pressure test pressure containing parts in the factory at the appropriate standard or code required level above the equipment component specified design pressure or operating pressure, whichever is higher. Submit pressure test reports before shipping.
- H. Test measurement and result accuracy:

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- 1. Use test instruments with accuracies as recommended in the appropriate referenced standards. When no accuracy is recommended in the referenced standard, use 1 percent or better accuracy test instruments. Improved (lower error tolerance) accuracies specified elsewhere prevail over this general requirement.
- 2. Do not adjust results of tests for instrumentation accuracy. Measured values and values directly calculated from measured values shall be the basis for comparing actual equipment performance to specified requirements.
- I. Field testing:
  - Submit test plan as specified in Division 1 General Conditions and this Section. Indicate test start time and duration, equipment to be tested, other equipment involved or required; temporary facilities required, number and skill or trade of personnel involved; safety issues and planned safety contingencies; anticipated effect on OWNER'S existing equipment and other information relevant to the test. Provide locations of all instruments to be used for testing. Provide calibration records for all instrumentation.
  - 2. Perform general start-up and testing procedures as specified in Division 1 General Conditions.
  - 3. Prior to testing, verify equipment protective devices and safety devices have been installed, calibrated, and tested.
- J. Reports: Submit reports for source and field-testing. Submit Source Quality Control Test result reports before shipping equipment to the field. Report features:
  - 1. Report results in a bound document in generally accepted engineering format with title page, written summary of results compared to specified requirements, and appropriate curves or plots of significant variables in English units.
  - 2. Include appendix with a copy of raw, unmodified test data sheets indicating test value, date and time of reading, and initials of person taking the data.
  - 3. Include appendix with sample calculations for adjustments to raw test data and for calculated results.
  - 4. Include appendix with the make, model, and last calibration date of instrumentation used for test measurements.
  - 5. Include in body of report a drawing or sketch of the test system layout showing location and orientation of the test instruments relative to the tested equipment features.

# 3.02 EQUIPMENT TESTING, GENERAL

- A. Tests for pumps, all levels of testing:
  - 1. Test in accordance with applicable HI Standards in addition to the requirements in this and other Sections.
  - 2. Test tolerances: In accordance with appropriate HI Standards, except the following modified tolerances apply:
    - a. From 0 to plus 5 percent of head at the specified flows.
    - b. From 0 to plus 5 percent of flow at the rated design point head.
    - c. No negative tolerance for the efficiency at the specified flows.
    - d. No positive tolerance for vibration limits. Vibration limits and test methods in HI Standards do not apply, use limits and methods specified in this or other Sections of the Specifications.

B. Tests for drivers: Test motors as specified in Division 16 Electrical. Test other drivers as specified in the driver equipment section.

# 3.03 REQUIREMENTS FOR VIBRATION TESTING

- A. Definitions:
  - 1. Peak-to-peak displacement: The root mean squared average of the peak-to-peak displacement multiplied by the square root of 2.
  - 2. Peak velocity: The root mean squared average of the peak velocity multiplied by the square root of 2.

# END OF SECTION

# SECTION 16010

# ELECTRICAL

### PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall install, ready for use, the electrical system as specified in Section 16010 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 required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.
- B. CONTRACTOR'S bid shall include first or second named or second named as indicated on the Drawings or in these Specifications. Where Drawings or Specifications call for a particular manufacturer "or equal", the CONTRACTOR must prepare his base bid using the first or second named equipment. CONTRACTOR shall bear the full responsibility for including in his bid any equipment, which is later found to be unacceptable or NOT equal to the equipment specified.
- C. 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 system as shown on the Drawings, included in these Specifications, or required for fully operating facilities. Use Device Indexes and Contract Drawings typical installation details for mounting detail requirements to be provided for equipment listed.
- D. Examine the Specification and Drawings for mechanical equipment and provide all starters, circuit breakers, switches, pushbuttons, and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire, cable, and make connections required to place all equipment in complete operation.
- E. Contract Elementary Drawings do not show all electrical interfaces, lockouts, etc. required for motor control. These Drawings show general layout and have made provisions for interlocks, solenoid valve control, etc. and are only typical. CONTRACTOR is responsible for examining the Contract Series Drawings for all motor control interfaces, temperature switches, solenoid valves, float switches and device lockout, requirements. The CONTRACTOR'S submitted elementary diagrams shall show all motor controls and interlocks for the specific piece of equipment. Provide a separate set of elementary diagrams for each similar group of equipment. It is within the CONTRACTOR'S scope of work to submit elementary diagrams that not only show the MCC bucket wiring, but also include the field interlocks, motor heaters, protective devices, valve controls, etc. The CONTRACTOR'S Elementary submittal Drawings

shall also show field terminal block numbers for each of the field interlocks and valve controls.

- F. The major areas in the Division scope of work are shown on the drawings and as designated on the Section 16010 plans, which include both the furnishing and installation of are:
  - 1. Motor Control Centers including motor starters.
  - 2. Meter/main switchboard MCCs.
  - 3. Processor Logic Controllers (PLC) and Operator Interface (OI) hardware for controlling the pumps, aerators, drives, etc. and other miscellaneous devices. The CONTRACTOR is to provide all configuration, programming and setup of the PLCs.
  - 4. Conduits, and the field interconnection wiring between the equipment, pumps, MCCs, control panels, panelboards, field devices, etc.
  - 5. All necessary miscellaneous shut off, sample, and calibration valves to sensors.
  - 6. Trenching, backfilling, compaction, and resurfacing for all new underground conduit routes.
  - 7. Building electrical devices, lights, and receptacles.
  - 8. Grounding system and equipment grounding.
  - 9. 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.
  - 10. Conduits, wiring, and terminations of all wiring associated with panels and equipment supplied under all other Divisions.
  - 11. Removal and disposal of excess materials from excavation, pavement removal and demolition work.
  - 12. The District's SCADA integrator will provide all City side work on modifications to city-wide SCADA. The Contractor's integrator will provide a register map and written narrative of the registers and the operation. The Contractor's integrator will provide the City with of a digital copy the program with comments embedded in the programming as to the operations of the pumps, and SCADA connections.
- G. Provide all necessary hardware, conduit, 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, conduits, relays, and isolators to complete interfaces of the electrical and instrumentation system.
  - 2. Changing normally open contacts to normally closed contacts or vise versa.
  - 3. Adding additional relays to provide more contacts as necessary to carry out work specified.
  - 4. Other work implied by the Contract documents.
- H. The following Specifications incorporate specific equipment and devices that are preferred by 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 existing maintenance Contracts; however, favorable alternatives proposed in writing during the submittal process will be reviewed by the OWNER as whether it is acceptable as an approved equal.

- 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 Electrical Code (NEC) 2013 issue. Nothing on the Drawings nor in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.
- J. Contractors which propose to bid on this project are encouraged to attend the pre-bid job walk to accomplish 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. 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.
- K. It is the CONTRACTOR'S responsibility to be fully familiar with the existing conditions and local requirements and regulations. New MCCs and generators are to be installed in areas with limited space. MCC and generator footprints were developed based on best available information. CONTRACTOR is responsible for any additional conduits, wires, construction costs, engineering design requirements, etc to accommodate MCCs and generators that are larger than that shown on Contract Documents.
- L. 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" and Conduit Schedule. The CONTRACTOR will reimburse the Electrical Engineer and the OWNER and then will deduct an amount equal of reimbursement from the CONTRACTOR'S contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings and Conduit Schedule due to any major unauthorized changes.
- M. The term "ENGINEER" used throughout this Division 16 is the "Salida Sanitary District" ENGINEER or their designated ENGINEER representative." The term "OWNER" in Division 16 is the Salida Sanitary District. When "CONTRACTOR" is listed in these documents without further definition such as "CONTRACTOR", it is to mean the "Prime or General Contractor."

### 1.02 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 for Measurements & Control (ISA)
~			Standards (formerly Instrument Society of America).
9.	JIC	-	Joint Industrial Council.
10.	NEC	-	National Electrical Code, 2005 Edition.
11.	NEMA	-	National Electrical Manufacturers Association.
12.	NETA	-	Acceptance Testing Specifications for Electrical Power
			Distribution Equipment and Systems, International Electrical
			Testing Association.
13.	NESC	-	National Electrical Safety Code.
14.	NFPA	-	National Fire Protection Agency.
15.	OSHA	-	Occupational Safety and Health Act Standards.
16.	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 nor 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 District, State, County or District 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.
- H. Amperage listed on the single-line Drawings for motors are per NEC Table 430-150 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.

### 1.03 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 the CONTRACTOR. This responsibility includes, but is not limited to, supervision and

coordination of work performed by the System Supplier. Uncertified electricians shall not perform electrical work for which certification is required.

- B. CONTRACTOR shall submit the proposed Electrical subcontractor and System Supplier with bid documents that will be used on this project.
- C. If the CONTRACTOR, Electrical Contractor, and System supplier listed in bid documents are deemed not qualified by OWNER, they will have their bid rejected at the OWNER'S sole discretion and the next qualified bidder selected.
- D. The Electrical Contractor shall meet the following minimum qualifications:
  - 1. Has a current C-10 Contractor's License.
  - 2. Has regularly engaged in similar electrical construction for the municipal water and wastewater industry.
  - 3. Has performed work of similar or greater complexity on at least five previous projects.
  - 4. Has all persons performing work as electricians certified by the California Apprenticeship Council per California Labor Code Section 3099.

### 1.04 SYSTEM SUPPLIER QUALIFICATIONS

- A. General:
  - 1. All switchboard, panels, MCCs, PLC hardware, and PLC programming shall be supplied by one system supplier. All panels and instrumentation listed for Division 16 in all Division 16 appendix Indexes shall be supplied by the same System Supplier. This includes, but not limited to, all work necessary to select, furnish, supervise installation, calibrate, program, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein. The system supplier shall not subcontract any portions of the equipment provisioning with the exception of fire and security alarm systems without written approval of OWNER.
  - 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. This project engineer's name, address, and phone number shall be provided within the first week after notice to proceed. The system supplier project engineer shall attend all coordination meetings and be on-site when requested by the OWNER'S Resident Engineer.
- B. System Suppliers
  - 1. System Suppliers shall submit the information listed herein the model prior to bid,
  - 2. The System Supplier shall submit prove they meet the following minimum qualifications:
    - a. Has regularly engaged in similar instrumentation systems for the Municipal Water and Wastewater industry.
    - b. Has successfully performed work of similar or greater complexity on at least five previous projects under one company name which is the present company name.

- c. Has been actively engaged in the type of PLC control system, and instrumentation work specified in this Division for a minimum of five years.
- d. Has a permanent, fully staffed, and equipped service facility in operation at least six (6) months prior to bid date within 150 miles of project site. Service facility shall be under same company name as System Supplier and same company shall be staffed with personnel and equipment required to maintain, repair and calibrate the instrumentation system. Subletting warranty to third party is not acceptable.
- 3. Non-paraqualified System Suppliers shall submit the following detailed information to the OWNER for determination of paraqualification , prior to bid:
  - a. Company history.
  - b. List of five (5) completed projects of similar size and nature for wastewater treatment plants.
    - 1) Provide completion dates of projects.
    - 2) References of OWNER Representative in charge of project, including contact name and telephone number.
  - c. List of projects in progress.
    - 1) Description of scope of projects.
    - 2) Dollar amount of projects.
- 4. 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.
- 5. System Supplier providing financial statements lacking detail or stating that detailed financial records are proprietary will be disqualified as a qualified System Supplier and is grounds alone for disqualification.
- 6. Any qualification package deemed incomplete or lacking sufficient information to determine qualification will result in System Supplier not being qualified.
- 7. No reason will be released on why a System Supplier was not qualified.

### 1.05 CONTRACT DOCUMENTS

- A. The Contract Drawings and Specifications are intended to be descriptive of the type of electrical system to be provided; any 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 OWNER'S Resident 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 requirements or descriptions in this Section shall take precedence in the event of conflict.
- C. 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, etc, shall be provided for an operation system at no additional cost to the OWNER.

- D. 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 conditions and coordination with other trades at no additional cost. Minor adjustments are defined as those adjustments required due to equipment size changes or variations between different equipment suppliers.
- E. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available. 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 and shall be approved by OWNER, if such changes are the direct result of the equipment selected by the CONTRACTOR. 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.
- F. Electrical & instrumentation, conduit & wire lengths shown on circuit Drawings are approximate and do not show changes in elevation or vertical risers. The CONTRACTOR is responsible for determining actual lengths for bidding and installation purposes.
- G. 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. These minor changes are changes which would provide adequate clearance and work areas in front of and around equipment.
- H. 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.
- I. 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 review within thirty days after the award of the contract.
- J. The resolution of conflicting interpretation of the Contract documents shall be as determined by the ENGINEER.
- K. The CONTRACTOR shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size Electrical (E-Series). 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. 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. 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.

- 1. The following lists the record documents that shall be as-built by CONTRACTOR:
  - a. E-Series Drawings.
  - b. Panelboard schedules.
  - c. Conduit and Wire Routing Schedule.
  - d. Lighting Schedule.
- 2. 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.
- 3. 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.
- 4. 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, duct banks, vaults, pullboxes, junction boxes, etc. 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.
- 5. Prior to acceptance of the work, the CONTRACTOR shall deliver to the ENGINEER one set of record full-size Electrical Record Contract Drawings and spreadsheets neatly marked accurately showing the information required above.

### 1.06 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 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. 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 close as possible to equipment terminals.

C. Manufacturer's directions and instructions shall be followed in all cases when they have more restrictive requirements than that shown on the Contract Drawings or have stipulations in order to meet warranty requirements.

### 1.07 SUPERVISION

- A. The CONTRACTOR shall schedule all activities, manage all technical aspects of the project, coordinate submittal and Drawings, and attend all project meetings associated with this Section.
- B. The CONTRACTOR shall supervise all work in this Section, including the CONTRACTOR'S general construction work, and System Supplier's work, from the beginning to completion and final acceptance.
- C. The CONTRACTOR shall supervise and coordinate all work in this Section to insure that each phase of the project, submittal, delivery, installation, and acceptance testing, warranty, 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 including that of the CONTRACTOR and the System Supplier, which shall include transmittals, submittal, forms, documents, manuals, instructions, and procedures.
- E. Electrical Construction Supervision:
  - 1. Prior to the start of any project site installation, the CONTRACTOR shall provide the OWNER with an expected manpower schedule as well as a list of applicable job site supervision personnel, their scheduled job site appearance, and the expected duration of their presence on the job site. Include in this manpower schedule the calculation of average manhour per month for the duration of electrical labor phase.
  - 2. When the Electrical Labor exceeds an average of 2,000 man-hours/month the CONTRACTOR shall have an office clerk on site for the duration of the construction work to order, follow up and receive materials, handle construction payroll, maintain the Construction Documents, and handle or assist the working foreman/superintendent with responsibility not directly related to the installation of the electrical equipment.
  - 3. The CONTRACTOR shall have a dedicated Project Manager in addition to the Office Clerk described above, on site for the duration of the construction work. The Project Manager shall have complete authority and responsibility for carrying out all aspects of the Contract with the OWNER.
  - 4. The CONTRACTOR shall provide a foreman for each six (6) installation labor electricians. A Job Site Superintendent shall be provided at the discretion of the CONTRACTOR unless the project falls behind schedule. If the project falls behind schedule, the OWNER can direct the CONTRACTOR to provide a non-working Superintendent who must remain with the project a minimum of the next two (2) project schedule deadlines.

### 1.08 INSPECTIONS

- A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the ENGINEER. If any material does not conform to the Contract documents, or does not have an "approved" or "approved as noted" submittal status; then the CONTRACTOR shall, within three days after being notified by the ENGINEER, 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. Work shall not be closed in or covered over before inspection and approval by the OWNER'S Resident Engineer. All costs associated with uncovering and making repairs where noninspected work has been performed shall be borne by the CONTRACTOR.
- C. The CONTRACTOR shall cooperate with the OWNER and provide assistance for the inspection of the electrical system under this Contract. The 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.
- D. 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.
- E. 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.
- F. 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 Reinspected.

### 1.09 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 the 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 approximately 870 feet above sea level. All equipment shall be de-rated as recommended by the manufacturer or in accordance with ANSI C37.30.
- D. The normal, unconditioned ambient temperature range of the job site will vary between10° to 110 °F. All equipment shall be rated to operate at continuous full load under these temperature ranges. Any additional provisions for cooling or heating shall be provided to meet these requirements at no additional cost.

### 1.10 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals covering instructions and maintenance on each type of equipment shall be furnished per Section 16080 Electrical and Instrumentation Operations and Maintenance Data.

# PART 2 MATERIALS

## 2.01 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 have adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. Provide the manufacturer's latest design that conforms to these Specifications.
- 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, 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, establish a standard of quality and do not prohibit the use of approved equal of other manufacturers. However, all provided products specified or not, must be favorably reviewed and approved by the ENGINEER prior to installation.
- D. Underwriter's 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 testing, 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. It is the System Supplier's responsibility to visit jobsite to collect and document existing equipment MCC device part numbers in order for all similar called out new equipment to match existing.

## 2.02 COMPONENTS

- A. SWITCHES AND LIGHTS
- B. Relays and Timers:
  - 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. A minimum of two isolated form C contacts, shall be provided on each timer or relay. 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 otherwise shown on the Contract Drawings or when relay is utilized in 24VDC control circuits. Relays and timers shall be designed for continuous duty. All relays shall be UL listed. The following is a summary of abbreviations associated with relays and timers:
    - a. CR- control relay
    - b. ISR intrinsic safe relay
    - c. PFR power fail relay
    - d. TR time delay relay
    - e. TDOE time delay on energization
    - f. TDOD time delay on dropout
  - 2. Control relays (CR) shall be plug-in type with clear see-through sealed or enclosed housing to exclude dust. Contact material shall be silver cadmium oxide. Relay shall be rated for 110% of rated voltage and have a frequency response of 1800 operations per hour. Sockets for plug-in relays shall be standard industrial 8 or 11 blade type with barrier pressure screw terminals. Provide relay energized neon lamp or LED (inside relay case). Provide IDEC type RH, Potter and Brumfield, or approved equal.
- C. 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, except when protecting motor feeders where motor circuit protector (MCP) breakers with adjustable magnetic trip shall be used. 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 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.

Circuit breakers and motor circuit protectors shall be manufactured by GE, Cutler-Hammer, ITE, or approved equal.

- 2. Breakers shall be sized and have a minimum interrupting capacity as shown on Drawings and as required for the supplied equipment.
- 3. Breakers requiring GF trip on E-Series Drawings shall be provided with breakers with integral ground fault trip.
- 4. Thermal magnetic circuit breakers with frames 250A and above shall be provided with removable interchangeable trip units.
- 5. Breaker for HVAC equipment shall have HACR rating.
- 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.
- D. Motor Starters:
  - 1. Motor starters (M) shall be 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.
  - 2. 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.
  - 3. Starters shall have adjustable 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.
- E. Control Power Transformer:
  - 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 for interrupt amperes shown on Contract Drawings shall be provided. Transformer size minimum ratings shall be as shown on Contract E-Series Drawings. When size is not shown on E-series Contract Drawings, then the following lists the minimum control power transformer per NEMA Starter size or VFD/Soft Starter size:

CONTACTOR	
NEMA SIZE	CTRL PWR XFMR
STARTER	<b>VA RATING</b>
SIZE 00	150
SIZE 0	150
SIZE 1	150
SIZE 2	150
SIZE 3	250
SIZE 4	250
SIZE 5	250

CONTACTOR	
NEMA SIZE	CTRL PWR XFMR
STARTER	<b>VA RATING</b>

- 2. The MCC supplier shall increase the CPT size by the VA rating of the motor heater when motors have heaters.
- F. Elapsed Time Meters:
  - Elapsed time meters (ETM) for general use shall be nonresettable with 0.0 to 99,999.9 hour readout, permanently lubricated synchronous motor drive, nominal 2-1/2" circular two-hole surface front panel mount housing, screw terminals, and rated at 120 VAC, at 60 Hz. Elapsed time meters shall be Stemco-Engler Series, 710-0002, Yokogawa, or approved equal.

### 2.03 ELECTRICAL ENCLOSURES AND BOXES

A. Enclosures to be NEMA rated per Indexes with fast access door latches. Enclosure construction shall be 14 gauge minimum with continuously welded seams. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in each box. Provide thermoplastic data pocket mounted on inside door. Provide enclosures with accessories consisting of breaker to disconnect incoming power, padlockable disconnect for breakers used in circuits above 120VAC, heater, fan, removable metal filters, louvers, and thermostats. Enclosure shall be Hoffman, Circle AW, or approved equal.

## 2.04 MOTOR CONTROL PANELS

- A. Provide motor control panels with padlockable main disconnect, motor circuit protector (MCP), auxiliary contacts for remote SCADA monitoring, control power transformer, elapsed time meter (ETM), HOA selector switch, reset pushbutton, starter with motor overloads, terminal blocks, relays, and interlocks as shown on Contract Drawings.
- B. Motor controls shall be mounted on a backpan and installed in a NEMA rated enclosure. Enclosure shall have a padlockable disconnect switch for locking out pump operation and controls.
- C. Motor control panel shall be Siemens, or approved equal.

#### 2.05 SAFETY LOCKOUTS

A. Safety lockouts per subsection 3.08.

#### PART 3 EXECUTION

- 3.01 WORKMANSHIP
  - A. All work in this Section shall conform to the codes and standards outlined herein.

- B. The 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. The CONTRACTOR shall ensure that all equipment and materials fit properly in his installations.
- D. The CONTRACTOR shall 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.
- F. All cutting and notching shall be laid out carefully in advance. Do not notch any structural member or building surface without specific approval from the ENGINEER. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to new condition using skilled craftsmen of the trades involved. Refinish damaged surfaces to new condition using skilled craftsmen of the trades involved at no additional cost to the OWNER.
- G. Keep the premises free from accumulation of waste material or rubbish on a daily basis. Upon daily completion of work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment.
- H. All equipment installed by the CONTRACTOR shall be in accordance with the Drawings and the manufacturer's recommendations and instructions and shall operate to the ENGINEER'S satisfaction. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment. 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. 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.
- I. The CONTRACTOR shall vacuum clean the interior of all motor control centers, panelboards, junction boxes and other enclosures supplied under this project containing electrical equipment to remove all dirt, metal chips, stripped insulation, etc., from the enclosure. This cleaning shall be done prior to energizing the device initially and a second time immediately prior to the final acceptance inspection.

### 3.02 CONSTRUCTION METHODS, GENERAL

- A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by 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, Panduit, 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. Wireways, retainers, and other devices shall be screw-mounted with round-head 316 stainless steel screws. Glue or sticky back attachment of any type or style shall not be used.
- D. All devices and wiring shall be installed and permanently labeled and secured in accordance with Section 16052 Nameplates.
- 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. 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 nylon selfinsulated twist on wire joints; T&B "Piggys", Panduit, or approved equal. Twist shall be UL listed for service voltage.
  - 2. Splices of #8 and larger shall be double crimped splices, or approved equal, insulated with heat shrink tubing, or approved equal.
  - 3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast fast curing epoxy powdered resin splice kits. Kits used shall have a date marking for shelf life that is not expired. Kit shall be UL listed for electrical insulating systems.
  - 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.

- I. Tapes shall conform to the requirements of UL 510 and be rated: 105 °C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mile 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.
- J. 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, de-burred, electrotin plating with flat bottom box.
    - b. For #8 to #4/0 wire, T&B "Locktite", Burndy QA lug of shape best suited with code copper conductor (for 600V).
  - 3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.
  - 4. Connections for all terminals shall be made with insulation stripped per manufacturer's instructions.
- K. 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, 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.
- L. Mating fittings, bulkhead fittings, plugs, connectors, etc., required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.
- M. All electrical and instrumentation 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.

# 3.03 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 nonshrinkable, 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 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. 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.
- G. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 312-6 (A) and (B).
- H. Wire sizes shall not be installed smaller than those shown in NEC Article 310 for each circuit amperage rating.
- I. 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.
- J. Doors shall swing freely a minimum of 90° and close with proper alignment.
- K. All control, power, and signal wires inside enclosures shall be run in separate plastic wireways. Wireways shall not be filled over 50% capacity.

### 3.04 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.

#### 3.05 DAMAGED PRODUCTS

A. Damage products will not be accepted. All damaged products shall be replaced with new products.

### 3.06 FASTENERS

- A. Fasteners for securing equipment to walls, floors, and the like shall be stainless steel. The minimum size fastener shall be 3/8-inch diameter. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required
- B. 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.
  - 4. Concrete Surfaces: Wedge or expansion anchors.
  - 5. Structural Steel: Right angle, parallel and edge type rigid metal clamps. Do not weld or drill structural steel.
- C. Equipment Mounting:
  - 1. The CONTRACTOR shall be responsible for furnishing and setting all anchor bolts required to install his equipment.
  - 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, anchors and fasteners 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 stainless steel anchor bolts shall be provided for each electrical freestanding equipment.
- D. 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.

#### 3.07 INSTALLATION, GENERAL

- A. System:
  - 1. Install all products per manufacturer's recommendations and the Drawings.
  - 2. Provide relays, signal converters, isolators, boosters, and other miscellaneous devices as required.
  - 3. Change normally open contacts to normally closed contacts or visa versa.
  - 4. Adding additional relays to provide more contacts as necessary.
  - 5. 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. Panels and Enclosures:
  - 1. Install panels and enclosures at the location shown on the Drawings or approved by the ENGINEER.
  - 2. Install level and plumb.
  - 3. Seal all enclosure openings to prevent entrance of insects and rodents.
- 4. 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.
- 5. Clearance about electrical equipment shall meet the minimum requirements of NEC 110-26.
- C. 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, the originating panel. The shield at the other 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.
- D. Cutting and Patching:
  - 1. 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.
- E. Seals:
  - Seal around all conduits, wires, and cables penetrating between 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.
  - 2. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.
  - 3. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.
- F. Cleaning and Touch up:
  - 1. Prior to startup and at the 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.

## 3.08 SAFETY LOCKOUTS

- A. CONTRACTOR shall provide safety lockout tags on the breakers for all MCCs and Panelboards and other electrical enclosures. Safety tags shall not be the same as those used by the OWNER. All padlocks used for this purpose shall be keyed differently from any of the OWNER'S padlocks. Padlocks shall remain in place by the CONTRACTOR until operation of the portion of work is turned over to the OWNER with the responsibilities noted on the acceptance form.
- B. The following is the procedure for transferring each portion of work over to the OWNER prior to completion of the entire project:
  - 1. CONTRACTOR shall inform the OWNER when a portion of the work is complete, ready for inspection and available to be placed into operation.
  - 2. The OWNER will schedule the inspection and substantiate that the work is complete and operational.
  - 3. The CONTRACTOR will correct any deficiencies.
  - 4. The OWNER will prepare a Partial Utilization form in which that portion of the project will be turned over the OWNER with the responsibilities noted on the acceptance form. The CONTRACTOR then shall remove his safety lockouts and tags.
- C. Safety lockout tags shall be rigid vinyl with write-on surface and brass grommet. Safety tags shall be secured in place with cord of sufficient strength to prevent accidental removal or displacement. Lockout shall meet OSHA standard 1910.147 requirements. Safety lockouts shall be Panduit write-on Safety Tags, model PVT-98, or approved equal.

#### 3.09 WARRANTY

- A. The CONTRACTOR shall warrant all electrical and instrumentation equipment and software programming supplied under this Division 16 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 System Supplier shall have a staff of experienced personnel available to provide service on a two (2) working day notice during the warranty period. Such personnel shall be capable of fully testing, programming and diagnosing the hardware and software delivered; and of implementing corrective measures.
- D. If the System Supplier fails to respond in two (2) working days, the OWNER at its option will proceed to have the warranty work completed by other resources; the total

cost for these other resources shall be reimbursed in full by the CONTRACTOR. The use of other resources, as stated above, shall not change or relieve the CONTRACTOR or supplier from fulfilling the remainder of the warranty requirements.

- E. Each time the System Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated OWNER maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction of the OWNER Staff. The OWNER reserves the right at its sole discretion to deny operations requested by the System Supplier. A written description of all warranty work performed shall be documented on a field service report to be given to OWNER prior to the repair person leaving job site each day. This field service report shall detail and clearly state problem, corrective actions taken, additional work that needs to be done, data, repair person name and company.
- F. 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.
  - 2. Material and equipment description, equipment number, part number, serial number, and model number.
  - 3. Manufacturer's warranty expiration date.

# 3.10 FINAL ACCEPTANCE

- A. Final acceptance will be given by the OWNER after the equipment has passed the "final acceptance trial period", each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.
- B. Upon completion of the project, prior to final acceptance, remove all temporary services, equipment, material, and wiring from the site.
- C. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall provide the following to the OWNER:
  - 1. A listing of warranty information.
  - 2. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.
- D. Prior to final acceptance 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.

# END OF SECTION

# SUPPORTING DEVICES

# PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall install, ready for use, the supporting devices as specified herein. 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 required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter at no additional cost to the OWNER.
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, incidentals, and services to provide supporting devices as shown on the Drawings, included in these Specifications, or required for fully operating facilities.
- C. Work includes that specified in Division 16.
- D. The supporting devices scope of work includes:
  - 1. Provide all necessary hardware, supporting devices, and devices to support and align raceways, cabinets, boxes, fixtures, and other appurtenances in an approved manner and as herein specified.
  - 2. The location of field control stations on Drawings are tentative. During construction, the OWNER will direct the CONTRACTOR, the exact position and direction of orientation at no additional cost to the OWNER.

#### 1.02 SUBMITTALS AND DRAWINGS

- A. Provide Submittals and Drawings as specified in Section 1300 Submittals.
- B. Submit detailed fabrication Drawings showing material of construction for each type of support.
- C. Submit dimensioned supporting device Drawings for each type of enclosure, instrument, and panel. The mounting tab locations for device mounting shall be clearly shown and dimensioned.

# PART 2 MATERIALS

### 2.01 SUPPORTING DEVICES

- A. General: Materials, and installation shall meet all requirements of the NEC, and meet the minimum following Specifications.
  - 1. Inserts, hangers, brackets and miscellaneous supports for electrical equipment and conduits must be designed with minimum safety factor of 4, based on ultimate strength of material used. For empty conduits, include weight of 4 Type XHHW copper wires of maximum permissible size.
  - 2. Secure hangers, brackets, conduit straps, supports and electrical equipment as specified in Electrical Section 16010 Fasteners.
  - 3. Power driven or velocity driven inserts may be used where their use does not affect finished appearance of work, but may not be used on structures in tension. They may not be used in prestressed slabs, beams, purlins, or in precast members.
  - 4. All concrete embedded bolts shall be 316 stainless steel.
  - 5. Support channels steel shall conform to the requirements of ASTM A570 and be nominal 1 5/8" x 1 5/8". One side of the channel shall have a continuous slot with in-turned lips. Double strut shall be two of these welded back to back.
- B. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding.
- C. Conduit Supports:
  - 1. Single Conduit Hangers: 3/8" minimum diameter stainless steel rod or anchor.
  - 2. Trapeze Hangers: Channel with 1/2" minimum diameter stainless steel rods.
  - 3. Supports for Indoors in Non-Corrosive/Dry Locations:
    - a. Hangers, channels, clamps, supports and rods; galvanized steel.
    - b. Conduit straps and single hole clamps; galvanized.
    - c. Steel bolts, screws, nuts and washers; galvanized.
    - d. Paint surfaces to match adjacent finishes.
  - 4. Supports for Outdoors, Corrosive/Wet, and NEMA 4X Locations:
    - a. Hangers, channels, clamps, supports and rods; 316 stainless steel. Fiberglass may be used when approved in writing by ENGINEER.
    - b. Conduit straps and single hole clamps; 316 stainless steel or PVC-coated galvanized steel with PVC coated backplates.
    - c. Bolts, screws, nuts and washers; shall be 316 stainless steel. 5. All supports shall be braced at 10-foot intervals, minimum.
- D. Equipment and Device Supports:
  - 1. Equipment and device supports shall be similar to that detailed on the Contract E- series Drawing "Typical Electrical Details."
  - 2. In wet and/or corrosive environments, all metal brackets and fasteners shall be 316 stainless steel.

# PART 3 EXECUTION

#### 3.01 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
- B. The Supplier shall employ personnel that are skilled and experienced in the installation of support devices 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.

### 3.02 INSTALLATION

- A. System:
  - 1. Install all products per Section 16010 Electrical.
  - 2. Restore to original condition apparatus or equipment damaged prior to final acceptance. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.
- B. Conduit Supports Installation Conduits shall be secured using approved manufactured supports, connectors, and securing devices. Conduits shall be supported independently of one another.
  - 1. Single Runs: Conduit straps with backplates or ring bolt type hangers with specialty spring clips. Do not use plumbers perforated straps.
  - 2. Multiple Runs: Unistrut conduit rack with 25 percent spare capacity.
  - 3. Provide additional supports where obviously required or as directed by ENGINEER.
- C. Equipment and Device Supports: Install plumb and level. Install anchors as listed in the approved seismic calculation submittals. Provide grout bases around all floor supports.

#### 3.03 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.

# END OF SECTION

# NAMEPLATES

# PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. CONTRACTOR shall provide nameplates for all instruments, panels, enclosures, devices and equipment.
- B. All nameplates shall be of the identical style, color, and material throughout the system.
- C. Work includes that specified in Section 16010 Electrical.
- D. Provide and install nameplates as specified herein.

#### 1.02 SUBMITTALS AND DRAWINGS

- A. Provide submittals and Drawings as specified in Section 16010 Electrical.
- B. Submit schedule of all nameplates to be used on project. Submittal to include the following drawn with AutoCAD or equivalent printout:
  - 1. Dimension of nameplate.
  - 2. Exact lettering and font for each nameplate.
  - 3. Color of nameplate.
  - 4. Color of lettering.
  - 5. Materials of construction.
  - 6. Method and materials for attachment.
  - 7. Drawing showing location of nameplate on each panel and enclosure.

# PART 2 MATERIALS

#### 2.01 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 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 "Equipment Name and Equipment Number" 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, 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  $\frac{1}{2}$ " high letters and be engraved with designations as shown on one-line Drawings.
- 6. All disconnect switches shall have nameplates with ½" high letters and be engraved with designations as shown on one-line drawings or as directed by OWNER.
- B. Equipment Interior Nameplates: Nameplate material shall be clear plastic with black machine printed lettering machine; except caution, warning, and danger nameplates shall have red lettering. 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. 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. Nameplates shall not be attached to wire way covers or to removable devices.
- C. Equipment Tags: The CONTRACTOR shall attach a tag to the equipment (including instruments) when there is not adequate room to place a nameplate. The tag shall be made from 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 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 nameplates and 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 1/2" letters minimum and labeled with P&ID tag number.

# PART 3 EXECUTION

#### 3.01 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
- B. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Perform any required work to correct improper installations or nameplates at no additional expense to the OWNER.
- D. Nameplates shall be readily visible and not painted over.
- E. Damaged or pained over nameplates shall be immediately replaced.
- F. Phenolic nameplates that are glued on shall be replaced with screw attached nameplates.

## 3.02 INSTALLATION

- A. Install all products per Section 16010 Electrical.
- B. Securely fasten nameplates in place using two stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable.
- C. All nameplates shall be in place prior to the start of any field test.

END OF SECTION

# GROUNDING

## PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall install, ready for use, the grounding system as specified herein. This document describes the function of the grounding system and particular components but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as required to provide a complete grounding system for accomplishing the functions and meeting the performance set forth hereinafter at no additional cost to the OWNER.
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide a complete grounding system as shown on the Drawings or included in these Specifications.
- C. Work includes that the grounding system scope of work includes:
  - 1. Provide and install miscellaneous trenching, grounding system wiring, and associated hardware.
  - 2. Related work specified in Section 16010 Electrical.

#### 1.02 SUBMITTALS AND DRAWINGS

A. Provide Submittals and Drawings as specified in Section 1300 Submittals for all grounding system components.

#### PART 2 MATERIALS

- 2.01 SERVICE GROUNDING
  - A. The main ground bonding wire from the ground shall extend up into the utility service entrance main switchboard for the visible connection with a UL approved "ground clamp" attached to the ground bus.
  - B. Network ground bond wires shall be connected between locations shown on Contract Drawings.
  - C. The system neutral 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. The grounding of the system neutral shall be in the enclosure that houses the service entrance main breaker.

- D. Ground grid and bond wires shall be AWG bare copper as manufactured by Southwire, Houston Wire or approve equal. Ground grid and bond wires shall be sized as shown on the Plans or in accordance with NEC Table 250-66, whichever is greater.
- E. The ground rods shall consist of not less than 10 continuous feet of <sup>3</sup>/<sub>4</sub>-inch copper coated electroplated high grade carbon steel. The ground rods shall be pointed type, UL listed, manufactured of 1035 cold drawn steel. The ground rods shall extend up for visible connection of a UL approved "ground clamp".
- F. Provide 14-inch diameter, 9-inch nominal throat, 12 inches depth minimum, concrete ground rod boxes where shown on plans. Boxes to have cast iron traffic cover embossed or engraved "GROUND." Ground rod boxes to be as manufactured by BES Concrete Products, Christy Concrete Products, or approved equal.
- G. All grid and bond wire connections shall be made with U.L. approved material and methods. Ground clamps & connectors shall be made of cast bronze.

# 2.02 RACEWAY, EQUIPMENT AND ENCLOSURE GROUNDING

- A. All raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.
- B. Ground clamps shall be bolt-on cast bronze type UL listed for grounding.
- C. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250- 122, whichever is greater.
- D. Bonding wires shall be installed on ends of all metallic conduits with grounding bushings, expansion joints, and for continuity of raceways transitions. Bonding wires shall be solid bare copper sized and installed per NEC 250-102. Bonding wires at endpoints shall be connected to enclosure ground bus or equipment grounding lug.
- E. All equipment and devices shall be grounded in a manner that satisfies the requirements of the National Electrical Code.
- F. One side or neutral of the secondary on all transformers shall be grounded to the ground bus or ground bond wire.
- G. All receptacles shall have their grounding contact connected to a grounding conductor.
- H. 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.
- I. All metallic light fixture enclosures and ballasts shall be grounded.

- J. 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.
- K. The negative side of all DC power supplies shall be grounded.

# 2.03 ENCLOSURE GROUND BUS

- A. Each electrical, control and instrumentation enclosure shall be provided with a copper grounding bus bar, mounted on the inside of the enclosure. The grounding bar shall be mounted on non- insulated standoffs so that a good electrical connection is made between the ground bar and the cabinet through the mounting.
- B. The bus bar shall be sized to meet the panel grounding requirements of NEC.
- C. Each ground bus shall be copper and UL recognized. Screw type fasteners shall be provided on all ground buses for connection of grounding conductors. Ground bus shall have a minimum of 10 taps, and be rated for copper conductors. Ground bus shall be an ILSCO CAN Series, or approved equal.

# PART 3 EXECUTION

- 3.01 WORKMANSHIP
  - A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
  - B. The Supplier shall employ personnel that are skilled and experienced in the installation grounding system, 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. All grounding system components installed by the CONTRACTOR shall be in accordance with the Drawings, NEC, and the manufacturer's recommendations and instructions.

# 3.02 INSTALLATION

- A. System:
  - 1. Install all products per Electrical Section 16010 Installation.
  - 2. Provide a separate grounding conductor in each raceway, securely grounded to equipment at each end of raceway.
  - 3. Bond metal piping and building structure metal frames to grounding electrode per NEC.

- 4. CONTRACTOR shall not conceal or cover any ground connections until the ENGINEER or OWNER has established that every grounding connection conforms to the Contract Drawings and Specifications and has given the CONTRACTOR written confirmation.
- 5. Grounding details shown on plans are minimum. If additional equipment, such as ground rods, clamps, conductors, etc., is required per NEC, and Title 24 CAC, furnish and install same without additional cost to OWNER.
- B. Connections:
  - 1. Use U.L. approved cast bronze ground clamps specifically designed for grounding purposes. Strap metal is not acceptable for grounding or bonding.
  - 2. Exposed connections to ground buses, raceways, and small pipes shall be made by means of U.L. approved grounding clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or approved equal.
  - 3. All buried, ground rod, large pipe, and steel plate or frame ground bond connections shall be made by welding process equal to CADWELD.
- C. Electrical Equipment Grounding:
  - 1. Metal conduits shall be bonded together to the enclosure ground bus.
  - 2. Lightning arresters or suppressors, shall be directly connected to the ground system using copper conductors sized per manufacturer's literature.
  - 3. Transformer secondary neutrals shall be directly connected to the ground system using copper conductors sized as per NEC.
  - 4. All motors shall be grounded by bonding the grounding conductor within the raceway to the motor frame. Motors as shown on Electrical Plans shall also have a supplemental grounding conductor bonded to the ground grid in the immediate area of the motor.
  - 5. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall be equal to panelboard neutral bus amp rating and shall have adequate quantity of lugs. No more than two grounding conductors shall be installed per lug.
- D. Excavation and Back Filling:
  - 1. Trenches for all bare copper ground bond wires shall be excavated to a minimum depth of 30".
  - 2. Back filling shall be done only after grounding system has been inspected. Excavation and back fill of grounding system shall conform to the requirements of Division 2 of these Specifications.
  - 3. At all times during the installation of the grounding system, the CONTRACTOR shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.
- E. 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 and painted to their original condition after cutting and patching.

# 3.03 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.

END OF SECTION

# ELECTRICAL IDENTIFICATION

# PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes: Identification of electrical conductors, raceways and equipment, and electrical equipment signs.

#### 1.02 REFERENCES

- A. National Electrical Code (NEC):
  - 1. Article 110–22 Disconnecting Means.
  - 2. Article 210–4 Multiwire Branch Circuits.
  - 3. Article 200 Use and Identification of Grounded Conductors.
  - 4. Article 384 Switchboards and Panelboards.
  - 5. Article 300 Wiring Methods.

#### 1.03 SUBMITTALS

- A. Shop Drawings:
  - 1. General: Submit shop drawings for electrical equipment room layouts, drawn at a minimum at 1/4 inch = 1 foot, scale.
  - 2. Cross Reference: Diagram shall carry a uniform and coordinated set of wire numbers and terminal block numbers to permit cross-referencing between the contract document drawings, the drawings prepared by the CONTRACTOR, and equipment O&M Manual Drawings.
  - 3. Drawing number cross references and continuation references shall also be provided. CONTRACTOR-prepared drawings shall reference applicable CONTRACTOR drawings such as P&IDs, control and logic diagrams, interface wiring diagrams, panel drawings, etc. CONTRACTOR-prepared drawings shall also reference applicable drawings provided by equipment manufacturers.
  - 4. On any drawing prepared for this project, if a wire, circuit, enclosure, panel, or device is continued on another drawing, the continuation drawing shall be referenced (and vice-versa). Wherever wires are shown connected to terminals, the drawings which show the continuation of the circuits on those terminals must be referenced.
  - 5. Interconnection Diagrams: Cables shall not be installed into raceways until the wiring interconnection diagrams are reviewed by the design engineer.
  - 6. Include tagging system, labels, markers, hazard tape, nameplates and signs.
- B. Product Data: Include tagging system, labels, markers, and hazard tape.
- C. Project Record Documents:

- 1. Document wire, cable, and conductor tags, and bundle tags installed in accordance with the Contract Documents.
- 2. Document installed wire, cable, and conductor tags and bundle tags when not specifically indicated.
- 3. Indicate on Record Drawings deviations from accepted shop drawing conductor identification.

## 1.04 QUALITY ASSURANCE

- A. Pre-installation Conference:
  - 1. Purpose: To clearly define requirements specified for circuit/cable/conductor identification, hold a meeting including representatives of CONTRACTOR, OWNER, and ENGINEER prior to significant cable or conductor purchase and installation/termination.

# PART 2 PRODUCTS

- 2.01 LABELS
  - A. Manufacturers: One of the following or equal:
    - 1. Brady.
    - 2. Seton.
  - B. Type: Sleeve type.

#### 2.02 CONDUCTOR AND CABLE MARKERS

- A. Manufacturers: One of the following or equal:
  - 1. Brady.
  - 2. Seton.
- B. Type: Slip-on PVC sleeve or strap-on type.
- C. Printed using Brady marker "XC PLUS," or equal.
- D. Markers used in tunnels or other wet locations shall be on heat-shrinkable marking sleeves.
- E. Use self-laminating vinyl on white background for markers within electrical equipment such as panels, termination cabinets, motor control centers.

# 2.03 RACEWAYS IDENTIFICATION (TAGS)

A. Conduit numbers shall be pressure stamped into a noncorrosive 2 inch long, 1/2 inch wide stainless steel tape, Dymo marking system or equal. A tag with number shall be fixed with No. 18 AWG or larger type 304 stainless steel wire, to each conduit segment and at the end of each conduit and within 3 feet of each pull box, panelboard and switchboard.

## 2.04 NAMEPLATES, LABELS AND SIGNS

- A. Nameplates:
  - 1. Type: Black lamicoid with white letters.
  - 2. Fastener: Round head stainless steel screws.
- B. Automatic Equipment and High Voltage Warning Signs:
  - 1. Type: Suitable for exterior use and meeting OSHA regulations.
- C. Underground Hazard Tape: 6 inches wide.
  - 1. Manufacturers: One of the following or equal:
    - a. Panduit.
    - b. Thomas and Betts.

# PART 3 EXECUTION

### 3.01 CIRCUIT IDENTIFICATION

- A. Identify 3-phase system conductors and cables as Phases A, B, and C and identify 1phase system conductors and cables at electrical equipment including, but not limited to, switchgear, switchboards, panelboards, motor control centers, and motors.
  - 1. Match OWNER'S existing electrical system identification scheme or meet requirements of the authority responsible for the project.
  - 2. 3-phase 480 Volts AC System Conductors: Phase A, brown; Phase B, orange; Phase C, yellow.
  - 3. Single-Phase Conductors for 120/240 VAC Circuits: Phase A, black; Phase B, red; Phase C, blue.
  - 4. Neutral Conductor: White for 120 VAC and gray for 277 VAC.
  - 5. Insulated Equipment Grounding Conductor: Green.
  - 6. General Purpose AC Control Conductors: Purple.
  - 7. General Purpose DC Control Conductors: Purple with white stripes.
- B. Use color coding and phasing consistent throughout the site. Bus bars at panelboards and motor control centers to be connected Phase A-B-C, top to bottom, or left to right facing connecting lugs.
- C. Conductors Number 2 American Wire Gauge (AWG) and smaller to be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables to be coded by the use of colored tape.
- D. In addition to color coding, for all 1-phase and 3-phase systems, identify each cable (single or multi-conductor) and conductor at each end, in each manhole, pullbox, cable tray, or other component of the raceway system. This identification is applicable to all power, control, alarm, signal, and instrumentation cables, and conductors.
- E. Identify each cable (single or multi-conductor) and groups or bundles of individual single conductors in each manhole, pullbox, cable tray or other component of the

raceway system with circuit identification markers. Implement a "from-to" cable/conductor bundle tagging system as part of this identification effort.

- F. Identify each individual conductor at each termination. This includes such locations as switchgear, switchboards, motor control centers, variable frequency drives, control panels, junction/terminal boxes, all field devices, and all other locations where conductors are terminated. Identify the termination of these conductors in accordance with the accepted shop drawings. Tag conductors with sleeve type labels.
- G. Where more than 1 nominal voltage system exists, identify each ungrounded system conductor by phase and system. Permanently post means of identification at each branch-circuit panelboard, switchboard, switchgear, motor control center, or other type of power distribution equipment.
- H. Include the following minimum information for wire and cable identification.
  - 1. Circuit number or load identification tag number.
  - 2. Origin (from source).
  - 3. Destination (to load).

### 3.02 NAMEPLATES

- A. Furnish and install nameplates for all electrical equipment indicated on the Drawings or specified.
- B. Each disconnect means for service, feeder, branch, or equipment conductors and pushbutton stations shall have nameplates indicating its purpose or identifying the load.

#### 3.03 AUTOMATIC EQUIPMENT WARNING

- A. Mount permanent warning signs at mechanical equipment which may be started automatically or from remote locations. Fasten warning signs with round head stainless steel screws or bolts, located and mounted in a manner acceptable to ENGINEER.
- B. Place a warning ribbon or other effective means suitable for conditions above ductbank underground installations.
- C. Place warning signs on utilization equipment that has more than one source of power. Provide panel and circuit number of conductor tag of the power source disconnect.
- D. Place warning signs on utilization equipment that has 120 VAC control voltage source used for interlocking. Provide panel, circuit number, and conductor tag of control voltage source disconnect.

# END OF SECTION

# ELECTRICAL & INSTRUMENTATION OPERATIONS AND MAINTENANCE DATA

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Compile product data and related information appropriate for OWNER'S operation and maintenance of products furnished under the Contract.
- B. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of Specifications for products furnished under the Contract.
- C. Instruct OWNER'S personnel in the maintenance of products furnished under the Contract and in the operation of equipment and systems.
- D. Product data for equipment provided by OWNER is not a part of this Contract.

### 1.02 REFERENCES

A. Related requirements specified in Division 16.

# 1.03 QUALITY ASSURANCE

- A. Preparation of data shall be done by CONTRACTOR'S personnel:
  - 1. Trained and experienced in operation and maintenance of the described products and authorized by the original equipment manufacturer to provide materials for the specified equipment.
  - 2. Completely familiar with requirements of this Section.
  - 3. Skilled as a technical writer to the extent required to communicate essential data to operating personnel.
  - 4. Skilled as a draftsman competent to prepare required Drawings.

# 1.04 SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by OWNER'S personnel. Provide to the OWNER two sets of hard copies in the format described in this section.
- B. Format:
  - 1. Size: 8<sup>1</sup>/<sub>2</sub>-inch by 11-inch. (except drawings)
  - 2. Text:

- a. Manufacturer's printed data properly edited for project. Cross out all data that does not apply to the equipment to be furnished.
- b. All documents shall be machine typed, handwritten documents are not acceptable. All documents shall be legible and original size, documents that cannot be read or have been reduced will be returned for correction.
- 3. Drawings:
  - a. Provide in separate reinforced punched binder to allow drawings to be easily removed.
  - b. For 11-inch by 17-inch shop Drawings provide in an 11½-inch by 17½- inch folder. Do not fold. 11"x17" drawing shall not be reduced for O&M manuals.
  - c. Drawings larger than 11-inch by 17-inch to be placed in an 8½-inch by 11-inch envelopes bound in text.
  - d. Suitably identified on Drawing binder.
  - e. Referenced clearly with index of drawings by title and drawing numbers.
- 4. Binders: Commercial quality, permanent, all white in color, three-ring, durable, cleanable plastic covers with inserts, insertable full height and width, front, back, and spine, with full-page sheet lifters, as manufactured by "K&M Company, Torrance, California 90503, 2-inch with pocket D-Ring View Binders, "Manufacturer No. 79792." Model VS11-20, Wilson Jones D-Ring Binders, or approved equal. All binders shall be 2-inch size.
- 5. Folder: Commercial quality, permanent. Two-hole "Sandwich" type.
- 6. Indexing: The manuals shall be fully indexed by use of "Avery Side Tab Legal Index Exhibit Dividers LGT5S1-25," "Avery Number AVY11370", Wilson Jones Commercial Indexes with pre-printed tabs, or approved equal.
- 7. Cover and Spine:
  - a. The cover sheet format inserted in the front of the view binder shall be as stated above herein.
  - b. The spine format inserted in the spine of the view binder shall list:
    - 1) Volume X of X.
    - 2) Operation and Maintenance Manual.
    - 3) Supplier Name.
    - 4) Project Name.
    - 5) Binder Contents.
- 8. Numbering: Number all pages within the O&M manual. The number shall be located ½-inch from the bottom, centered on each page. The system used within each tabbed section shall be the tab section-page number sequentially numbered (i.e., 1-1, 1-2, 1-3, and so on).
- 9. All of these sets of O & M manuals shall be made up of "original" (no copies or reproductions) documents. No photo or fax copies are allowed of standard published manuals available from manufacturers.
- C. Review:
  - 1. Submittals that are not fully indexed and tabbed with sequentially numbered pages shall be returned without review.
  - 2. The ENGINEER has allowed for up to and including two (2) reviews of each submittal. The ENGINEER shall be reimbursed for all reviews after the first two reviews by the OWNER and the OWNER will deduct the amount of the reimbursement from the CONTRACTOR'S Contract. The ENGINEER'S reimbursement shall be on a time and expense basis and the current billing rate

of the ENGINEER. The ENGINEER shall be the sole source for determining the suitability of any submittal.

D. O&M manual shall be properly completed, submitted, and approved prior to the personnel training.

# 1.05 CONTENT OF MANUALS

- A. Product of Data:
  - 1. Include only those sheets which are pertinent to the specific product.
  - 2. Annotate each sheet to:
    - a. Clearly identify the specific project or part installed.
    - b. Clearly identify the data applicable to the installation.
    - c. Cross-out references to inapplicable information.
- B. Drawings:
  - 1. Supplement product data with Drawings as necessary to clearly illustrate:
    - a. Relations of component parts of equipment and systems. Include individual parts list with exploded views for all equipment.
    - b. Control and flow diagrams.
  - 2. Coordinate Drawings with information in project Contract documents to assure correct illustration of completed installation.
  - 3. Do not use project Contract documents as maintenance drawings.
  - 4. "As Constructed" set of submittal drawings for all items in the electrical system.
  - 5. The CONTRACTOR shall include in his bid price an additional 80 hours of asbuilt documentation changes to be designated during testing and start-up by the ENGINEER or OWNER. All hours not used shall be credited back to the OWNER at rate listed on Bid Schedule.
- C. Written text as required to supplement product data for the particular installation:
  - 1. Organize in a consistent format under separate headings for different procedures.
  - 2. Provide a logical sequence of instructions for each procedure.
- D. Provide the index and information layout in the operation and maintenance manual for each unit of equipment, and system, including electrical, and electronic items as follows:
  - 1. Cover sheet including the following:
    - a. Volume \_\_\_\_\_ of \_\_\_
    - b. Operation and Maintenance Manual.
    - c. Project title.
    - d. OWNER project number.
    - e. Manufacturer:
      - 1) Manufacturer's name.
      - 2) Full address.
    - f. Date.
  - 2. Document Index: Neatly typewritten document index for each volume, arranged as indicated in Appendix "A". Master Table of Contents shall be placed in Volume

1 itemizing all of the information included in the O&Ms and the corresponding volume location of that information.

- 3. Equipment Record or Instrument Data Sheet:
  - a. Equipment record or Instrument Data Sheet.
  - b. A complete list of items supplied, including serial numbers, ranges, options, and other pertinent data necessary for ordering replacement parts.
  - c. Name and location of nearest parts supplier for all equipment.
- 4. Warranty:
  - a. Provide copy of warranty as specified in Section 16010 Electrical. Include procedures in the event of failure.
  - b. Provide copy of substantial completion with corresponding warranty duties.
- 5. Theory of Operation.
- 6. Description. Provide description of units and components parts function, normal operating characteristics, and limiting conditions.
  - a. Include general descriptive bulletins, brochures, or catalog sheets to describe the equipment.
  - b. Performance curves, engineering data, and tests.
- 7. Operating Instructions: Complete, detailed, written English description of the sequence of operating sequence for all control system (including PLC) and operations in all modes. The description shall be specifically prepared for this work, and shall be fully referenced to control diagrams and system components:
  - a. Recommended step-by-step startup, adjustment, calibration and break-in operating instructions.
  - b. Routine and normal operating instructions. Include summer and winter operating instructions as applicable. Also include special operating instructions.
  - c. Recommended step-by-step regulation, control, stopping, and shut-down instructions.
  - d. No photocopies are allowed of standard published manuals available from manufacturers.
  - e. Recommended step-by-step Emergency Instructions.
  - f. Current and desired control settings. Set points shall be documented in O&M manual prior to final acceptance.
- 8. Maintenance Instructions:
  - a. Lubrication schedule and list of lubrication required.
  - b. Detailed service, maintenance and operation instructions for each item supplied. Preventative maintenance to include routine operation, alignment, adjusting and checking. Include illustrations, assembly drawings, and diagrams required for maintenance. Preventative maintenance procedure and schedule for all equipment over a five-year cycle.
  - c. Corrective maintenance to include disassembly, repair, overhaul and reassembly.
  - d. Schematic diagrams of all electronic devices shall be included. A complete parts list with stock numbers shall be provided on the components that make up the assembly.
  - e. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
  - f. No photocopies are allowed of standard published manuals available from manufacturers.

- g. Include Maintenance Program data entry forms.
- h. Original manuals (no copies) shall be provided for all instruments and PLC components.
- 9. Shipping and Installation:
  - a. Receiving and handling.
  - b. Long-term storage and short-term storage.
  - c. Complete step-by-step installation instructions of all components.
- 10. Safety Procedures:
  - a. Manufacturer's safety procedures for operating and maintaining all equipment and materials used.
- 11. List of recommended spare parts:
  - a. Original manufacturer's parts list with manufacturer's current prices. Include complete nomenclature and commercial numbers of replaceable parts.
  - b. Predicted life of parts subject to warranty. Items recommended to be stocked as spare parts.
  - c. Complete nomenclature and commercial number of all replaceable parts.
- 12. Test Data:
  - a. Include all completed and signed test data and forms from factory and field testing.
- 13. Troubleshooting instructions.
- 14. Equipment catalogue sheets and submittals.
  - a. Include copy of all approved submittals supplied.
- 15. Drawings:
  - a. All Electrical & Instrumentation Drawings to include:
    - 1) As-built set of all required Drawings
    - 2) As-built drawings shall be signed and stamped by a registered Electrical Engineer in the State of California.
- 16. Complete software ladder logic printouts.
- 17. Record of all settings or parameters for all programmable devices.
- 18. At the end of the project these manuals shall be updated to show "as-built" or "as- installed" conditions.
- 19. Provide to the OWNER two sets of CDs containing all PDF as-built electrical and instrumentation drawings prepared for this project, and software ladder logic programs. Software disks shall contain the ladder logic program with all support files. These disks shall be the property of the OWNER, for its use on this and future projects.

# PART 2 MATERIALS

NOT USED

# END OF SECTION

# ACCEPTANCE TESTING

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Basic requirements for acceptance testing.
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 1 General Requirements.
  - 2. Section 16010 Electrical: Basic Requirements.

#### 1.02 QUALITY ASSURANCE

- A. Referenced Standards:
  - 1. International Electrical Testing Association (NETA):
    - a. ATS, Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.
  - 2. National Institute for Certification in Engineering Technologies (NICET).
  - 3. National Institute of Standards and Technology (NIST).
  - 4. Nationally Recognized Testing Laboratory (NRTL).

## 1.03 SYSTEM DESCRIPTION

- A. The purpose of field acceptance testing is to verify equipment and system integrity and operation after manufacture, shipping and installation.
  - 1. All equipment included in Division 16 shall receive all routine factory tests required by the applicable industry standards or Nationally Recognized Testing Laboratory (NRTL) and certification of these tests shall be submitted concurrent with shipment to the job site.
  - 2. However, factory testing will not be accepted in lieu of the field acceptance testing requirements specified in this Section.
  - 3. Field testing shall be by a third party.
- B. Test the following:
  - 1. Test all electrical equipment on the project.
  - 2. The following identifies the specific equipment to be tested:
    - a. Step down dry type transformers.
    - b. Low voltage cable:
      - 1) All feeders.
      - 2) All branch circuits:
        - a) Serving VFDs and/or motors.
          - b) Serving a load greater than 100 A.

- 3) All digital communication cables (e.g., Ethernet, Device Net, Modbus, etc.).
- c. Grounding and ground fault protection.
- d. Motors and motor controls.
- e. Functional tests.
- C. Tests and inspections not specifically listed but required to ensure that the equipment is safe to energize and ready for commercial operation, shall be performed.

# 1.04 SUBMITTALS

- A. See Division 1 for requirements for the mechanics and administration of the submittal process.
- B. Submit prior to energizing equipment:
  - 1. Photocopies of field test reports for all applicable pre-energization tests including over-potential, insulation resistance, contact resistance, ratio and excitation, protective device and continuity tests.
- C. Submit within two (2) weeks of the completion of acceptance testing:
  - 1. Final test report signed by the engineering technician including the following information:
    - a. Summary of Project.
    - b. Description of equipment/components tested.
      - 1) Identify equipment by tag numbers and circuit numbers shown on the Drawings.
      - 2) Individual units of switchgear and switchboards shall be identified by manufacturer's section number as shown on Shop Drawings.
    - c. Date and time of each test.
    - d. Visual inspection report.
    - e. Description of tests.
    - f. Test results recorded legibly or typewritten on appropriate test forms.
      - 1) Include acceptance criteria, acceptable range of values or other basis for pass/fail decision.
      - 2) Include "as found" and "as left" results and identify all adjustments or corrections made during testing.
    - g. Conclusions and recommendations.

# PART 2 PRODUCTS (NOT APPLICABLE)

# PART 3 EXECUTION

- 3.01 GENERAL REQUIREMENTS
  - A. Scope:
    - 1. Complete visual inspection, mechanical and electrical operational tests and electrical acceptance tests shall be performed in accordance with NETA ATS.
    - The following paragraphs identify the scope of testing for each item to be tested.
      a. All required tests per NETA shall be performed.

- b. Tests identified by NETA ATS as optional shall be performed when listed below.
- c. Additional tests not required by NETA ATS are also listed when required.
- 3. Perform and report all tests recommended or required by the equipment manufacturer's installation, operation and maintenance instructions, even if not included in NETA ATS or listed below.
- 4. Repairs shall be made when test values do not meet known acceptable values.
  - a. Test report shall clearly indicate "as found" and "as left" values, the cause of the unacceptable values, and the details of the corrective action taken to obtain acceptable results.
- B. Sequencing and Scheduling:
  - 1. Testing shall be performed only after completion of installation of systems and equipment unless the nature of the test requires an exception. a. Do not test partial systems unless specified.
  - 2. Schedule all tests intended to determine fitness for energizing to occur immediately prior to first energizing of equipment.
  - 3. Equipment and systems shall not be energized or placed into service until testing is complete and all unacceptable results have been resolved.
    - a. Except tests that, by their nature, require the equipment in an energized or operational state, such as synchronism-check.
- C. Testing personnel shall have the following system and equipment reference data on site during all testing:
  - 1. Approved Shop Drawings for the Project to include at a minimum:
    - a. Single line diagrams.
    - b. Three-line diagrams.
    - c. Cable schedules.
  - 2. Manufacturers approved Shop Drawings for motor control centers and other major equipment items.
  - 3. Manufacturer's instruction manuals for all equipment.
  - 4. A copy of this Specification Section.
  - 5. Manufacturer's instruction manuals for all test instruments.
  - 6. NETA ATS.

# 3.02 ACCEPTANCE TESTING

- A. Low Voltage Molded Case Circuit Breakers:
  - 1. Perform inspections and tests per NETA ATS 7.6.1.1.
  - 2. Components:
    - a. Test all components per applicable paragraphs of this Specification and NETA ATS.
    - b. Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
    - c. Solid-state trip type: Visual and mechanical inspection and electrical tests per NETA ATS.
  - 3. Record as-left settings.
- B. Grounding:

- 1. Perform inspections and tests per NETA ATS 7.13.
- 2. Components: Test all components per applicable paragraphs of this Specification and NETA ATS.
- C. Motors:
  - 1. Perform inspections and tests per NETA ATS 7.15.1.
  - 2. Components: Test all components per applicable paragraphs of this Specification and NETA ATS.
- D. Motor Controllers:
  - 1. Perform inspections and tests per NETA ATS 7.16.
  - 2. Components: Test all components per applicable paragraphs of this Specification and NETA ATS.
- E. Control System Functional Test:
  - 1. Perform test upon completion of equipment acceptance tests.
  - 2. The test is to prove the correct interaction of all sensing, processing and action devices.
  - 3. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
  - 4. Perform the following tests:
    - a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
    - b. Verify the correct operation of all sensing devices, alarms and indicating devices.
  - 5. Systems to be tested: PLC's and local control system panels.

# END OF SECTION

# WIRES AND CABLES 600 VOLT OR LESS

## PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. 600 Volt Class wire and cable.
  - 2. Instrumentation Class wire and cable.
  - 3. Fire Alarm wire and cable.
  - 4. Communication wire and cable.
- B. Related Sections:
  - 1. Section 16075 Electrical Identification.
  - 2. Section 16085 Electrical Acceptance Testing.
  - 3. Section 16130 Raceway and Boxes.
  - 4. Section 16133 Conduits.

#### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. B 3 Standard Specification for Soft or Annealed Copper Wire.
  - 2. B 8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- B. Insulated Cable Engineers Association (ICEA).
- C. National Electrical Code (NEC):
  - 1. Article 250 Grounding.
  - 2. Article 310 Conductors for General Wiring.
  - 3. Article 760 Fire Alarm Systems.
- D. Underwriters' Laboratories, Inc., (UL):
  - 1. UL 1277 Subject Electrical Power and Control Tray Cables with Optional Opticalfiber Members.

#### 1.03 SUBMITTALS

- A. Shop Drawings: Show splice locations. Submit cable pulling calculations for all cable feeder larger than 2/0 AWG and pulling lengths longer than 200 feet. Submit cable pulling calculations for all conductor runs longer than 400 feet.
- B. Product Data: Include wires, cables, pulling compounds, and splicing materials.

### 1.04 QUALITY ASSURANCE

- A. Conform to ASTM and ICEA standards.
- B. Furnish mechanical conductor connector and heat-shrink type insulation by same manufacturer.

# PART 2 PRODUCTS

- 2.01 WIRE AND CABLE MATERIALS
  - A. Conductors: ASTM B 8, soft drawn copper, maximum 12 months old, minimum 97 percent conductivity. American Wire Gauge (AWG) sizes as indicated on the Drawings, Class B or C stranded.
  - B. Insulation Thickness: Minimum specified by NEC Article 310.
  - C. Conductor Sizes: As indicated on wiring schedules and Drawings.

# 2.02 600-VOLT CLASS CABLE

- A. Power Wire and Cable:
  - 1. Manufacturers: One of the following or equal:
    - a. Okonite Company.
    - b. BICC Cable.
    - c. Rockbestos Company.
    - d. Rome Cable Corporation.
- B. Control Wire and Cable:
  - 1. Manufacturers: One of the following or equal:
    - a. Okonite Company.
    - b. BICC Cable.
    - c. Rockbestos Company.
    - d. Rome Cable Corporation.
- C. Insulation for Individual Wires or Multiple Conductor Cable for Power and Control Circuits:
  - 1. Type XHHW-2 insulation to be used in all locations.
- D. Jackets for Multiple Conductor Cable for Power and Control Circuits: Type CPE.
- E. Multi-Conductor Cable Insulated Grounding Conductors:
  - 1. Color: Integral green.
  - 2. Sizes: In accordance with NEC 250-122.
- F. Solid-conductor wire, Number 12 AWG and smaller, may be used only for lighting and receptacle circuits.

# 2.03 INSTRUMENTATION CLASS CABLE

- A. Single Pair or Triad Applications:
  - 1. Manufacturers: One of the following or equal:
    - a. The Okonite Company, Okoseal-N Type P-OS.
    - b. Equivalent manufactured by Cooper Industries, Belden Wire and Cable Division.
- B. Multiple Pair or Triad Applications:
  - 1. Manufacturers: One of the following or equal:
    - a. The Okonite Company, Okoseal-N Type SP-OS.
    - b. Equivalent manufactured by Cooper Industries, Belden Wire and Cable Division.
- C. Approved for cable tray installation in accordance with the National Electrical Code.
- D. Number of Individually Shielded, Twisted Pairs and Triads: As indicated on the Drawings or as necessary for the application.
- E. Voltage Rating: 600 volts.
- F. Cable Type: TC.
- G. Temperature Rating: 90 degrees Celsius dry location, 75 degrees Celsius wet location.
- H. Conductors: Bare, soft annealed copper in accordance with ASTM B 3, Class B, 7 strand concentric in accordance with ASTM B 8.
- I. Conductor Insulation: Flame-retardant polyvinyl chloride, 15 mils nominal thickness, with nylon jacket 4 mils nominal thickness, 90 degrees Celsius temperature rating in accordance with Underwriters' Laboratory Subject 1277.
- J. Color Code: Provide conductor color code as specified in Section 16075 Electrical Identification.
- K. Single Pair or Triad Shielding:
  - 1. Group Shielding: Minimum 1.35 mil double-faced aluminum/synthetic polymerbacked tape overlapped to provide 100 percent coverage.
  - 2. Drain Wire: 7-strand tinned copper drain wire, 2 sizes smaller than conductor.
- L. Multiple Pair or Triad Shielding:
  - 1. Group Shield: 1.35 mil aluminum-polyester tape overlapped to provide 100 percent coverage and a 7-strand tinned copper drain wire, 2 sizes smaller than conductor. Completely isolate group shields from each other.
  - 2. Cable Shield: 2.35 mils double-faced aluminum and synthetic polymer backed tape overlapped to provide 100 percent coverage and a 7-strand tinned copper drain wire, same size as conductors.

- M. Jacket: Black, flame-retardant in accordance with Underwriter's Laboratory Subject 1277, 90 degrees Celsius temperature rating, rip cord laid longitudinally under jacket to facilitate removal.
- N. Conductor Size: Number 16 AWG minimum unless otherwise indicated on the Drawings.
- O. Numerically identify one conductor within each pair and triad.

# 2.04 RELATED MATERIALS

- A. Splicing Material:
  - 1. In conformance with ANSI C119.1, IEEE 383, and ICEA 5-19-81.
  - 2. Manufacturers: One of the following or equal:
    - a. Elastimold.
    - b. Thomas-Betts.
    - c. Raychem, FCSM Series.
- B. Wire Nuts:
  - 1. Rated 600 volt with live-spring feature for tight fitting connections.
  - 2. Manufacturers: One of the following or equal:
    - a. 3M.
      - b. Thomas and Betts.
- C. Junction Boxes and Terminal Cabinets: As specified in Section 16130 Raceway and Boxes.
- D. Pulling Compound: As recommended by conductor manufacturer.
- 2.05 WIRE AND CABLE FABRICATION
  - A. Permanently mark American Wire Gauge (AWG) size, grade of insulation, voltage, and manufacturer's name on outer covering at maximum 24-inch intervals.
  - B. Identify and mark conductors in accordance with NEC Article 310.
  - C. Color code wire and cable as specified in Section 16075 Electrical Identification.
    - 1. Integrally color insulation for Number 2 AWG and smaller.
    - 2. Wrap colored tape around cable larger than Number 2 AWG.
  - D. Fabricate cable ends with provisions for field testing.

# 2.06 SOURCE QUALITY CONTROL

A. Test full lengths in accordance with ASTM and ICEA Standards.

# PART 3 EXECUTION

# 3.01 INSTALLATION

- A. Install continuous circuit conductors from source to load without splices or terminations in intermediate manholes or pull boxes, except for Number 10 AWG and smaller conductors for lighting and receptacles.
- B. Splices:
  - 1. Where splices are necessary because of extremely long wire or cable lengths that exceed standard manufactured lengths, install and label junction boxes for power conductors or termination cabinets for control and instrument conductors.
  - 2. Power and control conductors routed in common raceways may be spliced in common junction boxes.
  - 3. Install NEMA 4X junction and terminal boxes in wet and outdoor locations. Clearly label junction and terminal boxes containing splices with the word "SPLICE."
  - 4. Leave sufficient slack at junction boxes and termination boxes to make proper splices and connections. Do not pull splices into conduits.
- C. Properly coat wires and cables with pulling compound before pulling into conduits and prevent mechanical damage to conductors during installation.

# 3.02 600-VOLT CLASS CABLE

- A. Size power conductors in accordance with National Electrical Code when sizes are not indicated on the Drawings.
- B. Install minimum Number 12 AWG wiring for power circuits unless otherwise specified or indicated on the Drawings, and minimum Number 14 AWG for control wiring unless otherwise specified.
- C. Install minimum 14 AWG for internal panel control wiring with type MTW or SIS insulation.
- D. Do not exceed cable manufacturer's pulling tension and side-wall pressures.
- E. Terminations and Splices (600 Volt or Less):
  - 1. Terminations: Terminate control and instrument conductors in terminal boxes in accordance with Section 16130 Raceway and Boxes.
  - 2. Splicing: Join conductors mechanically with splice connectors and install heatshrink type insulation. Splice conductors in accordance with manufacturer's instructions. Make waterproof heat shrink type splices in wet and below grade locations.
  - 3. Splice or weld grounding conductors of different sizes.
  - 4. Conductor Number 10 AWG and smaller for lighting and receptacle circuits may be spliced in junction boxes with wire nuts.

F. All conductors of size No. 1/0 AWG and smaller for installation in cable trays and continuing without splices via other conduits; they shall be of the multi-conductor type with overall jacket.

# 3.03 INSTRUMENTATION CLASS CABLE

- A. Install instrumentation class cables in separate raceway systems.
  - 1. Install instrument cable in metallic conduit within non-dedicated manholes or pull boxes.
  - 2. Install cable without splices between instruments or between field devices and instrument enclosures or panels.
- B. Do not make intermediate terminations, except in designated terminal boxes indicated on the Drawings.
- C. Ground cable shields at only one location, typically at panels, not at field instruments.
- 3.04 SIGNAL CABLE AND CONDUIT INSTALLATION
  - A. Separate and isolate electrical signal cables from sources of electrical noise and power cables by minimum 12 inches.
- 3.05 FIELD QUALITY CONTROL
  - A. Testing: As specified in Section 16085 Electrical Acceptance Testing.
  - B. Grounding
- 3.06 FIELD CONDITIONS AND RELATED REQUIREMENTS
  - A. Existing underground water table is near or above the location for new ductbanks.
  - B. Existing underground pull boxes, handholes, ductbanks, and manholes contain excessive amounts of water, conductors and debris.
  - C. CONTRACTOR shall include cost for necessary dewatering, equipment cost to identify raceways, and cleaning equipment to perform the work required for new underground ductbanks, manholes and pull boxes.
  - D. CONTRACTOR shall include necessary cost to clean all underground ductbanks and pull boxes prior to installation of required new conductors.

#### 3.07 WIRING ALLOWANCES

A. CONTRACTOR shall include allowance of necessary conductors and termination to provide any and all motorized equipment, electrical outlets, fixtures, communication outlets, instruments, and devices within 10 linear feet of location shown on the Drawings.

- B. CONTRACTOR shall include allowance of necessary conductors and related materials to provide any and all pull boxes, manholes and ductbanks within 20 linear feet of location shown on the Drawings.
- C. Prior installation of any raceway or related items identified in paragraphs A and B above, the OWNER shall have the right to make changes related to preferred location, at no additional cost.
- D. CONTRACTOR shall include allowance to provide necessary conductors for all equipment specified, identified in wiring/raceway schedules, equipment schedules, panelboards schedules, electrical single line diagrams, block diagrams, process and instrumentation diagrams (P&IDs), fixture schedules, and devices. Said necessary conductors may not be shown on the plan drawings, but they shall be sized by CONTRACTOR in accordance with requirements of the National Electrical Code and included in this allowance if the conductor are necessary for the complete operation of the included device or equipment.
- E. Include cost allowance to provide the following wiring for potential extra items not included in contact documents:
  - 1. 500 linear feet of No. 12 AWG-XHHW-2 copper single conductor for installation in conduit.
  - 2. 300 linear feet of No. 14 AWG-XHHW-2 for installation in conduit.
  - 3. 100 linear feet of No. 16 AWG shielded one pair cable for installation in conduit.
  - 4. 500 linear feet of No. 12-2 w/Ground AWG-XHHW-2 with jacket for installation in conduit.

# END OF SECTION

# RACEWAYS AND BOXES

# PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Material and installation requirements for:
    - a. Conduits.
    - b. Conduit fittings.
    - c. Conduit supports.
    - d. Wireways.
    - e. Outlet boxes.
    - f. Pull and junction boxes.

## 1.02 QUALITY ASSURANCE

- A. Referenced Standards:
  - 1. American Iron and Steel Institute (AISI).
  - 2. ASTM International (ASTM):
    - a. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - b. D2564, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
  - 3. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
    - c. TC 2, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
    - d. TC 3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  - 5. Underwriters Laboratories, Inc. (UL):
    - a. 1, Standard for Safety Flexible Metal Conduit.
    - b. 6, Standard for Safety Rigid Metal Conduit.
    - c. 50, Standard for Safety Enclosures for Electrical Equipment.
    - d. 360, Standard for Safety Liquid-Tight Flexible Steel Conduit.
    - e. 467, Standard for Safety Grounding and Bonding Equipment.
    - f. 514A, Standard for Safety Metallic Outlet Boxes.
    - g. 514B, Standard for Safety Fittings for Cable and Conduit.
    - h. 651, Standard for Safety Schedule 40 and 80 Rigid PVC Conduit.
    - i. 870, Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.
    - j. 886, Standard for Safety Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

# 1.03 SUBMITTALS

- A. Shop Drawings:
  - 1. Product technical data:
    - a. Provide submittal data for all products specified in PART 2 of this Specification except:
      - 1) Conduit fittings.
      - 2) Support systems.
  - 2. Fabrication and/or layout drawings:
    - a. Identify dimensional size of pull and junction boxes to be used.

# PART 2 PRODUCTS

# 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. PVC coated rigid metallic conduits and repair kits:
    - a. Occidental Coating Company.
    - b. Rob-Roy Ind.
  - 2. Rigid non-metallic conduit:
    - a. Carlon.
    - b. Cantex.
  - 3. Flexible conduit:
    - a. AFC Cable Systems.
    - b. Anamet, Inc.
    - c. Electri-Flex.
  - 4. Wireway:
    - a. Hoffman Engineering Company.
  - 5. Conduit fittings and accessories:
  - a. OCAL.
  - 6. Support systems:
    - a. Unistrut Building Systems (stainless steel).
    - b. OCAL.
  - 7. Outlet, pull and junction boxes: a. OCAL.

# 2.02 RIGID METALLIC CONDUITS

- A. PVC-Coated Rigid Steel Conduit (PVC-RGS):
  - 1. Nominal 40 mil Polyvinyl Chloride Exterior Coating:
    - a. Coating: Bonded to hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1.
    - b. The bond between the PVC coating and the conduit surface: Greater than the tensile strength of the coating.
  - 2. Nominal 2 mil, minimum, urethane interior coating.
  - 3. Urethane coating on threads.
  - 4. Conduit: Epoxy prime coated prior to application of PVC and urethane coatings.
  - 5. Female Ends:
- a. Have a plastic sleeve extending a minimum of 1 pipe diameter or 2 IN, whichever is less beyond the opening.
- b. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
- 6. Standards: NEMA/ANSI C80.1, UL 6, NEMA RN 1.

# 2.03 RIGID NON-METALLIC CONDUIT

- A. Schedules 80 (PVC-80):
  - 1. Polyvinyl-chloride (PVC) plastic compound which includes inert modifiers to improve weatherability and heat distribution.
  - 2. Rated for direct sunlight exposure.
  - 3. Fire retardant and low smoke emission.
  - 4. Shall be suitable for use with 90 DegC wire and shall be marked "maximum 90 Deg C".
  - 5. Standards: NEMA TC 2, UL 651.

# 2.04 FLEXIBLE CONDUIT

- A. PVC-Coated Flexible Galvanized Steel (liquid-tight) Conduit (FLEX-LT):
  - 1. Core formed of continuous, spiral wound, hot-dip galvanized steel strip with successive convolutions securely interlocked. <sup>3</sup>/<sub>4</sub>-inch minimum size.
  - 2. Extruded PVC outer jacket positively locked to the steel core.
  - 3. Liquid and vapor tight.
  - 4. Standard: UL 360.

# 2.05 WIREWAY

- A. Watertight (NEMA 4X rated) Wireway:
  - 1. 14 GA Type 304 or 316 stainless steel bodies and covers without knockouts and 10 GA stainless steel flanges.
  - 2. Cover: Fully gasketed and held in place with captive clamp type latches.
  - 3. Flanges: Fully gasketed and bolted.

# 2.06 CONDUIT FITTINGS AND ACCESSORIES

- A. Fittings for Use with PVC-RGS:
  - 1. General:
    - a. In hazardous locations listed for use in Class I, Division 2, Groups C and D locations.
  - 2. Hubs: Threaded, insulated and gasketed metallic for raintight connection. Stainless steel or PVC coated.
  - 3. Unions: Threaded PVC coated, galvanized steel or zinc plated malleable iron.
  - 4. Conduit bodies (ells and tees):
    - a. Body: PVC coated with threaded hubs.
    - b. Standard and mogul size.
    - c. Cover:
      - 1) PVC coated, clip-on type with stainless steel screws.
  - 5. Conduit bodies (round):

- a. Body: PVC coated with threaded hubs.
- b. Cover: Threaded screw on type, PVC coated.
- 6. Sealing fittings:
  - a. Body: PVC coated.
  - b. Standard and mogul size.
  - c. With or without drain and breather.
  - d. Fiber and sealing compound: UL listed for use with the sealing fitting.
- B. Fittings for Use with FLEX-LT:
  - 1. Connector:
    - a. Straight or angle type.
    - b. PVC coated, insulated and gasketed.
    - c. Composed of locknut, grounding ferrule and gland compression nut.
    - d. Liquid tight.
  - 2. Standards: UL 467, UL 514B.
- C. Fittings for Use with Rigid Non-Metallic PVC Conduit:
  - 1. Coupling, adapters and conduit bodies:
    - a. Same material, thickness, and construction as the conduits with which they are used.
    - b. Homogeneous plastic free from visible cracks, holes or foreign inclusions.
    - c. Bore smooth and free of blisters, nicks or other imperfections which could damage the conductor.
  - 2. Solvent cement for welding fittings shall be supplied by the same manufacturer as the conduit and fittings.
  - 3. Standards: ASTM D2564, NEMA TC 3, UL 651, UL 514B.
- D. Weather and Corrosion Protection Tape:
  - 1. PVC based tape, 10 mils thick.
  - 2. Protection against moisture, acids, alkalis, salts and sewage and suitable for direct bury.
  - 3. Used with appropriate pipe primer.

# 2.07 ALL RACEWAY AND FITTINGS

- A. Mark Products:
  - 1. Identify the nominal trade size on the product.
  - 2. Stamp with the name or trademark of the manufacturer.

# 2.08 OUTLET BOXES

- A. Cast Outlet Boxes:
  - 1. Threaded hubs and grounding screw.
  - 2. Styles:
    - a. FS" or "FD".
    - b. "Bell".
    - c. Single or multiple gang and tandem.
    - d. "EDS" or "EFS" for hazardous locations.
  - 3. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.

- 4. Standards: UL 514A, UL 886.
- B. See Section 16140 Wiring Devices for wiring devices, wall plates and cover plates.

### 2.09 PULL AND JUNCTION BOXES

- A. NEMA 4X Rated (metallic):
  - 1. Body and cover: 14 GA Type 304 or 316 stainless steel.
  - 2. Seams continuously welded and ground smooth.
  - 3. No knockouts.
  - 4. External mounting flanges.
  - 5. Hinged door and stainless steel screws and clamps.
  - 6. Door with oil-resistant gasket.
- B. NEMA 7 and 9 Rated:
  - 1. Cast gray iron alloy or copper-free aluminum with manufacturers standard finish.
  - 2. Drilled and tapped openings or tapered threaded hub.
  - 3. Cover bolted-down with stainless steel bolts or threaded cover with neoprene gasket.
  - 4. External mounting flanges.
  - 5. Grounding lug.
  - 6. Accessories: 40 mil PVC exterior coating and 2 mil urethane interior coating.
- C. Miscellaneous Accessories:
  - 1. Rigid handles for covers larger than 9 SF or heavier than 25 LBS.
  - 2. Split covers when heavier than 25 LBS.
  - 3. Weldnuts for mounting optional panels and terminal kits.
  - 4. Terminal blocks: Screw-post barrier-type, rated 600 volt and 20 ampere minimum.
- D. Standards: NEMA 250, UL 50.

#### 2.10 SUPPORT SYSTEMS

- A. Multi-conduit Surface or Trapeze Type Support and Pull or Junction Box Supports:
  - 1. Material requirements.
    - a. Stainless steel: AISI Type 316.
    - b. PVC coated galvanized steel: ASTM A123 or ASTM A153 and 20 mil PVC coating.
- B. Single Conduit and Outlet Box Support Fasteners:
  - 1. Material requirements:
    - a. Stainless steel.
    - b. PVC coat malleable iron or steel: 20 mil PVC coating.

# PART 3 EXECUTION

- 3.01 RACEWAY INSTALLATION GENERAL
  - A. Shall be in accordance with the requirements of:

- 1. NFPA 70.
- 2. Manufacturer instructions.
- B. Size of Raceways:
  - 1. Raceway sizes are shown on the Drawings, if not shown on the Drawings, then size in accordance with NFPA 70.
  - 2. Unless specifically indicated otherwise, the minimum raceway size shall be:
    - a. Conduit: 3/4 IN (exposed) and 1 IN (buried).
    - b. Wireway: 2-1/2 IN x 2-1/2 IN.
- C. Field Bending and Cutting of Conduits:
  - 1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all field bends and cuts.
  - 2. Do not reduce the internal diameter of the conduit when making conduit bends.
  - 3. Prepare tools and equipment to prevent damage to the PVC coating.
  - 4. Degrease threads after threading and apply a zinc rich paint.
  - 5. Debur interior and exterior after cutting.
- D. Male threads of conduit systems shall be coated with an electrically conductive antiseize compound.
- E. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
  - 1. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
  - 2. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit; or a selfadhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape.
    - a. Total nominal thickness: 40 mil.
  - 3. Repair surfaces which will be inaccessible after installation prior to installation.
- F. Remove moisture and debris from conduit before wire is pulled into place.
  - 1. Pull mandrel with diameter nominally 1/4 IN smaller than the interior of the conduit, to remove obstructions.
  - 2. Swab conduit by pulling a clean, tight-fitting rag through the conduit.
  - 3. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.
- G. Only nylon or polyethylene rope shall be used to pull wire and cable in conduit systems.
- H. Where portions of a raceway are subject to different temperatures and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway shall be sealed to prevent circulation of warm air to colder section of the raceway.
- I. Fill openings in walls, floors, and ceilings and finish flush with surface.
  - 1. See Division 1.

### 3.02 RACEWAY ROUTING

- A. Raceways shall be routed in the field unless otherwise indicated.
  - 1. Conduit and fittings shall be installed, as required, for a complete system that has a neat appearance and is in compliance with all applicable codes.
  - 2. Run in straight lines parallel to or at right angles to building lines.
  - 3. Do not route conduits:
    - a. Through areas of high ambient temperature or radiant heat.
    - b. In suspended concrete slabs.
  - 4. Conduit shall not interfere with, or prevent access to, piping, valves, ductwork, or other equipment for operation, maintenance and repair.
  - 5. Provide pull boxes or conduit bodies as needed so that there is a maximum of 360 degrees of bends in the conduit run or in long straight runs to limit pulling tensions.
- B. Maintain minimum spacing between parallel conduit and piping runs in accordance with the following when the runs are greater than 30 FT:
  - 1. Between instrumentation and telecommunication: 1 IN.
  - 2. Between instrumentation and 125 V, 48 V and 24 Vdc, 2 IN.
  - 3. Between instrumentation and 600 V and less AC power or control: 6 IN.
  - 4. Between instrumentation and greater than 600 Vac power: 12 IN.
  - 5. Between telecommunication and 125 V, 48 V and 24 Vdc, 2 IN.
  - 6. Between telecommunication and 600 V and less AC power or control: 6 IN.
  - 7. Between telecommunication and greater than 600 Vac power: 12 IN.
  - 8. Between 125 V, 48 V and 24 Vdc and 600 V and less AC power or control: 2 IN.
  - 9. Between 125 V, 48 V and 24 Vdc and greater than 600 Vac power: 2 IN.
  - 10. Between 600 V and less AC and greater than 600 Vac: 2 IN.
  - 11. Between process, gas, air and water pipes: 6 IN.
- C. Conduits shall be installed to eliminate moisture pockets.
  - 1. Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

### 3.03 RACEWAY APPLICATIONS

- A. Permitted Raceway Types per Wire or Cable Types:
  - 1. Power wire or cables: All raceway types.
  - 2. Control wire or cables: All raceway types.
  - 3. Instrumentation cables: Metallic raceway except non-metallic may be used underground.
  - 4. Motor leads from a VFD: RGS, RAC or shielded VFD cables in all other raceways.
  - 5. Telecommunication cables: All raceway types.
- B. Permitted Raceway Types Per Area Designations:
  - 1. All exposed areas:
    - a. PVC-RGS.
- C. Permitted Raceway Types Per Routing Locations:
  - 1. Direct buried conduits and ductbanks:
    - a. PVC-80.

- b. 90 degree elbows for transitions to above grade:
  - 1) RGS wrapped with factory applied weather and corrosion protection tape.
  - 2) PVC-RGS.
- c. Long sweeping bends greater than 15 degrees:
  - 1) RGS wrapped with factory applied weather and corrosion protection tape.
  - 2) PVC-RGS.
- 2. Red concrete encased ductbanks:
  - a. PVC-80.
  - b. 90 degree elbows for transitions to above grade:
    - 1) RGS wrapped with factory applied weather and corrosion protection tape.
    - 2) PVC-RGS.
  - c. Long sweeping bends greater than 15 degrees:
    - 1) RGS for sizes 2 IN and larger.
- D. FLEX-LT conduits shall be install as the final conduit connection to light fixtures, dry type transformers, motors, electrically operated valves, instrumentation primary elements, and other electrical equipment that is liable to vibrate.
  - 1. The maximum length shall not exceed:
    - a. 3 FT to motors.
    - b. 3 FT to all other equipment.

### 3.04 CONDUIT FITTINGS AND ACCESSORIES

- A. Conduit Seals:
  - 1. Installed in conduit systems located in hazardous areas as required by the NFPA 70.
- B. Rigid non-metallic conduit and fittings shall be joined utilizing solvent cement.
  - 1. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated 1/4 turn to provide uniform contact.
- C. Install Expansion Fittings:
  - 1. Where conduits are exposed to the sun and conduit run is greater than 200 FT.
  - 2. Elsewhere as identified on the Drawings.
- D. Install Expansion/Deflection Fittings:
  - 1. Where conduits enter a structure.
    - a. Except electrical manholes and handholes.
  - b. Except where the ductbank is tied to the structure with rebar.
  - 2. Where conduits span structural expansions joints.
  - 3. Elsewhere as identified on the Drawings.
- E. Threaded connections shall be made wrench-tight.
- F. Conduit joints shall be watertight:
  - 1. Where subjected to possible submersion.

- 2. In areas classified as wet.
- 3. Underground.
- G. Terminate Conduits:
  - 1. In NEMA 4 and 4X rated enclosures:
    - a. Watertight, insulated and gasketed hub and locknut.
  - 2. In NEMA 7 and 9 rated enclosures:
    - a. Into an integral threaded hub.
  - 3. When stubbed up through the floor into floor mount equipment:
    - a. With an insulated grounding bushing on metallic conduits.
      - b. With end bells on non-metallic conduits.
- H. Threadless couplings shall only be used to join new conduit to existing conduit when the existing conduit end is not threaded, and it is not practical or possible to cut threads on the existing conduit with a pipe threader.

# 3.05 CONDUIT SUPPORT

- A. Permitted multi-conduit surface or trapeze type support system per area designations and conduit types:
  - 1. All areas:
    - a. Stainless steel system consisting of: Stainless steel channels and fittings, nuts and hardware and conduit clamps.
    - b. PVC coated steel system consisting of: PVC coated galvanized steel channels and fittings and conduit clamps with stainless steel nuts and hardware.
- B. Permitted single conduit support fasteners per area designations and conduit types:
  - 1. All areas:
    - a. Material: Stainless steel and PVC coat malleable iron or steel.
    - b. Types of fasteners: Straps, hangers with bolts, clamps with bolts and bolt on beam clamps.
- C. Conduit Support General Requirements:
  - 1. Maximum spacing between conduit supports per NFPA 70.
  - 2. Support conduit from the building structure.
  - 3. Do not support conduit from process, gas, air or water piping; or from other conduits.
  - 4. Provide hangers and brackets to limit the maximum uniform load on a single support to 25 LBS or to the maximum uniform load recommended by the manufacturer if the support is rated less than 25 LBS.
    - a. Do not exceed maximum concentrated load recommended by the manufacturer on any support.
    - b. Conduit hangers: Continuous threaded rods combined with struts or conduit clamps: Do not use perforated strap hangers and iron bailing wire.
  - 5. Conduit support system fasteners:
    - a. Use sleeve-type expansion anchors as fasteners in masonry wall construction.
    - b. Do not use concrete nails and powder-driven fasteners.

# 3.06 OUTLET, PULL AND JUNCTION BOX INSTALLATION

# A. General:

- 1. Install products in accordance with manufacturer's instructions.
- 2. See Section 16010 Electrical and the Drawings for area classifications.
- 3. Size boxes to accommodate quantity of conductors enclosed and quantity of conduits connected to the box.
- B. Outlet Boxes:
  - 1. Permitted uses of cast outlet boxes:
    - a. Housing of wiring devices surface mounted in non-architecturally finished dry, wet corrosive, highly corrosive and hazardous areas.
    - b. Pull and junction box surface mounted in non-architecturally finished dry, wet corrosive and highly corrosive areas.
  - 2. Mount device outlet boxes where indicated on the Drawings and at heights as scheduled in Section 16010 Electrical.
  - 3. Set device outlet boxes plumb and vertical to the floor.
  - 4. When an outlet box is connected to a PVC coated conduit, the box shall also be PVC coated.
- C. Pull and Junction Boxes:
  - 1. Install pull or junction boxes in conduit runs where indicated or required to facilitate pulling of wires or making connections. a. Make covers of boxes accessible.
  - 2. Permitted uses of NEMA 4X metallic enclosure:
    - a. Pull or junction box surface mounted in areas designated as wet and/or corrosive.
  - 3. Permitted uses of NEMA 7 enclosure:
    - a. Pull or junction box surface mounted in areas designated as Class I hazardous.
      - 1) Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

# **SECTION 16133**

# CONDUITS

# PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. This Specification Section covers the furnishing, installing and testing of all conduit, fittings, and supports as specified herein, as shown on the Drawings, and as required for a complete electrical installation.
- B. The provisions of Section 16010 Electrical of these Specifications shall apply, unless otherwise specified in this Section.
- C. The conduit system shall consist of the types and sizes as required and shall include all rigid steel conduit, flexible conduit, non-metallic conduit, wireway, and accessories as required for the embedded and exposed raceway systems.

#### 1.02 SUBMITTALS

- A. Provide data and Drawings for all materials furnished under this Section with the content and format as specified in Section 1300 Submittals.
- B. Submittals for the Conduit materials and equipment shall include, but shall not be limited to, the following:
  - 1. Catalog cuts showing manufacturer, catalog numbers, dimensions, weights and material for all raceway and accessories.
  - 2. Dimensioned "as-built" Drawings of Contract Electrical plans.
  - 3. Marked up "as-built" Conduit & Wire Routing Schedule.

#### 1.03 QUALITY ASSURANCE

- A. Materials shall be of a manufacturer that has been fabricating and assembling specified raceway systems in his current facility for a minimum of two (2) years.
- B. All materials selected for the manufacture of the hardware shall be the best available for the purpose for which they are used, considering strength, ductility, durability, and the best engineering practice.
- C. All like parts shall be interchangeable.

# PART 2 MATERIALS

### 2.01 REFERENCE STANDARDS

- A. Conduits supplied under this Contract shall be designed, manufactured, and tested in accordance with the latest version of the following standards.
- B. American National Standards Institute (ANSI) Publications:
  - 1. C33.92Flexible Liquidtight Metal Conduit
  - 2. C80.1 Rigid Steel Conduit
  - 3. C80.4 Rigid Steel Conduit Fittings
- C. National Electrical Manufacturer's Association (NEMA):
  - 1. FB 1 Fittings and Supports for Conduit Cable Assemblies
  - 2. TC-2 and TC-3 Non-metallic Conduit and Fittings
  - 3. RN 1 Rigid Steel Conduit PVC jacketed
- D. Underwriter's Laboratories, Inc.:
  - 1. UL-514A Metallic Outlet Boxes, Electrical
  - 2. UL-870 Wireways, Auxiliary Gutters and Associated Fittings
  - 3. UL-6 Rigid Metal Electrical Conduit
  - 4. UL 651 Schedule 40 and 80 Rigid PVC Conduit

### 2.02 CONDUIT AND CONDUIT FITTINGS

### A. General:

- 1. Conduit, fittings, and raceway materials shall be manufactured in accordance with UL and ANSI standards and be UL labeled for the application.
- 2. The CONTRACTOR shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract Drawings and "Conduit and Wire Routing Schedule" which shall take precedence over any general methods and materials specified in this Section.
- 3. Continuation of conduit runs, not specifically called out in Conduit and Wire Routing Schedule, especially "flex" conduits, shall be provided with wires listed in Conduit and Wire Routing Schedule of previous runs.
- B. Material for the conduit system shall conform to the following:
  - 1. Galvanized Rigid Steel Conduit (GRS):
    - a. Rigid steel conduit, couplings, bends and nipples shall be in accordance with ANSI C80.1 and UL-6.
    - b. Hotdip galvanized inside and outside after fabrication and then coated with a zinc bichromate finish.
    - c. Galvanized rigid steel factory elbows for indoor NEMA 12 90-degree transitions. Outdoor or Non-NEMA 12 area transitions shall be GRS-PVC factory ells.
    - d. EMT or IMC is not considered an equivalent to GRS.
    - e. GRS conduit is allowed only when specifically called out in the "Conduit and Wire Routing Schedule".
  - 2. Flexible Liquidtight Metal Conduit: (FLEX):

- a. Flexible liquidtight metal conduit shall be in accordance with ANSI C33.92 and shall be galvanized steel core with a copper bonding conductor between the spiral segments and an extruded synthetic jacket overall to insure a liquid-tight conduit. Flexible metallic conduit shall be fabricated from galvanized interlocked steel strip. Liquid-tight flexible metallic conduit shall have an extruded polyvinylchloride covering of the flexible steel conduit. The conduit shall be Anamet Sealtite Flexible conduit, or equal.
- b. FLEX conduits shall meet the minimum requirements of NEC Code Table C3 "Maximum Number of Conductors and Fixture Wires in Flexible Metallic Conduit" and Table C3A "Maximum Number of Compact Conductors in Flexible Metallic Conduit."
- c. Minimum trade size one-half inch (½") unless otherwise shown on Contract Drawings.
- d. Flexible conduit lengths shall not be greater than 36 inches for conduits  $1\frac{1}{2}$ " or smaller ( $\frac{1}{2}$ " minimum) and 48 inches for conduits 2" or larger.
- e. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
- f. Non-metallic flexible conduit shall not be used.
- g. Flexible conduit shall only be installed in exposed or accessible locations.
- h. Install flexible conduit in a manner that will minimize stress on connectors.
- 3. Rigid Galvanized Steel Conduit PVC Bonded (GRS-PVC): Conduit shall conform to the requirements of NEMA RN1, Type A40. GRS-PVC conduit shall be rigid galvanized steel conduit to which an epoxy acrylic primer and a 40 mil thick UV rated polyvinyl chloride coating has been bonded. The interior of all GRS-PVC conduits and fittings shall be coated with a two part chemically cured urethane coating at a 2 mil minimum thickness. Bond strength shall exceed the tensile strength of the plastic coat. Furnish Perma Cote Supreme, Robroy Industries, or approved equal.
  - a. Minimum trade size three-quarters inch (<sup>3</sup>/<sub>4</sub>") unless otherwise shown on Contract Drawings.
  - b. Provide PVC coated galvanized rigid steel factory elbows for 45 or 90 degree transitions.
  - c. All fittings used with plastic coated conduit shall be similarly coated with not less than 40 mils of polyvinyl chloride and shall be provided with Type #316 stainless steel hardware.
  - d. For factory coated conduit, use overlapping PVC sleeves. Sleeves shall extend beyond end of fitting minimum distance equal to nominal diameter of conduit, and shall fit tightly over conduit coating to form a watertight joint. Joints and fittings shall be made tight with strap wrenches.
  - e. All damage to PVC jacket shall be repaired with four separate applications of PVC paint. Finished patch shall be 0.040-inch minimum thickness. PVC coating patching material shall be as provided by the Manufacturer.
  - f. Support channel and pipe straps shall be PVC coated. Exposed metal bolts/nuts, all-thread rod shall be 316 stainless steel.
  - g. GRS-PVC conduits shall be used for all underground conduits except service entrance conduits.
- 4. Rigid Polyvinyl Chloride (PVC) Conduit: PVC conduit shall be manufactured in accordance with UL 651. PVC conduit shall be Schedule 40 or Schedule 80 high impact polyvinyl chloride, UL listed for direct burial and UV light resistant.

- a. Minimum trade size one inch (1") unless otherwise shown on Contract Drawings.
- b. PVC fittings shall have solvent-weld-type conduit connections.
- c. PVC conduit is not suitable for above grade installation except where specifically called out in Conduit and Wire Routing Schedule.
- 5. Electrical Metallic Tubing (EMT):
  - a. EMT shall be galvanized thin wall conduit conforming to UL 797.
  - b. Minimum trade size three-quarters inch (<sup>3</sup>/<sub>4</sub>") unless otherwise shown on Contract Drawings.
  - c. Couplings and connectors for EMT shall be galvanized or cadmium plated and shall be of the compression type requiring the tightening of a nut on a gland ring.
  - d. Rolled steel, zinc coated outside with zinc-coating or other approved corrosion-resistant coating on the inside.
  - e. EMT conduits may be used as follows when listed on plans or in the Conduit and Wire Routing Schedule:
    - 1) Conduit runs on walls and ceilings inside buildings more than 8 feet above the floor. EMT can be used below 8 feet, but not lower than 1 foot above the floor when EMT originates from above and conduit does not penetrate the floor. EMT Conduit may not be used in normal exposed locations lower than 8 feet above the floor when conduits penetrate the floor.
    - 2) Concealed in drywall partitions.
  - f. EMT conduits shall not be used:
    - 1) When other types of conduit material are specifically called out in the Conduit and Wire Routing Schedule.
    - 2) Any location subject to physical damage.
    - 3) Normal exposed locations lower than 8 feet above the floor when conduits penetrate the floor.
    - 4) In boiler rooms.
    - 5) Wetwell, outdoor or corrosive locations.
    - 6) Fittings:
      - a) GRS Fittings:
        - 1. Fittings for GRS conduits shall be threaded type. Set-screw type and compression-type are not acceptable. Fittings shall conform to the requirements of ANSI C80.4.
      - b) Flex Fittings:
        - Non-NEMA 4X locations shall have cadmium- plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and insulated throat. Fittings, for not-NEMA 4X locations only, shall have insulted throats, liquidtight, oil tight, suitable for outdoors and class I, Div 2 locations.
        - 2. NEMA 4X rated areas shall have PVC coated flex fittings and connectors.
      - c) GRS-PVC Fittings:
        - 1. GRS-PVC fittings shall be hot dipped galvanized steel or galvanized cast ferrous metal with a PVC 40 mils thick exterior

coating.and 2 mil thick interior coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable. Electrical continuity shall be maintained across assembled joints. Fittings shall be Robroy Perma-Cote, or approved equal coated fitting.

- d) EMT Fittings:
  - 1. Couplings shall be rain tight compression type Appleton Series, Efcor 760 Series, or approved equal.
  - 2. Connectors shall be rain tight compression type with insulated throat Appleton Series, Efcor 750B Series, or approved equal.
- C. Conduit Type by Installation: Provide conduits as listed in "Conduit & Wire Routing Schedule" or as shown on Contract Drawings. Conduits not covered by in "Conduit & Wire Routing Schedule" or Contract Drawings shall be GRS-PVC except where EMT is allowed.

#### 2.03 WIREWAY

- A. All Wireways shall have hinged access covers.
- B. Wireways shall be constructed in accordance with Underwriter's Laboratories Standards UL 870 for Wireways, Auxiliary Gutters and Associated Fittings. Every component including lengths, connectors, and fittings shall be UL listed.
- C. Wireways shall be suitable for "lay-in" of conductors. All screws installed toward the inside shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.
- D. Wireways shall be JIC EMP-1 Sectional flanged oil-tight type with hinged covers and shall be 8 inches by 8 inches in cross Section unless otherwise specified. New wireways extending existing wireways shall be of the same manufacturer and type.
- E. Non-Corrosive Areas: Wireways shall be with a rust inhibiting phosphatizing coating and gray baked enamel finish. All hardware shall be plated to prevent corrosion and painted to match adjoining surface.
- F. Corrosive or NEMA 4X Areas: Wireways shall be NEMA 4X 316 stainless steel. Non-Metallic wireways may be used when approved by ENGINEER in writing.

# 2.04 CONDUIT SEAL

A. Conduit seal shall provide high adhesion and moisture protection. Seal shall absorb cable-filling material and be re-enterable. Conduit seal shall be 3M 8882 High Gel re-enterable encapsulant, or approved equal.

# PART 3 EXECUTION

### 3.01 CONDUIT AND RACEWAY INSTALLATION

- A. Conduit and Raceway Requirements:
  - 1. Install an accessible raceway and conduit system for connection of all boxes, panelboards, cabinets, and equipment.
  - 2. All conduit and raceway shall be the type and size as shown on Conduit and Wire Routing Schedule. In no case shall the conduit size be smaller than that shown.
  - 3. Conduits connected to boxes, cabinets, etc., outdoors, exposed to weather or in areas subject to excessive moisture shall be fitted with watertight sealing hubs of steel or malleable iron with sealing ring and insulated throat, Myers hub, Thomas and Betts 370 Series, or approved equal.
  - 4. Malleable iron threaded grounding bushing, with insulated throat and set screw solderless lugs, Appleton GIB-XXXLS-BC series shall be placed on the end of all rigid conduits. A ground bare copper wire shall bond each bushing to the enclosure ground bus.
  - 5. Matching Existing Facilities: When new conduit are added to areas which are already painted, the conduit and its supports shall be painted to match the existing facilities. Where new conduit is used to replace existing conduit, the existing conduit and supports shall be removed, resulting blemishes shall be patched and repainted to match original conditions. Similarly, if existing conduits are to be reused and rerouted, resulting blemishes shall be corrected in the same manner.
  - 6. CONTRACTOR is to remove and waste all unused wire associated with existing conduits reused for new work.
  - 7. When existing conduits have new wire pulled to existing equipment, the CONTRACTOR is responsible for reconnecting all terminations to these equipment.
  - 8. CONTRACTOR to remove and waste all conduit and wire associated with removal or demolition of equipment.
  - 9. Equipment to be replaced with new shall have new flex conduits installed and wire reconnected by CONTRACTOR.
- B. Exposed Conduit:
  - All exposed conduits shall be run in straight lines parallel to column lines, walls or beams. Where conduits are grouped, the bends and fittings shall be installed so as to present an orderly appearance. Unnecessary bending or offsets shall be avoided. Conduits shall be kept at least 12 inches away from heating devices or similar equipment.
  - 2. Supports for exposed conduit shall be in accordance with Title 24, CAC.
  - 3. Support rigid conduits at 8 feet intervals and PVC conduits at 4 feet intervals. Support all conduits within 1 foot of boxes or changes in direction. Use riser supports with clamps for vertical conduit risers.
  - 4. For single conduit runs, use pipe straps or suspend from ceiling with single conduit hangers. Single hole malleable iron clamps with backplates may be used for horizontal runs on vertical surfaces. Perforated strap (plumber's tape), not acceptable.

- 5. For multiple conduit runs, group conduits together and support from ceiling by means of trapeze hangers. Wall brackets or unistrut supports shall be used for conduit runs on vertical surfaces. Clamp each conduit to trapeze or support, using conduit clamp.
- 6. Fasten hanger rods to structural steel members with beam clamps or to concrete inserts set flush with surface. Install reinforcing rod through opening in concrete insert.
- 7. Exposed conduit shall be supported rigidly in place. All exposed conduit shall include, where required, the drilling of holes in the bottom or sides of enclosures. The CONTRACTOR shall thoroughly examine work prior to drilling to avoid drilling into components within enclosures.
- C. Conduits in Concrete Slabs:
  - 1. Conduits may be installed in structural slabs, or in slabs on grade, having the following minimum thickness: 2<sup>1</sup>/<sub>2</sub>" thick for <sup>1</sup>/<sub>2</sub>" conduit, 4<sup>1</sup>/<sub>2</sub>" thick for <sup>3</sup>/<sub>4</sub>" conduit, and 5" thick for 1" conduit.
  - 2. Maintain a minimum of two-inches of clearance between conduits and any reinforcement bars. In structural slabs, place conduits carefully between upper and lower layers of steel. In prestressed concrete slab construction, place conduits in center of slab and do not support from prestressed steel.
  - 3. Space conduits to maintain structural integrity of slabs.
  - 4. Place conduits running parallel to slab supports (beams, columns, walls, etc.) not less than 12" from such supports.
  - 5. Where floor slab is in direct contact with earth or fill, rigid steel conduit may be embedded in concrete blister below bottom of slab with 2-inch minimum of concrete cover.
  - 6. Runs of conduit to be embedded in concrete shall be rigidly supported in their proper positions while concrete is being placed. Place conduit separators every 4 feet on centers and securely anchor to prevent movement. Ends of conduits shall be plugged or capped during construction to prevent the entrance of concrete or other foreign matter. Connections shall be checked for tightness before being embedded.
- D. Underground Conduits:
  - 1. Buried conduit shall be placed at least 24 inches below grade and be located to avoid interference with other underground piping, foundations, etc. Conduit for Telephone and Power Utilities shall be set to depth as required by Utility engineered drawings and not less than 36" below grade.
  - 2. All conduits entering or leaving the ground shall be sealed to prevent condensation of moisture inside the conduit. Conduit entrances in the bottom of MCCs, power distribution panels, switchboards, and enclosures shall project into the enclosure a minimum of two inches to prevent water from entering conduits.
  - 3. Conduit placed in concrete which is in contact with earth or water shall be adequately separated from the earth or water by at least 3" of concrete. Concrete encasement shall extend 4" above finished grade or into housekeeping pad at completion of each run.
  - 4. Install expansion couplings in conduit runs crossing expansion or contraction joints in concrete. Expansion couplings shall be zinc coated and watertight.

- 5. Where other piping systems are encountered or being installed along a raceway route, maintain a 12-inch-minimum vertical separation between raceways and other systems at crossings. Maintain a 12-inch-minimum separation between raceways and other systems in parallel runs. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the OWNER'S Representative for instructions before further work is done.
- 6. Underground conduits not encased shall have a minimum 4" sand bedding completely encircling the conduits.
- E. Raceway Identification:
  - 1. All conduits and raceways listed in Conduit and Wire Routing Schedule shall have conduit tags at both terminations of each conduit. All conduits and raceways listed in Conduit and Raceway Schedule shall be provided with conduit tags with tag numbers listed in schedule. All spare conduits shall be labeled.
  - 2. All exposed conduit inside buildings entering/leaving panels and enclosures shall have conduit tags composed of tag tiles with tag holder where allowed by space. Tag holder shall be secured to conduit using nylon cable ties on both ends. Tag tiles shall be Almetek Type EZ-V, or approved equal. Tag holder shall be Almetek Type TH, or approved equal.
  - 3. Conduit terminating in walls shall be identified by stenciling the conduit number on the wall directly under the conduit.
  - 4. When there is no space available to use tag ties, such as in Motor Control Centers with underground feed or for conduits outside of buildings, then the tag material shall be rigid laminated red phenolic with white 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, stain-proof, electrically non-conductive and non-corroding. Securely fasten tags in place using UV rated plastic ty-wraps. Engrave the tags, on both sides, with the conduit number. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Custom B-1, or approved equal.
  - 5. 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.
  - 6. Each conduit listed in Conduit and Wire Routing Schedule shall have permanent tags where it enters and also when it leaves an open transition point, junction boxes, terminal boxes, pullboxes, vaults, and manholes, etc.
  - 7. All existing conduits listed in Conduit and Wire Routing Schedule reused for new work shall have new conduit tags installed at all transition boxes and endpoints.
- F. Workmanship and Installation Requirements:
  - Where field changes are required, every precaution shall be taken to insure that the change is coordinated with other conduit, structural, plumbing, and piping work. Information shall be obtained regarding the completed raceway runs to ensure that there will be no interference when the raceway run is extended or revised. A complete record of such changes shall be made on the Record Contract Drawings.
  - 2. Conduits shall be cut square, threaded and reamed to remove sharp or rough edges and burrs. No running threads will be allowed. Conduit joints and

connections shall be made waterproof and rustproof by application of a noninsulating thread compound, such as white lead or graphite, and zinc sealing material. Each threaded joint shall be thoroughly cleaned to remove cutting oil before the compound is applied.

- 3. All bends and offsets, where required, shall either be made with factory made bends or shall be field bends made with a conduit bender designed specifically for use with the type of conduit to be bent. Elbows and bends for conduits shall be formed in the field and shall be reasonably free from flattened surfaces, indentations, or kinks. Avoid field bends and offsets where possible. Heating of conduit to facilitate bending shall not be acceptable. Metallic conduits shall be bent cold to prevent damage to the protective coating. All bending shall be gradual and be done smoothly to permit the pulling on insulated electrical wires and cables without incurring damage to the insulation or sheath. Radius of curvature shall be not less than that permitted by NEC.
- 4. 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.
- 5. Flexible liquidtight metal conduit shall be used to provide flexible connections between the rigid system and motor conduit boxes or other equipment subject to vibration.
- 6. To reduce damage to the zinc coating, only strap type wrenches shall be used. All wrench marks, field cut threads, and all other places where the zinc coating is damaged, shall be repaired with zinc-rich galvanizing repair compound.
- 7. Special "Soft-Jaw" type pipe clamps shall be used to prevent damage to PVCcoated conduit while field threading and cutting to length.
- 8. Raceway shall be installed with necessary fittings and supports.
- 9. After installation of all conductors, all underground conduit ends into enclosures shall have a conduit seal placed around wires inside conduit.
- 10. Grout around conduit tie-ins entering walls of building structure for watertight seal.
- 11. CONTRACTOR shall limit the number of directional changes of the conduit to total no more than the equivalent of 270 degrees in any run between pull points. Where required for ease of pulling and as necessary to meet code, the CONTRACTOR shall supply and install junction or pullboxes even though not shown on Drawings at no additional cost to the OWNER.
- 12. Install and equip conduits and fittings installed outdoors or in other wet locations, entering equipment from bottom unless necessary to enter from side, so as to prevent water from entering the equipment. Top entry of conduits into enclosures located outdoors or in other wet locations is not allowed.
- 13. Spare or Future Conduits:
  - a. Provide a braided yellow polypropylene pull ropes with 1' distance markers, 1/4" minimum size.
  - b. Provide a waterproof label on each end of the pull cords to indicate the destination of the other end.
  - c. Provide caps on conduit ends to prevent entrance of dirt or insects.
- 14. CONTRACTOR shall neatly bundle all new and reused wires with ty-wraps.
- 15. Conduit stubs for future use shall be capped with coupling, nipple, and plug.
- 16. Seal all conduits to prevent water traveling through conduits into buildings, junction boxes, underground facilities, electrical enclosures, panels, instruments

or any other boxes that house electrical and instrumentation components. Install conduit drain boxes and plug conduit interior to form an effective barrier to keep out water traveling into equipment located below grade.

- 17. Conduit between vibrating equipment and outlet boxes or conduits shall be liquid tight flexible electrical conduits.
- 18. Whenever possible, make bends for exposed conduit stub-ups completely below the surface. Make stubs vertical and arrange neatly.
- 19. Where conduits turn up in accessible floor areas or under removable partitions, install coupling flush with finish floor surface (exclusive of floor covering). Provide flush threaded plug in this coupling where conduit is not to be extended.
- 20. For flush mounted panels, run empty conduits from panel to accessible spaces above. Install a minimum of one <sup>3</sup>/<sub>4</sub>" conduit for every 3 single pole spare circuit breakers or spaces, or fraction thereof.
- 21. Running Threads: Do not use running threads. Where such device is needed, use rain tight unions or concrete tight couplings.
- 22. The entire electrical raceway system shall be bonded and form a continuous metallic electrical conductor from service point to every box and shall be terminated with ground bushings connected to the ground bus. Conduits entering enclosures shall be fitted with insulated grounding bushing. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC Code.
- 23. Connection to steel conduit from PVC shall be made with approved threaded adapters.
- 24. All conduits which are installed shall be capped during construction to prevent the entrance of foreign material.
- 25. Secure hangers, brackets, conduit straps, supports and electrical equipment by means of toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; wood screws on wood construction. Wood or fiber plugs or concrete nails are not acceptable.
- G. Warning Tapes:
  - 1. Bury warning tapes approximately 12 inches above all underground concreteencased duct banks and other conduit runs over 100' in length. 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, 6-inch minimum width, utilize tape made of material resistant to corrosive soil. Use red tape for "Electric" service and orange tape for "Communication" service. Use tape with printed wording listing type of service. Manufacturers and types: ITT Blackburn, Griffolyn Co., Terra-Tape, or equivalent.
- H. Cutting and Patching:
  - 1. The CONTRACTOR shall do all core drilling, cutting, and patching required to install his work at no additional cost to the OWNER. Core drilling, cutting, and patching is considered standard work to be done at existing facilities, therefore, this work is not specifically called out on Drawings. Any core drilling or cutting which may impair the structure shall require prior approval by the ENGINEER. Core drilling, cutting, and patching shall be done only by skilled labor of the

respective trades. All surfaces shall be restored to their original condition after core drilling, cutting, and patching and made watertight.

- I. Excavation and Back Filling:
  - 1. At all times during the excavation and backfilling, the CONTRACTOR shall provide barricades, fences, guard rails, etc., to safeguard authorized personnel, and the general public from excavated trenches.
  - 2. Provide excavation and back filling for Utility power and telephone services, electrical, and instrumentation equipment foundations and trenches for conduits and ductbanks as necessary. Excavations, backfill and resurfacing of trench shall be in accordance with Division 2 site work.
    - a. Underground conduits outside of structures, excluding utility conduits, shall have a minimum cover of 24 inches. Utility power and telephone conduits shall have a minimum cover of 36 inches.
    - b. Trenches for all conduits below floor slabs and underground shall be excavated to the required depths. Conduits under floor slabs shall have trenches no deeper than is required to properly contain bends within walls.
    - c. All trenching and underground work shall be closely coordinated with the OWNER and ENGINEER. CONTRACTOR shall be responsible for locating, and avoiding disruption of, all existing underground facilities such as gas lines, water lines, sewer, fire protection lines, and existing underground electrical facilities. Any damage caused by the CONTRACTOR must be repaired at the CONTRACTOR'S cost, to the satisfaction of the OWNER.
    - d. All trenching shall be done as to minimize disruption to normal plant or construction operations. All open trenches shall be suitably marked and/or protected to avoid any accidents or injuries to workers or plant personnel.
    - e. Where new electrical ducts intersect existing facilities, at essentially the same depth, CONTRACTOR shall gradually divert the electrical facilities down, under, and back up around the existing facilities.
    - f. Back filling shall be done only after conduits have been inspected by OWNER.
    - g. All excavations shall be backfilled and resurfaced to match surfaces prior to and adjacent to excavation.

### 3.02 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.

# SECTION 16140

# WIRING DEVICES

### PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall install, ready for use, the receptacles, plugs, switches, boxes, and appurtenances specified herein. 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 required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter at no additional cost to the OWNER.
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals, and services to provide complete and operational wiring devices as shown on the Drawings, included in these Specifications, or required for fully operating facilities.
- C. Work includes that specified in Division 16.
- D. The wiring devices scope of work includes:
  - 1. Provide and install miscellaneous wiring devices, conduits, field interconnection wiring, and associated hardware.
  - 2. Provide all necessary hardware, fittings, and devices to connect the electrical equipment provided under other Sections.

#### 1.02 SUBMITTALS AND DRAWINGS

A. Provide submittals and Drawings as specified in Section 1300 Submittals.

# PART 2 MATERIALS

- 2.01 WIRING DEVICES
  - A. General: Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA area rating.
  - B. Boxes:
    - 1. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC Article 314 requirements.
    - 2. Boxes shall be located and placed according to OWNER requirements.

- 3. All terminal and junction boxes shall be labeled identifying them by number shown on Contract Drawings engraved with ½" letters on nameplates meeting the requirements of Section 16052 Nameplates.
- 4. Non-Weatherproof Boxes:
  - a. Recessed boxes shall be flush with wall. Boxes for fixtures shall not be less than four (4) inches square or diameter. Boxes for switches and receptacles shall be two and one-eight inch (2-1/8) deep. Provide plaster rings or box cover adapters for the wall surface finish.
  - b. Surface boxes shall be cast ferrous, deep FD type.
- 5. Weatherproof Boxes:
  - a. Boxes located in NEMA 4X areas shall be stainless steel type rated NEMA 4X.
  - b. PVC-coated cast ferrous boxes may be used in place of stainless-steel boxes, except where boxes contain devices on cover. Boxes shall be deep, FD type. Single gang boxes shall have cast hubs.
- 6. Explosion proof Boxes:
  - a. Boxes shall be rated for Class 1, Division 1 or 2 and weatherprooflocations.
- C. Switches:
  - General purpose switches shall be manufactured in accordance with UL 20. Switches shall be single 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, or approved equal.
  - 2. Special purpose switches shall be provided with the amperage, voltage, and configuration as shown on the Drawings. Switches used as motor disconnects for single phase motors shall be horsepower rated.
- D. Receptacles:
  - General purpose receptacles shall be duplex and rated 20 amps, at 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, Specification grade, and side wired to screw terminals. Face color shall be brown in industrial areas and white or ivory in finished areas. General purpose receptacles shall be Bryant, Hubbell, or approved equal.
  - 2. GFI (ground fault circuit interrupting) receptacles shall be "Specification grade". 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 Arrow-Hart, Leviton, or approved equal.
  - 3. Four in One receptacles (4 each 20A-125V receptacles in one housing, shall mount on a single gang box without additional adapters). Four in One receptacles shall be Leviton 21254, Hubbell, or approved equal.
- E. Device Plates and Covers:
  - 1. Non-Weatherproof general purpose device plates and covers shall be stainless steel. Plates or covers shall be attached with stainless steel screws. Exception:

Device plates & covers within reach of sinks & other wet areas shall have beige plastic covers with plastic screws.

- 2. Device plates and covers for cast metal boxes shall be same material as the box.
- 3. PVC coated cast boxes shall have PVC coated cast covers.
- 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. Screws and hinge springs shall be stainless steel. Weatherproof access covers shall be Hubbell, Tay Mac, Crouse-Hinds, or approved equal.
- 5. Receptacle and light switch plates shall be stamped or engraved as specified in Section 16052 Nameplates.

### PART 3 EXECUTION

#### 3.01 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
- B. The Supplier shall employ personnel that are skilled and experienced in the installation of receptacles, plugs, switches, appurtenances, 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.

#### 3.02 INSTALLATION

#### A. System:

- 1. Install all products per Section 16010 Electrical.
- 2. Keep boxes, and other openings closed during construction to prevent entry of foreign matter. Cover devices and boxes to protect them against dirt, paint, water, chemical, or mechanical damage before and during construction period. Restore to original condition apparatus or equipment damaged prior to final acceptance. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.
- 3. All receptacles shall be tested by CONTRACTOR in presence of OWNER for correct connections utilizing a plug-in ground, line and neutral test light plug.
- 4. Boxes shall be relocated at no additional cost to OWNER as directed by ENGINEER when a conflict occurs in the box placement shown on Contract drawings and other building appurtenances.
- 5. Provide and install necessary wires in surface mount 3/4" (min) EMT conduit for lighting and receptacle arrangement as shown on Contract drawings.
- 6. Conductors shall be copper type THHN, #12 AWG (minimum).

- 7. Mount conduits using single bolt galvanized pipe straps and clamp back spacers.
- 8. Use stainless steel expansion wedge anchors or epoxy anchors as necessary for device mounting.
- 9. Provide and install all device boxes, junction boxes, receptacles, switches, and covers.
- 10. Receptacles to ground fault interrupter (GFI) type and weatherproof (WP) where shown.
- 11. See electrical symbols and abbreviations drawing for symbol definition.
- 12. All work shall conform to local codes and National Electric Code (NEC).
- B. Device Mounting Heights:
  - 1. Mounting heights of fixtures and devices shall be as follows unless otherwise indicated or when height has to be adjusted to be over or under counter tops.
    - a. Wall switches => 48 inches
    - b. Convenience outlets
- => 18 inches finished areas =>
  - 24 inches non-finished areas
- 54 inches c. Telephone outlets =>
- d. Bracket fixtures => 7 feet 6 inches
- C. Cutting and Patching:
  - 1. 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 and painted to their original condition after cutting and patching.
- D. Boxes:
  - 1. Leave no unused opening in any box. Install close-up plugs as required to seal openings.
  - 2. All spare and/or empty conduits shall terminate in a device box.
  - 3. Use stainless steel boxes when box must support door mounted devices.
  - 4. In NEMA 4X areas boxes are to be spaced <sup>1</sup>/<sub>4</sub>-inch minimum from walls using stainless steel, nylon, or plastic spacers. Regular steel washers are not considered an approved spacer.

#### 3.03 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.

# **SECTION 16223**

# **MOTOR STARTERS**

# PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes: Full voltage across the line starters, magnetic contactors, overload relays, combination starters and related motor controllers.

#### 1.02 REFERENCES

- A. National Electrical Code (NEC):1. Article 430 Motors, Motor Circuits and Controllers.
- B. National Electrical Manufacturers Association (NEMA).

### 1.03 SUBMITTALS

- A. Shop Drawings: Submit all Product DATA.
- B. Manufacturer's installation instructions.
- 1.04 WARRANTY
  - A. Submit manufacturer's standard warranty.

# PART 2 PRODUCTS

- 2.01 MANUFACTURERS
  - A. Variable Frequency Drives for pump operation:1. Allen-Bradley. Power Flex 700 series or approval equal.

#### 2.02 STARTERS

- A. Suitable for the horsepower ratings specified, and in accordance with NEC Article 430.
- B. Verify motor ratings and coordinate starter and overload trip ratings with actual horsepower and nameplate current ratings of motors installed.
- C. Magnetic Contactors: Factory adjusted and chatter free.

- D. Overload Relays: Install bimetallic type overload relays in each line conductor as indicated on the Drawings. Provide contacts for remote monitoring of overload status as indicated on the Drawings.
- E. Mount extended overload reset buttons to be accessible for operation without opening door of enclosure. Plastic overload relay reset buttons with plastic operator shafts are unacceptable.
- F. Provide starters of sufficient size to accommodate motors furnished, including larger starters required for larger motors supplied by CONTRACTOR.
- G. Combination Starters: Furnish complete with a 120 volt control transformer unless otherwise noted.
- H. Control Fuses: Size and furnish as required and where indicated in the schematics.
- I. VFD shall be specific to Pump Operation and be able to program start Pressure, Target Pressure, Ramp times, Drives shut off time and Have a Full Speed by pass contact.

#### 2.03 PROTECTION

- A. Heat Sink Thermistor. Monitored by microprocessor overtemp trip.
- B. Drive Overcurrent Trip.
  - 1. Soft Current Limit: 20-160% of rated current.
  - 2. Hardware Current limit: 200% of rated current (typical).
  - 3. Instantaneous Current limit: 220-300% of rated current (dependent on drive rating).
- C. Line transients, up to 6000 volts peak per IEEEC62.41-1991.
- D. Control logic Noise Immunity, Showering arc transients up to 1500V peak.
- E. Power Ride-Thru, 15 millisecond sat full load.
- F. Logic Control Ride-Thru, 0.5 seconds minimum, 2 seconds typical.

# 2.04 AGENCY CERTIFICATION

- A. The drive is designed to meet the following specifications: NFPA 70- US National Electrical Code NEMA ICS 3.1 – Safety standards for Constructions and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. NEMA 250 Enclosures of Electrical Equipment IEC 146 – International Electrical Code.
- B. UL and cUL Listed to UL508C and CAN/CSA-C2.2 No. 14-M91.

### 2.05 ENVIRONMENT

A. Altitude: 1000 m (3300 ft) max. without derating.

- B. Ambient Operating Temperature without derating, NEMA Type 1: 0 degrees © to 40 degrees © (32 degrees (f) to 104 degrees (f).
- 2.06 ELECTRICAL
  - A. Voltage Tolerance, -10% of minimum, + 10% of maximum.
  - B. Frequency Tolerance, 47-63 Hz.
  - C. Input Phase, Three-phase input provides full rating for all drives. Single-Phase operation provides 50% or rated current.
  - D. Efficiency, 97.5% at rated amps, nomical line volts.

### 2.07 CONTROL

- A. Method: Since coded PWM with programmable carrier frequency. Rating apply to all drives (refer to the Derating Guidelines on page 1-3 or reference manual). The drive can be supplied as 6 pulse or 12 pulse in a configured package.
- B. Carrier Frequency: PF700 0-3 Frames: 2-10 kHz. Drive rating based on 4 kHz.
- C. Output Voltage Rang: 0 to rated motor voltage.
- D. Output Frequency Range: 0 to 400 Hz.
- E. Electrical Motor Overload Protection: Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.

### PART 3 EXECUTION

- 3.01 INSTALLATION
- 3.02 APPLICATION
  - A. Supply circuit breaker trip elements and starter overload trip elements to meet above normal ambient temperatures where such conditions are anticipated (subject to ENGINEER'S acceptance).
- 3.03 DEMONSTRATION
  - A. Demonstrate operation of equipment.
- 3.04 PROTECTION
  - A. Protect products until acceptance by OWNER.

# SECTION 16225

# MOTOR CONTROL CENTER

# PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. The System Supplier shall customize and supply the motor control centers (MCC) as specified herein. Standard MCCs supplied direct from MCC manufacturer's factory will not be accepted. 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 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, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational MCCs as described in these Specifications, or required for fully operating facility.
- C. Work includes that specified in Division 16.
- D. The MCC scope of work includes:
  - 1. Providing MCCs.
  - 2. Installation of the MCCs.
  - 3. Submittal data and Drawings.
  - 4. Startup assistance.
  - 5. Testing.
  - 6. Operation and maintenance manuals.
  - 7. Warranty of all MCC components.
- E. All wiring and terminal blocks within each MCC shall be labeled. All neutral wires shall have white insulation.
- F. All MCCs shall be wired at System Supplier's facilities.
- G. Foot prints of MCCs shown on Contract Drawings were developed based on best available information. It is the CONTRACTOR'S responsibility to obtain site plans of the location for each MCC, control panel, etc to ensure the supplied equipment is appropriate for the location. CONTRACTOR is responsible for any additional conduits, wires, construction costs, engineering design requirements, etc to accommodate MCC, control panel, etc that are larger than that shown on Contract Documents.

### 1.02 SUBMITTALS

- A. Provide Data and Drawings as specified in general conditions specification.
- B. All submittal drawings shall be prepared by System Supplier. Factory supplied MCC drawings are not acceptable.

# 1.03 OPERATION AND MAINTENANCE MANUALS

- A. Provide operation and maintenance manuals as specified in general conditions specifications.
- B. In addition, include the following records in the O&M manuals for the MCC:
  - 1. Each motor starter including manufacturer, full part number, size, etc.
  - 2. Each overload heater element size and setting including manufacturer, full part number, size, etc.
  - 3. Each breaker part number and as-finalized breaker setting.

### 1.04 SUPPLIERS SERVICES

- A. Prices for the items specified shall include the following services of MCC supplier technical representatives at the job site. The number of hours and scope of services indicated are minimum requirements not including travel time. Time for travel and all associated expenses shall also be included in bid price for the work.
  - 1. 8 Labor hours per MCC Installation assistance, field inspection and functional testing.

# PART 2 MATERIALS

#### 2.01 MOTOR CONTROL CENTERS

- A. General:
  - 1. Each motor control centers (MCC) shall be built and tested in accordance with:
    - a. NEMA Standards.
    - b. ANSI.
    - c. Underwriter's Laboratories, Inc.
  - 2. Each 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. MCCs 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 be NEMA 1 type with 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. Each MCC shall be provided with the type, capacity, and ratings of components shown on the Drawings or otherwise specified. The breakers shall be rated to withstand an available fault current shown on contract Drawings.
- 7. MCP breakers shall be selected to have trip and breaker size based on the motor full load amps to meet NEC. When the MCP breaker 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 MCP breaker at no additional cost to OWNER.
- 8. MCC components such as relays, starters, breaker, lights, switches, etc. shall meet the requirements of Section 16010 Electrical.
- 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 CONTRACTOR 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. The concrete housekeeping pad shall be expanded by CONTRACTOR at no additional cost to OWNER when larger MCCs are supplied.
  - 3. MCCs 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. All starters and contactors shall be rated and designated in accordance with NEMA standards. Starters and contactors rated in amperes without manufactures published data indicating the corresponding NEMA sizes will not be acceptable. Submittals shall provide cross reference data which includes details of the manufacturer compliance with NEMA standards and tests.
  - 6. Existing MCC is a Meyer Controls Pedestal with motor starters. The new cabinets are to be pedestal style construction, as manufactured by Tesco, Primex, Telstar, or other approved system suppliers (information submitted before bid).
- C. Construction:
  - 1. Each 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. Each 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 or ANSI 49 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. MCCs 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.
- 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.
  - 3. A full length vertical bus shall be furnished in each Section and rated as shown on the Contract Elevation Drawings. 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 isolate 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 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. Compartment interconnect wiring shall be to 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 panelboards shall have panelboards installed per Section 16440 Panelboard.
- 11. Compartments containing motor starters shall each have an overload selection table posted inside the door.
- 12. MCC compartments labeled as space shall have a blank hinged door and drawout relay panel installed, occupying the full space area.

# PART 3 EXECUTION

- 3.01 WORKMANSHIP
  - A. All work in this Section shall conform to the safety lockouts, codes and standards specified in Section 16010 Electrical.

- B. The Supplier shall employ personnel that are skilled and experienced in the startup and testing 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 and all doors open a minimum of 90°.
- D. Electrical Section 16010 General Construction Methods and General Equipment Fabrication apply to the construction and assembly of MCCs.
- E. Perform any required work to correct improper installations at no additional expense to the OWNER.

### 3.02 INSTALLATION

- A. MCCs 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 CONTRACTOR 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 CONTRACTOR.
- B. Vertical Sections shall be mounted, leveled, and anchored to the concrete pad.
- C. In general, all conduits entering or leaving a MCC shall be stubbed up into the bottom horizontal wireway directly below the vertical Section in which the conductors are to be terminated.
- D. All motor starters that utilize changeable overload heater elements shall be furnished to the job site without the elements installed. After the mechanical equipment arrives, the CONTRACTOR shall check the nameplates for the full load amperage (FLA) rating and select the appropriate overload element to be installed. Electronic overloads shall be adjusted based on equipment nameplate FLA rating.
- E. Field interconnect wiring to the MCCs shall be neatly grouped by compartment and bound by plastic ty-wraps. All wiring shall be supported so that circuit terminations are not stressed.
- F. All lugs shall be copper sized for wires listed in the Conduit and Wire Routing Schedule.
- G. 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.
- H. The as-built electrical Drawings shall be placed in a water tight plastic wrap and shipped with the MCCs to the jobsite.
- I. Construction of MCC Sections shall be modular to allow installation of MCCs in buildings through standard access doors.

- J. Provide 1 cup of each color used for exterior paint finish of MCC to OWNER for its use.
- K. Clean and touch up paint the MCC exterior surfaces prior to final punch list.
- L. Clean and vacuum the interior of MCC prior to applying power and at the end of project, prior to final acceptance.
- 3.03 FIELD TESTS
  - A. Provide field testing of.
- 3.04 WARRANTY
  - A. Provide warranty as specified in Section 16010 Electrical.

# SECTION 16410

# SAFETY AND DISCONNECT SWITCHES

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall install, ready for use, disconnects switches as specified herein. 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 required to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter atno additional cost to the OWNER.
- B. Work includes that specified in Division 16.
- C. The disconnect switches scope of work includes:
  - 1. Provide and install fused switches on all mechanical HVAC units and other loads shown on one-line diagrams.
  - 2. Provide and install disconnect switches for disconnecting motor loads as shown on one-line diagrams.
  - 3. Provide all necessary hardware, conduit, fittings, and devices to connect the electrical equipment provided under other sections.

#### 1.02 SUBMITTALS AND DRAWINGS

A. Provide Submittals and Drawings as specified in Section 1300 Submittals.

#### PART 2 MATERIALS

- 2.01 GENERAL
  - A. Switches shall be provided with the voltage, and amperage rated as shown on the oneline and otherContract Drawings. All switches shall be UL labeled.
  - B. Switches to be located outdoors or in damp/wet NEMA 4X locations shall be stainless steel rated NEMA 4X. All other disconnect switches shall be steel NEMA 12 except in hazardous locations orwhere specifically called out on Contract Drawings.
  - C. Switches to be installed in a hazardous (Class 1, Division 1 or 2) areas shall be housed in explosion proof enclosures.
  - D. The operating handle shall be capable of being padlocked in the "OFF" position. The operator shallbe a positive, quick-make, quick-break mechanism.

- E. Switches shall be provided with defeatable door interlocks that prevent the door from opening when the operating handle is in the "ON" position.
- F. Operating handle shall be an integral part of the enclosure frame and in no way part of the door orcover.
- G. Handle position shall clearly indicate whether the switch is in "ON" or "OFF".
- H. Equipment ground kits shall be furnished for each switch.

# 2.02 FUSED DISCONNECT SWITCHES

- A. Fused disconnect switches shall be provided with fuse holder with fuses sized as required by to protect the equipment.
- B. The rating of disconnects for mechanical HVAC equipment shall be per HVAC manufacturers requirements. Combined fused disconnect with GFI receptacle and transformer is acceptable for HVAC disconnects.
- C. Fused disconnect switches shall be heavy-duty rated, safety type.
- D. Switches shall have fuse shields.
- E. Fused disconnect switches shall be Square D, Cutler-Hammer, or equal.

# 2.03 NON-FUSIBLE DISCONNECT SWITCHES

- A. Switches shall be fully HP rated to disconnect the motors under load or connect the motors to start.
- B. Disconnects shall be of the enclosed knife blade type.
- C. Disconnect switches shall be Square D, Cutler-Hammer, or approved equal.

# PART 3 EXECUTION

- 3.01 WORKMANSHIP
  - A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
  - B. The Supplier shall employ personnel that are skilled and experienced in the installation of switches 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.
- 3.02 INSTALLATION
  - A. System:
    - 1. Install all products per Section 16010 Electrical.
    - 2. Cover switches and protect them against dirt, paint, water, chemical, or mechanical damage before and during construction period. Restore to original condition prior to final acceptance. Protect bright finished surfaces and similar items until in service. No rust or paint damage will be permitted.
  - B. Install switches with NEMA type enclosures as required by the location designation.
  - C. Provide all mounting brackets, stands, hardware as necessary to completely support the switches at he locations indicated on the Contract Drawings.
  - D. Provide supports per Section 16051 Supporting Devices.
  - E. Connect equipment grounding conductors only to the approved equipment ground kit.
  - F. Nameplates shall be provided on each disconnect switch per Section 16052 Nameplates.

### 3.03 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.
# **SECTION 16440**

# PANELBOARD

### PART 1 GENERAL

#### 1.01 SCOPE OF WORK

- A. The CONTRACTOR shall supply the panelboards and panelboard transformers shown on the Contract Drawings and as specified herein.
- B. Furnish all required labor, materials, safety equipment, transportation, test equipment, incidentals and services to provide complete and operational panelboards as described in these Specifications and required for fully operational facility.
- C. Work includes that specified in Section 16010 Electrical.
- D. The panelboard:
  - 1. Providing panelboard.
  - 2. Installation of panelboards at locations shown on Drawings.
  - 3. The quantity of breakers with size and number of poles as shown on panelboard schedules.
  - 4. Submittal data and Drawings.
  - 5. Startup assistance.
  - 6. Testing.
  - 7. Operation and maintenance manuals.
  - 8. Warranty of all components of the panelboards.

#### 1.02 SUBMITTALS AND DRAWINGS

- A. Provide data and drawings for all panels and service pedestals to be provided under this project.
- B. Provide ratings and characteristics including voltage ratings, busing arrangements, continuous current ratings, fault current withstand ratings, neutral bus rating, ground bar, ratings, and arrangement of overcurrent protective devices.
- C. Provide catalog cuts for panelboards, circuit breakers and transformers.
- D. Submit panelboard schedules for approval.
- E. Existing panelboard schedules were developed based on best available information. CONTRACTOR shall verify that circuits to be used for this project are available.

### 1.03 OPERATIONS AND MAINTENANCE MANUALS

A. Provide data and Drawings for all materials furnished under this Section with the content and format as specified Section 16080 Electrical and Instrumentation Operations and Maintenance Data.

### PART 2 MATERIALS

#### 2.01 PANELBOARDS

- A. General:
  - 1. The CONTRACTOR shall furnish panelboards of a type indicated on the Contract panelboard schedules and specified herein.
  - 2. Panelboards shall comply with the applicable Sections of UL, NEC, and NEMA and be manufactured by the same manufacturer for all panelboards.
  - 3. A removable machine-typed circuit directory with clear plastic cover shall be shipped with each panelboards and mounted on the inside of door in a frame. Circuit directory shall be as approved in the Submittal. Circuit directory shall be updated or replaced to show asbuilt breaker identification.
  - 4. The directory cards shall be placed in panelboards when the panelboards are mounted in field and prior to termination of wires to breakers.
- B. Interior:
  - 1. Factory assembled with bolt-on devices.
  - 2. Full size insulated neutral bus shall be included. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
  - 3. Bus bar shall be copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 50° C above an ambient 40° C maximum.
  - 4. A copper ground and neutral bus bar shall be included in panelboards with terminal screws.
- C. Trim:
  - 1. Provide hinged door over all circuit breaker handles. Door of panelboard trim shall not uncover any live parts. Door shall have a catch, lock, and trim.
  - 2. Surface of the trim assembly shall be properly cleaned, primed, and a finish coat of gray paint to match MCC color when installed in MCC, otherwise painted to match room décor.
  - 3. Provide engraved nameplates on panelboards as specified in Section 16052 Nameplates.
- D. Panelboard Ratings:
  - 1. Panelboards shall be rated as shown on the Contract Drawings.
  - 2. Breakers shall be a minimum of 100 ampere frames. Breakers 15 through 100 amperes trip size shall take up the same pole spacing. All panelboard breakers shall be provided with individual padlock hasps (lockable in off position). Provide molded-case breakers with quick-make and quick-break toggle mechanism, inverse- time trip characteristics, and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by handle position between the

manual OFF and ON position. Provide high intensity discharge (HID) rated circuit breakers for HID lighting circuits. Provide HACR rated breakers for all HVAC loads. Provide trip ratings as indicated in panelboard schedule. Series breakers devices are not allowed to meet interrupt ratings listed.

- 3. Panelboards shall be labeled with a UL short circuit rating.
- E. Space Only:
  - 1. Where "space" is noted on the drawings, provide connectors, mounting brackets, blank covers, etc., for the future insertion of an overcurrent device.

## PART 3 EXECUTION

- 3.01 GENERAL
  - A. Set taps under load conditions for correct voltage.
  - B. Install transformers located outside MCC on Korfund double-deflection mounts selected for the weight of the transformer, to produce the maximum isolation. Secure with four one-half inch (minimum) diameter stainless steel anchors, minimum 2-1/2" embedment.
  - C. For floor and wall mounted transformer install with a 6" minimum clearance (or distance required by transformer manufacturer) between transformer and walls.

#### 3.02 WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards specified in Section 16010 Electrical.
- B. Ensure that all equipment and materials fit properly in their installations.
- C. Perform any required work to correct improper installations at no additional expense to the OWNER.

#### 3.03 WARRANTY

A. Provide warranty as specified in Section 16010 Electrical.

# END OF SECTION

# SECTION 17050

# COMMON WORK RESULTS FOR PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. General requirements applicable to all Process Control and Instrumentation Work.
  - 2. General requirements for process control and instrumentation submittals.

#### B. Related sections:

- 1. Section 1300 Submittals.
- C. Interfaces to equipment, instruments, and other components:
  - 1. Drawings, Specifications, and overall design are based on preliminary information furnished by various equipment manufacturers, which identify a minimum scope of supply from the manufacturers. This information pertains to, but is not limited to, instruments, control devices, electrical equipment, packaged mechanical systems, and control equipment provided with mechanical systems.
  - 2. Provide all material and labor needed to install the actual equipment furnished, include all costs to add any additional instruments, wiring, control system inputs/outputs, controls, interlocks, electrical hardware etc., which may be necessary to make a complete, functional installation based on the actual equipment furnished:
    - a. Make all changes necessary to meet the manufacturer's wiring requirements.
  - 3. Submit all such changes and additions to the ENGINEER for acceptance.
  - 4. Review the complete set of Drawings and Specifications in order to ensure that all items related to the instrumentation and control systems are completely accounted for. Include any items indicated on the Drawings or in Specifications from another discipline in the scope of Work:
    - a. If a conflict between Drawings and Specifications is discovered, refer conflict to the ENGINEER as soon as possible for resolution.
  - 5. Loop drawings:
    - a. Provide complete loop drawings for all systems, including packaged equipment furnished as part of a vendor furnished package, and for all pre-purchased equipment.
    - b. The form, minimum level of detail, and format for the loop drawings must match that of the sample loop drawings included in the Contract Documents.
    - c. The OWNER and ENGINEER are not responsible for providing detailed loop diagrams for CONTRACTOR furnished equipment.

- D. All instrumentation, and control equipment and systems for the entire project to comply with the requirements specified in the Instrumentation and Control Specifications, whether referenced in the individual Equipment Specifications or not:
  - 1. The requirements of the Instrumentation and Control Specifications apply to all Instrumentation and Control Work specified in other Specifications, including HVAC controls, packaged mechanical systems, LCPs, VCPs, etc.
  - 2. Inform all vendors supplying instrumentation, control systems, panels, and/or equipment of the requirements of the Instrumentation and Control Specifications.
  - 3. The OWNER is not responsible for any additional costs due to the failure of the CONTRACTOR to notify all subcontractors and suppliers of the Instrumentation and Control Specifications' requirements.
- E. Contract Documents:
  - 1. General:
    - a. The Drawings and Specifications are complementary and are to be used together in order to fully describe the Work.
  - 2. Specifications:
    - a. Sections 00700 General Conditions and 00800 Supplementary Conditions of the Contract Documents govern the Work.
    - b. These requirements are in addition to all General Requirements.
  - 3. Contract Drawings:
    - a. The Instrumentation and Control Drawings show in a diagrammatic manner, the desired locations, and arrangements of the components of the Instrumentation Work. Follow the Drawings as closely as possible, use professional judgment and coordinate with the other trades to secure the best possible installation, use the entire Drawing set for construction purposes.
    - b. Locations of equipment, control devices, instruments, boxes, panels, etc. are approximate only, exercise professional judgment in executing the Work to ensure the best possible installation:
      - 1) The equipment locations and dimensions indicated on the Drawings and elevations are approximate. Use the shop drawings to determine the proper layout, foundation, and pad requirements, etc. for final installation. Coordinate with all subcontractors to ensure that all instrumentation and control equipment is compatible with other equipment and space requirements. Make changes required to accommodate differences in equipment dimensions.
      - 2) The CONTRACTOR has the freedom to select any of the named manufacturers as identified in the individual Specifications; however, the ENGINEER has designed the spatial equipment layout based upon a single manufacturer and has not confirmed that every named manufacturer's equipment fits in the allotted space. It is the CONTRACTOR'S responsibility to ensure that the equipment being furnished fits within the defined space.
    - c. Installation details:
      - 1) The Contract Drawings include installation details showing means and methods for installing instrumentation and control equipment. For cases where typical details are not provided or compatible with an installed location, develop installation details that are necessary for

completing the Work, and submit these details for review by the ENGINEER.

- d. Schematic diagrams:
  - 1) All controls are shown de-energized.
  - 2) Schematic diagrams show control function only. Incorporate other necessary functions for proper operation and protection of the system.
  - 3) Add slave relays, where required, to provide all necessary contacts for the control system or where needed to function as interposing relays for control voltage coordination, equipment coordination, or control system voltage drop considerations.
  - 4) Mount all devices shown on motor controller schematic diagrams in the controller compartment enclosure, unless otherwise noted or indicated.
  - 5) Control schematics are to be used as a guide in conjunction with the descriptive operating sequences indicated on the Drawings or in the Specifications. Combine all information and furnish a coordinated and fully functional control system.
- F. Alternates/Alternatives:
  - 1. Substitute item provisions as specified in Section 00700 General Conditions.
- G. Changes and change orders:
  - 1. As specified in Section 00700 General Conditions.

# 1.02 REFERENCES

- A. Code compliance:
  - 1. The following codes and standards are hereby incorporated into this Section:
    - a. American National Standards Institute (ANSI).
    - b. American Petroleum Institute (API):
      - RP 550 Manual on Installation of Refinery Instruments and Control Systems; Part II-Process Stream Analyzers; Section 5-Oxygen Analyzers.
      - 2) RP 551 Process Measurement Instrumentation.
    - c. International Organization for Standardization (ISO):
      - 1) 9001 Quality Management Systems Requirements.
    - d. International Society of Automation (ISA):
      - 1) 5.1 Instrumentation Symbols and Identification.
      - 2) 5.4 Instrument Loop Diagrams.
      - 3) 20 Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.
    - e. National Electrical Manufacturers Association (NEMA):
      - 1) 250 Enclosures for Electrical Equipment (1000 V Maximum).
    - f. National Fire Protection Association (NFPA).
    - g. National Institute of Standards and Technology (NIST).
    - h. Underwriters Laboratories, Inc. (UL):
      - 1) 508 Standard of Safety for Industrial Control Equipment.
      - 2) 508A Standard of Safety for Industrial Control Panels.
- B. Compliance with Laws and Regulations:

1. As specified in Division 0 Specifications.

# 1.03 DEFINITIONS

- A. Definitions of terms and other electrical and instrumentation considerations in accordance with:
  - 1. Factory Mutual (FM).
  - 2. International Electrotechnical Commission (IEC).
  - 3. Institute of Electrical and Electronics Engineers (IEEE).
  - 4. International Society of Automation (ISA).
  - 5. International Organization for Standardization (ISO).
  - 6. National Electrical Code (NEC).
  - 7. National Electrical Manufacturers Association (NEMA).
  - 8. InterNational Electrical Testing Association (NETA).
  - 9. National Fire Protection Association (NFPA).
  - 10. National Institute of Standards and Technology (NIST).
  - 11. Underwriters Laboratories (UL).
- B. Specific definitions:
  - 1. Control circuit: Any circuit operating at 120 volts alternating current (VAC) or direct current (VDC) or less, whose principal purpose is the conveyance of information (including performing logic) and not the conveyance of energy for the operation of an electrically powered device.
  - 2. Panel: An instrument support system that may be a flat surface, a partial enclosure, or a complete enclosure for instruments and other devices used in process control systems.
  - 3. Power circuit: Any circuit operating at 90 volts (AC or DC) or more, whose principal purpose is the conveyance of energy for the operation of an electrically powered device.
  - 4. Signal circuit: Any circuit operating at less than 50 VAC or VDC, which conveys analog information or digital communications information.
  - 5. Digital bus: A communication network, such as PROFIBUS, Foundation Fieldbus, or DeviceNet, allowing instruments and devices to transmit data, control functions and diagnostic information.
  - 2-Wire transmitter (loop powered): A transmitter that derives its operating power supply from the signal transmission circuit and requires no separate power supply connections. As used in this Section, 2-wire transmitter refers to a transmitter that provides a signal such as 4 to 20 mA 24VDC regulation of a signal in a series circuit with an external 24 VDC driving potential:

     a. Fieldbus communications signal or both.
  - 7. Powered transmitters: A transmitter that requires a separate power source (120 VAC, 240 VAC, etc.) in order for the transmitter to develop its signal. As used in this Section, the produced signal may be a 4 to 20 mA 24VDC signal, a digital bus communications signal or both.
  - 8. System supplier As specified in ICSC Qualifications in the Quality Assurance article of this Section.
- C. NEMA:
  - 1. Type 1 enclosure in accordance with NEMA 250.

- 2. Type 2 enclosure in accordance with NEMA 250.
- 3. Type 3 enclosure in accordance with NEMA 250.
- 4. Type 3R enclosure in accordance with NEMA 250.
- 5. Type 3S enclosure in accordance with NEMA 250.
- 6. Type 3X enclosure in accordance with NEMA 250.
- 7. Type 3RX enclosure in accordance with NEMA 250.
- 8. Type 3SX enclosure in accordance with NEMA 250.
- 9. Type 4 enclosure in accordance with NEMA 250.
- 10. Type 4X enclosure in accordance with NEMA 250.
- 11. Type 5 enclosure in accordance with NEMA 250.
- 12. Type 6 enclosure in accordance with NEMA 250.
- 13. Type 6P enclosure in accordance with NEMA 250.
- 14. Type 7 enclosure in accordance with NEMA 250.
- 15. Type 12 enclosure in accordance with NEMA 250.
- 16. Type 12K enclosure in accordance with NEMA 250.
- 17. Type 13 enclosure in accordance with NEMA 250.
- D. Acronym definitions:
  - 1. CCS: The PCS central computer system (CCS) consisting of computers and software. The personal computer-based hardware and software system that includes the operator interface, data storage, data retrieval, archiving, alarming, historian, reports, trending, and other higher level control system software and functions.
  - 2. DPDT: Double-pole, double-throw.
  - 3. ES: Enterprise system: Computer based communications or data sharing system utilized for non-process control functions such as E-mail, sharing files, creating documents, etc.
  - 4. FAT: Factory acceptance test also known as Source Test.
  - 5. HART: Highway addressable remote transducer.
  - 6. HOA: Hand-Off-Auto control function that is totally PLC based. In the Hand mode, equipment is started or stopped, valves are opened or closed through operator direction under the control of the PLC software. In the Auto mode, equipment is started or stopped and valves are opened or closed through a control algorithm within the PLC software. In the Off mode, the equipment is prohibited from responding from the PLC control.
  - 7. SCADA: A software application that presents information to an operator or user about the state of a process, and to accept and implement the operators control instructions. Typically information is displayed in a graphical format.
  - 8. ICSC: Instrumentation and control system CONTRACTOR: Subcontractor who specializes in the design, construction, fabrication, software development, installation, testing, and commissioning of industrial instrumentation and control systems.
  - 9. IJB: Instrument junction boxes: A panel designed with cord sets to easily remove, replace, or relocate instrument signals.
  - 10. I/O: Input/Output.
  - 11. IP: Internet protocol or ingress protection.
  - 12. Local control panel (LCP): Operator interface panel that may contain pilot type control devices, operator interface devices, control relays, etc. and does not contain a PLC or RIO.

- 13. LAN: Local area network: A control or communications network that is limited to the physical boundaries of the facility.
- 14. HMI: Human Machine Interface is an operator interface device consisting of an alphanumeric or graphic display with operator input functionality. The HMI is typically a flat panel type of display mounted on the front of an enclosure with either a touch screen or tactile button interface.
- 15. LOR: Local-Off-Remote control function. In the Remote mode, equipment is started or stopped, and valves are opened or closed through the PLC based upon the selection of the HOA. In the Local mode, equipment is started or stopped, valves are opened or closed based upon hardwired control circuits completely independent of the PLC with minimum interlocks and permissive conditions. In the Off mode, the equipment is prohibited from responding to any control commands.
- 16. NJB: Network junction box. An enclosure that contains multiple access points to various networks within the facility. Networks could be Ethernet, Ethernet/IP, Fieldbus, RIO etc.
- 17. P&ID: Process and instrumentation diagram.
- 18. PC: Personal computer.
- 19. PCIS: Process control and instrumentation system: Includes the entire instrumentation system, the entire control system, and all of the Work specified in the Instrumentation and Control Specifications and depicted on the Instrumentation Drawings. This includes all the PCS and instruments and networking components as well as the various servers, workstations, thin clients etc.
- 20. PCM: Process control module: An enclosure containing any of the following devices: PLC, RTU, or RIO.
- 21. PCS: Process Control System: A general name for the computerized system that gathers and processes data from equipment and sensors and applies operational controls to the process equipment. It includes the PLCs and/or RIOs, HMIs, both LCPs, VCPs and all data management systems accessible to staff.
- 22. PJB: Power junction box: An enclosure with terminal blocks that distribute power to multiple instruments.
- 23. PLC: Programmable logic controller.
- 24. RIO: Remote I/O device for the PLC consisting of remote I/O racks, or remote I/O blocks.
- 25. RTU: Remote telemetry unit: A controller typically consisting of a PLC, and a means for remote communications. The remote communications devices typically are radios, modems, etc.
- 26. SPDT: Single-pole, double-throw.
- 27. SPST: Single-pole, single-throw.
- 28. UPS: Uninterruptible power supply.
- 29. VCP: Vendor control panel: Control panels that are furnished with particular equipment by a vendor other than the ICSC. These panels may contain PLCs, RIO, HMI, etc.
- 30. WAN: Wide area network: A control or communications network that extends beyond the physical boundaries of the facility.

### 1.04 SYSTEM DESCRIPTION

A. General requirements:

- 1. The Work includes everything necessary for and incidental to executing and completing the instrumentation and control system work indicated on the Drawings and specified in the Specifications and reasonably inferable there from including but not limited to:
  - a. Preparing hardware submittals for field instrumentation.
  - b. Design, develop, and draft loop drawings, control panel designs, and all other drawing submittals specified in the Instrumentation and Control Specifications.
  - c. Prepare the test plan, the training plan, and the spare parts submittals.
  - d. Procure all hardware.
  - e. Provide all HMI hardware.
  - f. Provide all HMI software.
  - g. Fabricate panels.
  - h. Perform factory tests on panels.
  - i. Perform bench calibration and verify calibration after installation.
  - j. Oversee and certify installation of the PCS system.
  - k. Oversee, document, and certify loop testing.
  - I. Oversee, document, and certify system.
  - m. Installation Testing.
  - n. Oversee and document Functional Testing.
  - o. Conduct the Process Operational Period and the Instrumentation and Controls Process Performance Testing.
  - p. Prepare operation and maintenance manuals.
  - q. Conduct training classes.
  - r. Integrate the PCS with instrumentation and control devices provided under other sections.
  - s. Provide Record Drawings and Loop Drawings associated with Instruments and equipment:
    - 1) As specified in the Contract Documents.
    - 2) For OWNER furnished items.
    - 3) For interfaces with existing equipment.
  - t. Resolve signal, power, or functional incompatibilities between the PCS and interfacing devices.
  - u. Perform all required corrective and preventative maintenance.
- 2. It is the intent of these Specifications that the entire electrical power, instrumentation, and control system be complete and operable. Provide all necessary material and labor for the complete system from source of power to final utilization equipment, including all connections, testing, calibration of all equipment furnished by others, as well as equipment furnished by the CONTRACTOR, whether or not specifically mentioned but which are necessary for successful operation.
- Provide the complete operating HMI to perform the specified monitoring, communications, alarm, control, and display functions in accordance with the HMI requirements.
- 4. Coordinate all aspects of the Work between CONTRACTOR and all subcontractors before bidding to ensure that all costs associated with a complete installation are included. The OWNER is not responsible for any change orders due to lack of coordination of the Work between the CONTRACTOR, the ICSC, the other subcontractors or suppliers.

- 5. Furnish detailed, complete, and thorough operations and maintenance documentation, including but not limited to operations manuals, maintenance manuals, as-built wiring drawings, training manuals, as-built software documentation, and all other documentation required to operate, modify, and maintain all parts of the PCS.
- 6. The Programmer will provide as-built software documentation for the PLCs and HMIs programmed by the Programmer. The Programmer will provide training on hardware and software items provided by the Programmer. All other documentation and training shall be by the CONTRACTOR.
- 7. Revise in a manner as directed by the ENGINEER all I/O and addressing that the ENGINEER determines to be unacceptable as a result of a lack of CONTRACTOR coordination between Contract Documents and all suppliers.
- 8. Defective Work:
  - a. As specified in Section 00700 General Conditions.
- B. New system:
  - 1. This project consists of improving the existing Covert Lift Station by replacing and modifying existing valves, changing the existing pipe layout, updating electrical controls and monitoring system, and paving around the existing facility.
  - 2. Provide new PLC and HMI. Reuse existing radio (to be relocated from existing enclosure).
- 1.05 SUBMITTALS
  - A. Furnish submittals as specified in Section 1300 Submittals and this Section.
  - B. General:
    - 1. Instruct all equipment suppliers of submittals and operation and maintenance manuals of the requirements in this Section.
    - 2. Furnish the submittals required by each section in the Instrumentation Specifications.
    - 3. Adhere to the wiring numbering scheme specified in Section 16075 Identification for Electrical Systems throughout the Project:
      - a. Uniquely number each wire.
      - b. Wire numbers must appear on all Equipment Drawings.
    - 4. Use equipment and instrument tags, as indicated on the Drawings, for all submittals.
  - C. Submittal organization:
    - 1. First page:
      - a. Specification section reference.
      - b. Name and telephone number of individual who reviewed submittal before delivery to ENGINEER.
      - c. Name and telephone number of individual who is primarily responsible for the development of the submittal.
      - d. Comments.
      - e. CONTRACTOR'S review certification statement and signature.
    - 2. Next pages:

- a. Provide confirmation of specification compliance in a tabular form that individually lists each specification section, paragraph, and subparagraphs and unequivocally states compliance with said requirement or takes exception to the requirement and lists the reason for said exception and offers alternative means for compliance.
- b. Include a response in writing to each of the ENGINEER'S comments or questions for submittal packages which are re-submitted:
  - 1) In the order that the comments or questions were presented throughout the submittal.
  - 2) Referenced by index section and page number on which the comment appeared.
  - 3) Acceptable responses to ENGINEER'S comments are either:
    - a) ENGINEER'S comment or change is accepted and appropriate changes are made.
    - b) Explain why comment is not accepted or requested change is not made.
    - c) Explain how requirement will be satisfied in lieu of comment or change requested by ENGINEER.
  - 4) Any re-submittal, which does not contain responses to the ENGINEER'S previous comments shall be returned for Revision and Re-submittal.
  - 5) No further review by the ENGINEER will be performed until a response for previous comments has been received.
- 3. Remaining pages:
  - a. Actual submittal data:
    - 1) Organize submittals in exactly the same order as the items are referenced, listed, and/or organized in the specification section.
    - 2) For submittals that cover multiple devices used in different areas under the same specification section, the submittal for the individual devices must list the area where the device is intended to be used.
- D. Submittal requirements:
  - 1. Furnish submittals that are fully indexed with a tabbed divider for every component.
  - 2. Sequentially number pages within the tabbed sections. Submittals and operation and maintenance manuals that are not fully indexed and tabbed with sequentially numbered pages, or are otherwise unacceptable, will be returned without review.
  - 3. Furnish submittals in the following general order, each in a separate bound set:
    - a. Schedule of Values.
    - b. Product Data.
    - c. After ENGINEER acceptance of the Product Data, submit the Project Shop Drawing submittals.
    - d. Loop Description Submittal.
    - e. The Process Control Hardware and Software Submittal including, control system software, programming, and screens.
    - f. Testing, Calibration and Process Start-up procedures.
    - g. Operation and Maintenance Data.
    - h. Training Submittals.
    - i. Record Documents.

- 4. Edit all submittals and operation and maintenance manuals so that the submittal specifically applies to only the equipment furnished:
  - a. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment being furnished.
- 5. Submit copies of shop drawings, and product data:
  - a. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
- 6. Where submittals are required, provide a separate submittal for each specification section. In order to expedite construction, the CONTRACTOR may make more than 1 submittal per specification section, but a single submittal may not cover more than 1 specification section:
  - a. The only exception to this requirement is when 1 specification section covers the requirements for a component of equipment specified in another section. (For example, circuit breakers are a component of switchgear. The switchgear submittal must also contain data for the associated circuit breakers, even though they are covered in a different specification section.)
- 7. Exceptions to Specifications and Drawings:
  - a. Include a list of proposed exceptions to the Specifications and Drawings along with a detailed explanation of each.
  - b. If there is insufficient explanation for the exception or deviation, the submittal will be returned requiring revision and re-submittal.
  - c. Acceptance of any exception is at the sole discretion of the ENGINEER:
    - 1) Provide all items (materials, features, functions, performance, etc.) required by the Contract Documents that are not accepted as exceptions.
  - d. Replace all items that do not meet the requirements of the Contract Documents, which were not previously accepted as exceptions, even if the submittals contained information indicating the failure to meet the requirements.
- E. Submittal preparation:
  - 1. During the period of preparation of submittals, the CONTRACTOR shall authorize direct, informal liaison between the ICSC and the ENGINEER for exchange of technical information. As a result of this liaison, certain minor refinements and revisions may be authorized informally by the ENGINEER, which do not alter the scope of Work or cause increase or decrease in the Contract price or times. During this informal exchange, no oral statement by the ENGINEER shall be construed to give formal approval of any component or method, nor shall any statement be construed to grant exception to, or variation from, these Contract Documents.
  - 2. In these Contract Documents, some items of Work are represented schematically, and are designated for the most part by numbers, as derived from criteria in ISA-5.1:
    - a. Employ the nomenclature and numbers designated in this Section and indicated on the Drawings exclusively throughout shop drawings, data sheets, and similar submittals.
    - b. Replace any other symbols, designations, and nomenclature unique to a manufacturer's, suppliers, or subcontractor's standard methods with those identified in this Section and indicated on the Drawings.

- F. Specific submittal requirements:
  - 1. Shop drawings:
    - a. Required for materials and equipment listed in this and other sections.
    - b. Furnish sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications.
    - c. Shop drawings requirements:
      - 1) Front, side, and, rear elevations, and top and bottom views, showing all dimensions.
      - 2) Locations of conduit entrances and access plates.
      - 3) Component layout and identification.
      - 4) Schematic and wiring diagrams with wire numbers and terminal identification.
      - 5) Connection diagrams, terminal diagrams, internal wiring diagrams, conductor size, etc.
      - 6) Anchoring method and leveling criteria, including manufacturer's recommendations for the Project site seismic criteria.
      - 7) Weight.
      - 8) Finish.
      - 9) Nameplates:
        - a) As indicated in the Drawings.
      - 10) Temperature limitations, as applicable.
    - d. Use equipment and instrument tags as depicted on the P&IDs for all submittals.
    - e. Adhere to wiring numbering scheme outlined in Section 16075 Identification for Electrical Systems throughout the Project:
      - 1) Uniquely number each wire per the Specifications.
    - f. Wire numbers must appear on all equipment drawings.
    - g. Organize the shop drawing submittals for inclusion in the Operation and Maintenance Manuals:
      - 1) Furnish the initial shop drawing submittal bound in one or more standard size, 3-ring, D-ring, loose leaf, vinyl plastic, hard cover binders suitable for bookshelf storage.
      - 2) Binder ring size: 2 inches.
    - h. Include the letterhead and/or title block of the firm responsible for the preparation of all shop drawings. Include the following information in the title block, as a minimum:
      - 1) The firm's registered business name.
      - 2) Firm's physical address, email address, and phone number.
      - 3) OWNER'S name.
      - 4) Project name and location.
      - 5) Drawing name.
      - 6) Revision level.
      - 7) Personnel responsible for the content of the drawing.
      - 8) Date.
    - i. The work includes modifications to existing circuits:
      - 1) Clearly show all modifications to existing circuits.
      - 2) In addition, show all existing unmodified wiring to clearly depict the functionality and electrical characteristics of the complete modified circuits.

- 2. Product data:
  - a. Submitted for non-custom manufactured material listed in this and other sections and shown on shop drawings.
  - b. Include:
    - 1) Catalog cuts.
    - 2) Bulletins.
    - 3) Brochures.
    - 4) Quality photocopies of applicable pages from these documents.
    - 5) Identify on the data sheets the Project name, applicable specification section, and paragraph.
    - 6) Identify model number and options for the actual equipment being furnished.
    - 7) Neatly cross out options that do not apply or equipment not intended to be supplied.
  - c. Use equipment and instrument tags as depicted on the P&IDs for all submittals.
  - d. Adhere to wiring numbering scheme outlined in Section 16075 Identification for Electrical Systems throughout the Project:
    - 1) Uniquely number each wire per the Specifications.
  - e. Wire numbers must appear on all equipment drawings.
- 3. Detailed sequence of operation for all equipment or systems.
- 4. Operation and maintenance manuals:
  - a. Submit preliminary sets of these manuals to the ENGINEER for review of format and content:
    - 1) ENGINEER will return 1 set with comments.
    - Revise and/or amend as required and submit the requisite number of copies to the ENGINEER 15 days before Functional Testing of the systems.
  - b. Incorporate changes that occur during process start-up and submit as part of the final manuals.
  - c. Provide comprehensive information on all systems and components to enable operation, service, maintenance, and repair.
  - d. Include Record Documents and the accepted shop drawing submittals, modified for conditions encountered in the field during the work.
  - e. Include signed results from Functional Testing and Process Operational Period.
  - f. Provide installation, connection, operating, calibration, setpoints (e.g., pressure, pump control, time delays, etc.), adjustment, test, troubleshooting, maintenance, and overhaul instructions in complete detail.
  - g. Provide exploded or other detailed views of all instruments, assemblies, and accessory components together with complete parts lists and ordering instructions.
  - h. Spare parts list:
    - 1) Include a priced list of recommended spare parts for all the equipment furnished under this Contract:
      - a) Include recommended quantities sufficient to maintain the furnished system for a period of 5 years.
    - 2) Annotate the list to indicate which items, if any and quantity are furnished as part of this Contract.

- i. Provide the name, address, and phone number of manufacturer and manufacturer's local service representative of these parts.
- j. Additional operation and maintenance manual requirements:
  - 1) Completely index manuals with a tab for each section:
    - a) Each section containing applicable data for each piece of equipment, system, or topic covered.
    - b) Assemble manuals using the accepted shop drawings, and include, the following types of data:
      - 1. Complete set of 11-inch by 17-inch drawings of equipment.
      - 2. Complete set of 11-inch by 17-inch drawings of the control system.
      - 3. Complete set of control schematics.
      - 4. Complete parts list for all equipment being provided.
      - 5. Catalog data for all products or equipment furnished.
- k. Operational Manual:
  - 1) Prepare and provide a simplified version of the standard manufacturer's SCADA software and system operations manual that includes basic instructions in the application of the system as required for operators in day-to-day operations.
- I. Control System Software Record Documents:
  - 1) Include complete documentation of all the software programs provided for the entire control and PCS system, including:
    - a) Listings of all application software on both hard copy and DVD-ROM.
    - b) Database, both hard copy and DVD-ROM.
    - c) Communication protocols.
    - d) All documentation necessary to maintain, troubleshoot, modify, or update the software system.
- m. Organize the operation and maintenance manuals for each process in the following manner:
  - 1) Section A Process and Instrumentation Diagrams.
  - 2) Section B Control Descriptions.
  - 3) Section C Loop Drawings.
  - 4) Section D Instrument Summary.
  - 5) Section E Instrument Data Sheets and Brochures.
  - 6) Section F Sizing Calculations.
  - 7) Section G Instrumentation Installation Details.
  - 8) Section H Test Results.
  - 9) Section I Operational Manual.
  - 10) Section J Spare Parts List.
  - 11) Section K Control System Software.
- 5. Material and equipment schedules:
  - a. Furnish a complete schedule and/or matrix of all materials, equipment, apparatus, and luminaries that are proposed for use:
    - 1) Include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.
- 6. Itemized instrument summary:
  - a. Submit a hard copy of the instrument summary.
  - b. List all of the key attributes of each instrument including:

- 1) Tag number.
- 2) Manufacturer.
- 3) Model number.
- 4) Service.
- 5) Area location.
- 6) Calibrated range.
- 7) Loop drawing number.
- c. Associated LCP, VCP, PCM, or PLC.
- 7. Instrument data sheets and cut sheets:
  - a. Furnish fully completed data sheets, both electronically in Microsoft Word or Excel and in hardcopy, for each instrument and component according to ISA-20 Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves. The data sheets provided with the instrument specifications are preliminary and are not complete. They are provided to assist with the completion of final instrument data sheets. Additional data sheets may be required. Include the following information on the data sheet:
    - 1) Component functional description specified in this Section and indicated on the Drawings.
    - 2) Manufacturers model number or other product designation.
    - 3) Tag number specified in this Section and indicated on the Drawings.
    - 4) System or loop of which the component is a part.
    - 5) Location or assembly at which the component is to be installed.
    - 6) Input and output characteristics.
    - 7) Scale range with units and multiplier.
    - 8) Requirements for electric supply.
    - 9) Requirements for air supply.
    - 10) Power consumption.
    - 11) Response timing.
    - 12) Materials of construction and of component parts that are in contact with, or otherwise exposed to, process media, and or corrosive ambient air.
    - 13) Special requirements or features, such as specifications for ambient operating conditions.
    - 14) Features and options that are furnished.
  - b. Provide a technical brochure or bulletin ("cut sheet") for each instrument on the project. Submit with the corresponding data sheets:
    - 1) Where the same make and model of instrument is used in 2 or more applications on the project, and the process applications are nearly identical, and the materials, features and options are identical submit one brochure or bulletin for the set of identical instruments.
    - 2) Include a list of tag numbers for which it applies with each brochure or bulletin.
    - 3) Furnish technical product brochures that are complete enough to verify conformance with all Contract Document requirements, and to reflect only those features supplied with the device.
    - 4) Cross out models, features, options, or accessories that are not being provided.
    - 5) Clearly mark and identify special options and features.

- c. Organization: Index the data sheets and brochures in the submittal by systems or loops.
- 8. Control panel hardware submittal:
  - a. Submit the following in 1 submittal package.
  - b. Complete and detailed bills of materials:
    - 1) Including quantity, description, manufacturer, and part number for each assembly or component for each control panel.
    - 2) Include all items within an enclosure.
  - c. Complete grounding requirements for each system component including any requirements for PLCs, process LANs, and Control System equipment.
  - d. Requirements for physical separation between control system components and 120 VAC, 480 VAC, and medium voltage power cables.
  - e. UPS and battery load calculations to show that the backup capacity and time meet the specified requirements.
  - f. Provide a data sheet for each control system component together with a technical product brochure or bulletin, which include:
    - 1) The manufacturer's model number or other identifying product designation.
    - 2) Tag and loop number.
    - 3) System to which it belongs.
    - 4) Site to which it applies.
    - 5) Input and output characteristics.
    - 6) Requirements for electric power.
    - 7) Device ambient operating requirements.
    - 8) Materials of construction.
- 9. Schedule of values:
  - a. Submit per unit instrument and labor costs used in developing the final bid for the PCS system, for the express purpose of pricing and cost justification for any proposed change orders. It is the responsibility of the ICSC subcontractor to prove to the ENGINEER'S satisfaction that said per unit costs were used in the development of the final Bid amount.
- 10. Installation recommendations:
  - a. Submit the manufacturer's printed recommendations for installation of instrumentation equipment.
- 11. Training submittals:
  - a. Develop and submit for review a general training plan for approval by OWNER within 14 calendar days from Notice to Proceed. Include complete descriptions of all planned training classes, a preliminary training schedule, a list of all proposed instructors along with resumes, examples of proposed training manuals, and a description of any special training tools to be used (simulators, self-paced modules, personal computer-based training, etc.).
  - b. The ENGINEER will review the general training plan. Special emphasis will be placed on review of the qualifications of the proposed instructors and the timing of the individual courses to maximize their effectiveness. If, in the opinion of the ENGINEER, the proposed instructors are not sufficiently qualified to conduct the specified training courses, or lack experience, where required, on the specific configuration of the system, provide more qualified instructors.

- c. The general training plan and schedule shall be updated by the CONTRACTOR at the beginning of each Phase and approved by the OWNER a minimum of 30 days prior to commencement of training.
- d. Training course plan submittals:
  - 1) For each training course or other training activity, submit a detailed, complete outline and agenda for each lesson.
  - 2) Describe any student pre-requisites for the course or training activity.
  - 3) Provide an updated schedule for all sessions of the course, including dates, times, durations, and locations.
  - 4) Submit training materials.
- e. Incorporate all submittal review comments into the course.
- f. Do not conduct training courses before review and acceptance of the Course Plan submittal for the course.
- 12. Project Record documents:
  - a. Record Drawing requirements:
    - 1) Provide Project Record Drawing of all Instrumentation Drawings.
    - 2) Update Record Drawings weekly.
    - 3) Record Drawings must be fully updated as a condition of the monthly progress payments.
    - 4) Clearly and neatly show all changes including the following:
      - a) All existing pipe, conduit, wire, instruments, or other structures encountered or uncovered during construction.
  - b. Shop drawings:
    - 1) General:
      - a) Coordinate all aspects of the Work so that a complete, instrumentation, computer, and control system for the facility is supported by accurate shop and record drawings:
        - 1. Clearly show every wire, circuit, and terminal provided under this contract on one or more submitted wiring diagrams.
      - b) Show all interfaces between any of the following: instruments, vendor control panels, motor control centers, motor starters, variable speed drives, control valves, flow meters, chemical feeders and other equipment related to the PCS.
      - c) Generate all drawings developed for this project utilizing AutoCAD by Auto Desk Version 2012 or later:
        - 1. Furnish CD-ROM disks or USB drive(s) containing the following for each drawing:
          - a. Original CAD files in DWG format.
          - b. PDF version.
        - 2. Provide hard copies on 11 inch by 17 inch plain bond paper.
      - d) Upon completion of the Work, update all shop drawings to indicate the final as-built configuration of the systems:
        - 1. Should an error be found in a shop drawing during installation or process start-up of equipment, note the correction, including any field changes found necessary, on the drawing and submit the corrections in the Record Documents.
        - 2. Update, check, and revise all wiring drawings and other submitted drawings and documents to show final installed conditions.

- 3. Provide as-built shop drawings for all instrumentation equipment on 11 inch by 17-inch using plain bond paper.
- Provide electronic copies of these documents on CD-ROM or USB drive(s) disks in AutoCAD DWG 2010 format or later and Adobe PDF format. Size all drawings to be readable and legible on 11 inch by 17-inch media.
- e) Submittal Documents:
  - 1. Provide an interim submittal of Record Documents after the PCS system Functional Testing.
  - 2. Submit final Record Documents before Substantial Completion or earlier if so specified for the project.
- f) Review and Corrections:
  - 1. Correct any Record Documents or other documents found to be incomplete, not accurate, of poor quality, or containing errors.
  - 2. Promptly correct and re-submit Record Documents returned for correction.
- 2) Furnish written information prepared specifically for this Project using Microsoft Word.doc and Adobe.pdf formats and printed on 8.5-inch by 11-inch plain bond paper:
  - a) Provide electronic copies of these documents on CD-ROM disks or USB Drive(s).
- c. Review and corrections:
  - 1) Correct any record documents or other documents found to be incomplete, not accurate, of poor quality, or containing errors.
  - 2) Promptly correct and re-submit record documents returned for correction.
- 13. Loop Drawings:
  - a. Submit loop drawings for every analog, discrete, and fieldbus signal and control circuit:
    - 1) Provide a loop drawing submittal that completely defines and documents the contents of each monitoring, alarming, interlock, and control loop on this Project.
    - 2) This requirement applies to all signal and control circuits associated with equipment on this Project including vendor supplied equipment packages and control panels.
    - 3) Provide loop drawings in the format indicated in the contract drawings. Provide all tagging in accordance with the OWNER'S standard.
  - b. Show every instrument and I/O point on at least one loop diagram.
  - c. Provide a complete index in the front of each bound volume:
    - 1) Index the loop drawings by systems or process areas.
  - d. Provide drawings showing definitive diagrams for every instrumentation loop system:
    - 1) Show and identify each component of each loop or system using requirements and symbols from ISA-5.4.
    - 2) Furnish a separate drawing sheet for each system or loop diagram.
  - e. In addition to the ISA-5.4 requirements, show the following details:
    - 1) Functional name of each loop.

- 2) Reference name, drawing, and loop diagram numbers for any signal continuing off the loop diagram sheet.
- 3) Show all terminal numbers, regardless of the entity providing the equipment.
- 4) MCC panel, circuit, and breaker numbers for all power feeds to the loops and instrumentation.
- 5) Designation of and, if appropriate, terminal assignments associated with, every manhole, pull-box, junction box, conduit, and panel through which the loop circuits pass.
- 6) Show vendor control panel, instrument panel, conduit, junction box, equipment and PCS terminations, termination identification, wire numbers and colors, power circuits, and ground identifications.
- 7) If a circuit is continued on another drawing, show the name and number of the continuation drawing on the loop drawing. Provide complete references to all continuation drawings whether vendor control panels, other loop drawings, existing drawings provided by the OWNER, or other drawings.
- f. In addition to the above requirements, provide loop diagrams in accordance with the example loop diagram as indicated on the Drawings.
- 14. Instrument Installation Drawings:
  - a. Submit, instrument installation, mounting, and anchoring details for all components and assemblies, including access requirements and conduit connection or entry details.
  - b. Furnish for each instrument a dedicated 8 1/2-inch by 11-inch installation detail that pertains to the specific instrument by tag number.
  - c. For each detail, provide certification and the hard copies, by the instrument manufacturer, that the proposed installation is in accordance with the instrument manufacturer's recommendations and is fully warrantable.
  - d. For each detail, provide, as a minimum, the following contents:
    - 1) Necessary sections and elevation views required to define instrument location by referencing tank, building or equipment names and numbers, and geographical qualities such as north, south, east, west, basement, first floor, etc.
    - 2) Ambient temperature and humidity where the instrument is to be installed.
    - 3) Corrosive qualities of the environment where the instrument is to be installed.
    - 4) Hazardous rating of the environment where the instrument is to be installed.
    - 5) Process line pipe or tank size, service and material.
    - 6) Process tap elevation and location.
    - 7) Upstream and downstream straight pipe lengths between instrument installation and pipe fittings and valves.
    - 8) Routing of tubing and identification of supports.
    - 9) Mounting brackets, stands, anchoring devices, and sun shades.
    - 10) Conduit entry size, number, location, and delineation between power and signal.
    - 11) NEMA ratings of enclosures and all components.
    - 12) Clearances required for instrument servicing.

- 13) List itemizing all manufacturer makes, model numbers, quantities, lengths required, and materials of each item required to support the implementation of the detail.
- 15. Control Panel Drawings:
  - a. Layout Drawings:
    - 1) Submit panel, enclosure, console, furniture, and cabinet layout drawings for all items provided.
    - 2) As a minimum, include the following information:
      - a) To scale front, side, and plan views.
        - b) Dimensions.
      - c) Interior and exterior arrangements.
      - d) Mounting information, including conduit entrance location.
      - e) Finish data.
      - f) Tag number and functional name of items mounted in and on each panel, console, and cabinet.
      - g) Nameplate legend including text, letter size, materials and colors.
  - b. Wiring and Piping Diagrams:
    - 1) Submit panel wiring and piping diagrams for every panel that contains wiring and/or piping.
    - 2) Include the following information:
      - a) Name of panel.
      - b) Wiring and piping sizes and types.
      - c) Terminal strip numbers.
      - d) Wire tags and labels.
      - e) Functional name and manufacturer's designation for items to which wiring and piping are connected.
      - f) Electrical control schematics in accordance with ANSI standards.
  - c. Installation drawings:
    - 1) Provide site-specific installation drawings for all control equipment panels, including dimensions.
    - 2) Provide scaled drawings and show the position of the equipment at its intended installation location.
    - 3) Show the placement of all equipment being provided under this Contract and its spatial relationship to all other equipment located in the abutting and adjoining areas.
    - 4) Show all required access and clearances associated with the equipment with a statement of compliance to manufacturer's recommendations, NEC, and other applicable codes.
- 16. Schematic Diagrams:
  - a. Submit schematic diagrams for all electrical equipment in ladder diagram format.
  - b. Include device and field connection terminal numbers on all schematic diagrams.
  - c. Incorporate equipment manufacturer's shop drawing information into the schematic diagrams in order to document the entire control system.
- 17. Control System Diagram:
  - a. Submit a complete set of control system diagrams including the following information:

- 1) All PLCs, workstations, printers, communication devices, and communication links:
  - a) Show all PLCs with their current I/O allocation, and future I/O allocation, current plus spares provided, and maximum potential I/O based on available slots.
- 2) All cables required for communication requirements.
- 3) Show each component fully annotated with conduit size and number associated with the power source.
- 18. Process Control Software Submittal:
  - a. In accordance with Product Data and Shop Drawing general requirements.
  - b. Submit a complete description of the standard application software programs, operating system and utility programs, including modifications and explanation of how the specific functional requirements are met:
    - 1) Provide a cross-reference between the Specification requirements and the software submittal, in order to provide the ENGINEER the ability to identify how each specified requirement or function is met.
  - c. A complete listing of the PCS system point I/O database:
    - 1) Include for each data point, relevant parameters such as range, contact orientation, limits, incremental limits, I/O card byte, I/O hardware address, and PLC assignment.
    - 2) Organize on a site-by-site basis, separate by point type.
    - 3) In addition to the active I/O points, list the implemented spare I/O points and the available I/O points remaining on each card, as well as other defined future points specified or shown.
  - d. Detailed descriptions of procedures used to implement and modify control strategies and database construction.
  - e. Preliminary overview, screens, station graphic displays, and preliminary reports.
- 19. Instrumentation and Control System Contractor Statement of Qualifications:
  - a. Submit statement of qualifications of the proposed ICSC in accordance with subsequent requirements of this Section.
- 20. Control Descriptions:
  - a. For each control loop, provide a detailed functional description of the operation of the equipment, signals, and controls as shown on the P&IDs:
    - 1) Include all functions depicted or described in the Contract Documents.
    - 2) Include within the Control Description content:
      - a) All specific requirements.
      - b) All common requirements that pertain in general to all loops.
      - c) Listing all ranges, setpoints, timers, values, counter values, etc.
- 21. Commissioning and Process Start-up Submittals:
  - a. Inform the OWNER and/or ENGINEER of the day, date, and time for a scheduled test at least 15 calendar days before the test takes place to allow the OWNER and/or ENGINEER sufficient time to plan travel to the test site.
  - b. Test Procedure Submittals:
    - 1) Submit the proposed procedures to be followed during tests of the PCS and its components in 2 parts:
      - a) Preliminary Submittal: Outline of the specific proposed tests and examples of proposed forms and checklists.

- b) Detailed Submittal: After successful review of the Preliminary Submittal, submit the proposed detailed test procedures, forms, and checklists. Include a statement of test objectives with the test procedures.
- c. Provide certified and witnessed test and calibration checklists for each of the following tests:
  - 1) Source Testing:
    - a) Also called Factory Acceptance Tests (FAT).
    - b) Submit completed Manufacturer's Certificate of Source Testing.
  - 2) Functional Testing:
    - a) Loop Validation Tests:
      - 1. Loop Validation Certifications:
        - a. Complete field device loop tests have been successfully completed for all individual instruments, all separate analog control networks, all valves, all VCPs, all motors, all local operator interface panels, all motor control centers, etc.
      - b) Calibration, adjustment, and test details for all components and systems.
      - c) Programming.
      - d) Submit completed Manufacturer's Certificate of Installation and Functionality Compliance.
  - 3) Process Operational Period.
- 22. Test reports:
  - a. As specified in Section 1300 Submittals.
  - b. Include the following:
    - 1) A description of the test.
    - 2) List of equipment used.
    - 3) Name of the person conducting the test.
    - 4) Date and time the test was conducted.
    - 5) All raw data collected.
    - 6) Calculated results.
    - 7) Each report signed by the person responsible for the test.
- 23. Calculations:
  - a. Where required by specific Instrumentation Specifications:
    - 1) Because these calculations are being provided by a REGISTERED PROFESSIONAL ENGINEER, they will be reviewed for form, format, and content but will not be reviewed for accuracy and calculation means.

# 1.06 QUALITY ASSURANCE

- A. Manufacture instruments at facilities certified to the quality standards of ISO 9001.
- B. Furnish all equipment listed by and bearing the label of UL or of an independent testing laboratory acceptable to the ENGINEER and the Authority Having Jurisdiction.
- C. The ICSC must have their own operating UL listed panel fabrication facility. All panels must be fabricated at this facility and meet all UL 508/508A requirements.

- D. ICSC:
  - 1. The CONTRACTOR, through the use of a qualified ICSC, is responsible for the implementation of the PCIS and the integration of the system with other required instrumentation, control devices and software.
  - 2. The ICSC assumes full responsibility, through the CONTRACTOR, to perform all work to select, furnish, install, program, test, calibrate, and place into operation all instrumentation, controls, telemetry equipment, control panels, and control system including application software, for a complete, integrated and functional PCIS system.
  - 3. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the ICSC be responsible for the integration of the PCIS and devices provided under the Contract Documents with the objective of providing a completely integrated control system.

# 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store all equipment and materials delivered to the job site in a location that will not interfere with the construction or the OWNER'S operations.
- B. Shipping precautions:
  - 1. After completion of shop assembly, successful Source Test, pack all equipment, cabinets, panels, and consoles in protective crates and enclose in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture.
  - 2. Place dehumidifiers when required, inside the polyethylene coverings.
  - 3. Skid-mount the equipment for final transport.
  - 4. Provide lifting rings for moving without removing protective covering.
  - 5. Display boxed weight on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.
- C. Special instructions:
  - 1. Securely attach special instructions for proper field handling, storage, and installation to each piece of equipment before packaging and shipment.
- D. Tagging:
  - 1. Tag each component and/or instrument to identify its location, instrument tag number, and function in the system.
  - 2. Firmly attach a permanent tag indelibly machine marked with the instrument tag number, as given in the tabulation, on each piece of equipment constituting the PCS.
  - 3. Tag instruments immediately upon receipt in the field.
  - 4. Prominently display identification on the outside of the package.
  - 5. Utilize the Tag and Loop Number identifications shown on the P&IDs.
- E. Delivery and inspection:
  - 1. Deliver products in undamaged condition, in manufacturer's original container or packaging with identifying labels intact and legible. Include date of manufacture on label.

## 1.08 PROJECT OR SITE CONDITIONS

#### A. Site conditions:

- 1. Provide a PCS, including all equipment, raceways and any other components required for a complete installation that meets the environmental conditions for the Site as specified in the General Requirements and below.
- 2. Wind:
  - a. Provide all equipment and construction techniques suitable for the site wind loading criteria, as specified in Section 01614 Wind Design Criteria.
- 3. Altitude, temperature and humidity:
  - a. Provide all equipment and instrumentation fully rated for continuous operation at this altitude, temperature and humidity conditions with no additional derating factors applied.
  - b. Provide additional temperature conditioning equipment to maintain all equipment and instrumentation in non-conditioned spaces or outdoors subject to these ambient temperatures 10 degrees Fahrenheit above the minimum operating temperature and 10 degrees Fahrenheit below maximum operating temperature as determined by the equipment manufacturer's guidelines:
    - 1) Provide all power wiring for these devices (e.g., heaters, fans, etc.), whether or not indicated on the Drawings.
- 4. Area classifications:
  - a. Furnish enclosures that match the area classifications as specified in Section 16010 Electrical.
- 1.09 SEQUENCING (NOT USED)
- 1.10 SCHEDULING (NOT USED)
- 1.11 WARRANTY
  - A. Provide additional warranty as specified in the individual Instrumentation and Control Specifications that extends beyond the Correction Period, as specified in Sections 00700 General Conditions and 00800 Supplementary Conditions.
- 1.12 SYSTEM PROCESS START-UP
  - A. Replace or modify equipment, software, and materials that do not achieve design requirements after installation in order to attain compliance with the design requirements:
    - 1. Following replacement or modification, retest the system and perform additional testing to place the complete system in satisfactory operation and obtain compliance acceptance from the ENGINEER.
- 1.13 OWNER'S INSTRUCTIONS (NOT USED)
- 1.14 MAINTENANCE
  - A. Before Substantial Completion, perform all maintenance activities required by the Contract Documents including any calibrations, final adjustments, component

replacements or other routine service required before placing equipment or systems in service.

- B. Furnish all spare parts as required by the Contract Documents.
- C. Spare parts:
  - 1. Furnish the spare parts selected by the ENGINEER from the priced list of spare parts in the hardware submittal.
  - 2. Furnish a price list of all special tools required to calibrate and maintain all of the instrumentation provided under the Contract Documents. Furnish the special tools selected by the ENGINEER from the priced list.
- D. Provide additional spare parts specified in other sections of the Instrumentation and Control Specifications.
- E. Submit all special tools and spare parts, suitably wrapped and identified, before Process Operational Period commences.

### PART 2 PRODUCTS

- 2.01 MANUFACTURERS
  - A. Provide similar items from a single manufacturer throughout the PCIS portion of the Project.
  - B. Allowable manufacturers are specified in individual instrument and equipment specifications.
- 2.02 EXISTING PRODUCTS (NOT USED)
- 2.03 MATERIALS
  - A. Furnish all materials under this Contract that are new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these devices and that bear all approvals and labels as required by the Specifications.
  - B. Provide materials complying with the applicable industrial standard as specified in the Contract Documents.
- 2.04 MANUFACTURED UNITS (NOT USED)
- 2.05 EQUIPMENT (NOT USED)
- 2.06 COMPONENTS
  - A. Furnish all meters, instruments, and other components that are the most recent field proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise specified to match existing equipment.

- B. Unless otherwise specified, furnish individual instruments that have a minimum accuracy of within 0.5 percent of full scale and a minimum repeatability of within 0.25 percent of full scale.
- C. Signal transmission:
  - 1. Analog signals:
    - a. Furnish analog measurements and control signals that vary in direct linear proportion to the measured variable, unless otherwise indicated.
    - b. Furnish electrical analog signals outside control panels that are 4 to 20 milliamperes 24 VDC, except as indicated.
    - c. Analog signals within enclosures may be 1 to 5 VDC.
    - d. Electrically or optically isolate all analog signals from other signals.
    - e. Furnish regulated analog signals that are not affected by changes in supply voltage or load resistance within the unit's rating.
    - f. Maintain the total 4 to 20 milliamperes loop impedance to 10 percent below the published value at the loop operating voltage.
    - g. Where necessary, reduce loop impedance by providing current-to-current (I/I) isolation amplifiers for signal re-transmission.
  - 2. Pneumatic Signals:
    - a. All pneumatic signals: 3 to 15 pounds per square inch gauge.
  - 3. Discrete input Signals:
    - a. As indicated in the controller hardware specification.
  - 4. Discrete output signals:
    - a. Dry contacts or TRIAC outputs (with express written approval by the ENGINEER) as needed to coordinate with the field device.
    - b. Provide external terminal block mounted fuse with blown fuse indication for all discrete outputs.
    - c. Provide interposing relays for all discrete outputs for voltage and/or current compatibilities.
    - d. Provide interposing relays as required for functionality of the control circuit.
  - 5. Signal Performance and Design Criteria:
    - a. Stability:
      - 1) After Control have taken corrective action, oscillation of the final control element shall not exceed 2 cycles per minute or a magnitude of motion of 0.5 percent of full travel.
    - b. Response:
      - 1) Any change in setpoint or controlled variable shall produce a corrective change in position of the final control element and stabilized within 30 seconds.
    - c. Agreement:
      - 1) Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3 percent of full scale over a 6:1 operating range.
    - d. Repeatability:
      - 1) For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 percent of full travel regardless of force required to position the final element.
    - e. Sensitivity:

- 1) Controls shall respond to a setpoint deviations and measured variable deviations within 1.0 percent of full scale.
- f. Performance:
  - 1) All instruments and control devices shall perform in accordance with the manufacturers' specifications.
- D. Discrete circuit configuration:
  - 1. Configure discrete control circuits to fail safe, on loss of continuity or loss of power.
  - 2. Alarm contacts: Fail to the alarm condition.
  - 3. Control contacts fail to the inoperative condition unless otherwise indicated on the Drawings.
- E. Grounding:
  - 1. Provide control panels with a signal ground bus, isolated from the power ground bus:
    - a. Provide multiple panels in one location with a common point for signal ground bus connection to ground.
  - 2. Ground single point ground shields and measurement loops at the source panel external terminals, unless otherwise noted, by bonding to the control panel signal ground bus.
  - 3. Provide isolating amplifiers within control panels for field equipment possessing a grounded input or output, except when the panel circuit is galvanically isolated.
- F. Instrument air:
  - 1. Where indicated on the Drawings, provide dry, filtered control air at 30 pounds per square inch gauge nominal pressure piped to all field instruments and instrument panels requiring air:
    - a. Provide each field instrument with an integral, non-adjustable filter/regulator assembly to provide regulated air.
    - b. Provide each instrument panel requiring air with an adjustable filter/regulator assembly with gauge and an air manifold to provide air to pneumatic instruments.
    - c. Filter all air to 5 micron maximum particle size.
    - d. Provide low pressure switch to alarm on insufficient air supply.

# 2.07 ACCESSORIES

- A. Provide flow conditioning devices or other required accessories if necessary to meet the accuracy requirements in the Contract Documents.
- B. Nameplates:
  - 1. Provide a nameplate for each controller, instrument transducer, instrument power supply, solenoid, or any other control device located either in the field or within panels.
  - 2. All nameplates shall be of identical style, color, and material throughout the facility.
  - 3. Device nameplates shall include:
    - a. Designations as indicated on the Drawings and identified on the Process and Instrumentation Drawings:
      - 1) Device tag and loop number ID (e.g. FIT-60.011).

- 2) PLC ID (e.g. PLC-11).
- 3) Power information (e.g. PCM-11, 120VAC).
- b. White lettering on a black background, laminated plastic.
- 4. All instruments shall be equipped with Type 316 stainless steel nameplate with the instrument tag stamped in 3/8-inch letters and connected to the instrument using Type 316 stainless steel wire.
- 2.08 MIXES (NOT USED)
- 2.09 FABRICATION (NOT USED)
- 2.10 FINISHES (NOT USED)
- 2.11 SOURCE QUALITY CONTROL
  - A. Provide all equipment that is new, free from defects, and standard products produced by manufacturers regularly engaged in the production of these products that bear all approvals and labels as required by the Specifications.
  - B. Arrange with all manufacturers of the equipment and fabricators of panels and cabinets, to allow the OWNER and ENGINEER to inspect and witness the testing of the equipment at the site of fabrication:
    - 1. Equipment includes the cabinets, special control systems, flow measuring devices, and other pertinent systems and devices.

### PART 3 EXECUTION

- 3.01 EXAMINATION
  - A. The ICSC is encouraged to attend a pre-bid conference and examine the premises completely before bidding. It is the ICSC's responsibility to be fully familiar with the existing conditions and local requirements and regulations.
  - B. Review the existing Site conditions and examine all shop drawings for the various items of equipment in order to determine exact routing and final terminations for all wiring and cables.
  - C. Provide a complete instrumentation and control system:
    - 1. Install all extra conduits, cables, and interfaces as may be necessary to provide a complete and operating electrical, and process control and instrumentation system.
- 3.02 PREPARATION (NOT USED)
- 3.03 INSTALLATION
  - A. Equipment locations indicated on the Drawings may change due to variations in equipment size or minor changes made by others during construction:
    - 1. Verify all dimensions as indicated on the Drawings:
      - a. Actual field conditions govern all final installed locations, distances, and levels.

- 2. Review all information indicated on the Drawings, including architectural, structural, mechanical, instrumentation, and the accepted electrical, instrumentation, and mechanical shop drawings, and coordinate Work as necessary to adjust to all conditions that arise due to such changes.
- 3. Make minor changes in location of equipment before rough in, as directed by the OWNER or ENGINEER.
- B. Perform all related Electrical Work in accordance with the applicable sections of the Electrical Specifications.
- C. The PCIS configurations are diagrammatic:
  - 1. The locations of equipment are approximate unless dimensioned.
  - 2. Where Project conditions require, make reasonable changes in locations and arrangements.
- D. Field instruments installation:
  - 1. Install field instruments as specified in the Contract Documents, API RP 550 and RP 551, and the manufacturer's instructions.
  - 2. Mount field instruments so that they can be easily read, readily approached, and easily serviced, and so they do not restrict access to mechanical equipment:
    - a. Mount field instruments on a pipe stand or local panel, if they are not directly mounted, unless otherwise indicated on the Drawings.
    - b. Provide sun shields for all field electronic instruments exposed to direct sunlight.
  - 3. Make connections from rigid conduit systems to field instruments with PVC coated flexible conduit:
    - a. Type of flexible conduit required for the area classification:
      - 1) Area classification as specified in Section 16010 Electrical.
    - b. Maximum length of 18 inches.
  - 4. Connect field instruments with cable as specified in the Electrical Specifications, except when the manufacturer requires the use of special cable, or otherwise specified in this Section:
    - a. Special cable applications shall be in accordance with the NEC.
  - 5. Verify the correctness of each installation:
    - a. Polarity of electric power and signal connections.
  - 6. Ensure all process connections are free of leaks.
- E. Process sensing lines and air tubing:
  - 1. Install individual tubes parallel and/or perpendicular to and near the surfaces from which they are supported.
  - 2. Provide supports for rigid tubing at intervals of not more than 3 feet.
  - 3. Slope horizontal runs of instrument tubing at a minimum of 1/16th inch per foot to allow for draining of any condensate.
  - 4. Bends:
    - a. Use proper tool.
    - b. Make bends for parallel lines symmetrical.
    - c. Make bends without deforming or thinning the walls of the tubing.
  - 5. Square-cut and clean all ends of tubing before being inserted in the fittings.
  - 6. Provide bulkhead fittings at all panels requiring pipe and/or tubing entries.

- 7. Use stainless steel tubing for all piping hard piped from the air header, unless otherwise indicated on the Drawings or not compatible with the fluids or atmosphere in the area:
  - a. Use flexible connections only on moving equipment and under the constraint that the length shall be less than 1.5 times maximum travel of the equipment.
- F. Conduit, cables, and field wiring:
  - 1. Provide all PCS equipment cables, and process LAN communication networks under the Instrumentation and Control Specifications.
  - 2. Provide terminations and wire identification as specified in the Electrical Specifications.
  - 3. Protect all wiring from sharp edges and corners.
  - 4. Provide all conduits, fittings, boxes, etc. in accordance with all the requirements of the Electrical Specifications.
- G. Equipment tie-downs:
  - 1. Anchor all instruments, control panels, and equipment by methods that comply with seismic and wind bracing requirements, which apply to the Site.
  - 2. All control panels, VCPs, LCPs, RTUs, PCMs, etc., shall be permanently mounted and tied down to structures.
- H. Instrument tagging:
  - 1. As specified in Section 16052 Nameplates.
  - 2. Provide all field-mounted instruments with nameplates:
    - a. Nameplates engraved with the instrument's full tag number as indicated on the Drawings:
      - 1) Affix tags with stainless steel wire fasteners.
  - 3. Provide all back of panel instruments with nameplates:
    - a. Engraved with the instrument's full tag number as indicated on the Drawings.
  - 4. Provide all front of panel instruments with a nameplate.
  - 5. Provide all front of panel instruments with a nameplate:
    - a. Engraving to include the following:
      - 1) Instrument's full tag number.
      - 2) Service description.
    - b. Nameplates:
      - 1) Secure nameplates to the panel with stainless steel screws.
      - 2) Use an accepted adhesive if screws would violate the NEMA or other ratings of the enclosure.
- I. Cable and conductor termination:
  - 1. Terminate all cables and conductors on terminal blocks.
  - 2. Terminal block enclosures:
    - a. Suitable for the area classification as specified in Section 16010 Electrical.
- J. Surge protection:
  - 1. Provide outdoor field instrument loops with voltage surge protection units installed on the instruments and the panel.
  - 2. Individually fuse each 4 to 20 milliamperes direct current loop with a 1/16 ampere fuse between power supplies and receiver surge protectors.

- Provide voltage surge protection for 4 wire transmitters and analyzers:
   a. Protect both power source and signal loop.
- 3.04 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)
- 3.05 REPAIR/RESTORATION (NOT USED)
- 3.06 RE-INSTALLATION (NOT USED)
- 3.07 COMMISSIONING

# A. Owner Training:

- 1. General:
  - a. Provide system maintenance and operator training courses for all the instrumentation and control equipment and systems furnished, as described below:
    - 1) All training described below shall be provided by the CONTRACTOR.
    - 2) The Programmer will provide training on software provided by the Programmer.
  - b. Conduct all training at the Project Site unless another location is accepted by the ENGINEER and OWNER:
    - 1) Include instruction on the use of all maintenance equipment and special tools provided under the Contract.
  - c. Tailor training classes to the specific needs of the class participants:
    - 1) Develop separate courses for operators, maintenance staff, and supervisors:
      - a) The specific categories and number of personnel in each category are identified below.
    - 2) Furnish training courses that are a combination of classroom and hands-on training:
      - a) Limit classes that include extensive hands-on activities to a maximum of 5 students per class.
    - Present the minimum number of sessions, specified in Table 17050-3.10-T1, for each course in order to satisfy class size restrictions and limitations scheduling OWNER staff.
    - 4) Furnish additional sessions if required to accommodate the total number of personnel identified for each course.
  - d. Schedule individual training classes:
    - 1) Coordinate with the OWNER at least 3 weeks before the start of the class.
    - Schedule training classes Monday Friday between 8:00 AM and 4:00 PM.
    - 3) Each individual daily training session, travel time excluded:
      - a) Minimum duration of 4 hours.
      - b) Maximum duration of 7 hours.
      - c) Breaks scheduled at least every 90 minutes and 1 hour for lunch.
    - 4) Complete training for maintenance personnel 90 days before Process Operational Period.

- 5) Complete operator training classes before process start-up of the control system software, or any part of it:
  - a) As specified in the Sequencing article of this Section.
- 6) Schedule follow-up training classes after the PCS start-up on a schedule determined by the OWNER.
- e. Instructor qualifications:
  - 1) Highly qualified training instructors for technical training with demonstrated expertise in not only control system functionality but also professional training techniques:
    - a) Instructor qualifications are subject to the approval of the ENGINEER.
  - 2) Furnish training instructors thoroughly familiar with the PCIS system, who are members of the implementation team.
  - 3) One of the individuals conducting the PCIS training course must be the same individual responsible for the majority of the programming that was performed for the instrumentation and control system.
- 2. Training manuals and materials:
  - a. Furnish training manuals and other materials for training courses.
  - b. Manuals are to be professionally written to present the course material in a format that is easy to comprehend.
  - c. The manuals are to serve as teaching aids during presentation of the training classes.
  - d. Manuals are to serve as reference material after the training has been completed.

Table 1			
Course Title	Minimum Course Length (hours per session)	Personnel (Estimated Number of Students)	Minimum Number of Sessions
	<u></u> 1	10	
	10	-	
Historian System Training		•	
PLC Hardware			
PLC Software			[
HMI Hardware and Software	8	7	1
PLC/SCADA Interface			
Follow ap Training	Ĵ	Ū	Ū.
Instrument Training	4	7	1
Hanalytisal instrument Training	Ĵ	Ĵ	

- 3. Training course requirements:
  - a. System overview training:
    - 1) Furnish training courses that give the OWNER'S supervisory level personnel an overview of all elements of the PCIS system that focus on

the overall functional aspect of elements of the control system and provide an understanding of the interaction of the various components.

- b. Operator training:
  - 1) Furnish training courses that instruct system operators in the efficient operation of all aspects of the PCIS that include not only the general operation of the control system but also the operation of specific system features.
  - 2) Operator's training shall include the following for each vendor package and programmable device:
    - a) Control system overview: Architecture, equipment functions, software components, etc.
    - b) Display navigation, overview, and types of displays.
    - c) Process and equipment monitoring and control: Basic principles and operation.
    - d) Logging ON and OFF the system and description of the security and access system.
    - e) Alarm subsystem.
    - f) Trending: Provide a thorough session on how to use all trending functions.
    - g) Reports: How to access, print, and review content.
    - h) Control strategies: Present an average 15-minute review of each control strategy, including a hands-on demonstration of screens and operator functions for each.
- c. PLC hardware training:
  - 1) Furnish training on PLC hardware and on related components, including battery backup equipment, UPSs, HMI hardware, control circuits, and analog circuits.
  - 2) Furnish training on PLC hardware principles, product features, proper installation, operation, troubleshooting, and maintenance.
  - 3) PLC training may be provided by manufacturer's certified trainers.
- d. PLC software training:
  - 1) Furnish training on PLC software.
  - 2) Two types of training are required, basic and project-specific:
    - a) Basic PLC software training covers the principles of PLC programming and the specific features and function of the PLC products used on this Project, provided by one of the PLC manufacturer's certified trainers.
    - b) Project-specific PLC software training covers the programming conventions, new standardized software modules, specific control strategy programs, and documentation created for the Work performed under this Contract. This training includes the specific knowledge needed to modify, expand, duplicate, troubleshoot, and repair the PLC programs provided under this Contract, provided by a qualified member of the ICSC who is thoroughly familiar with the delivered system, and is one of the senior programmers who programmed the PLCs for this Project.
- e. HMI hardware and software training:
  - 1) Provide the following:

- a) Overview of hardware and firmware, including starting, stopping, and PLC interface.
- b) Configuration of tag database.
- c) Creating, editing, and saving display screens.
- d) Troubleshooting.
- f. Network equipment training:
  - 1) Furnish basic training on all network hardware, switch and router configuration and software, and network monitoring software.
  - 2) Include a detailed description and explanation of the installed network architecture, media, and functions.
  - 3) Furnish an overview of the function and operation of each piece of network equipment.
  - 4) Furnish training on network maintenance troubleshooting and repair.
  - 5) Furnish training on how to install spare or off-line backup equipment.
- g. Follow-up training:
  - 1) Provide a series of on-site follow-up training classes beginning after process start-up of the SCADA/PCIS system. The intent for these classes is to provide the OWNER'S personnel the opportunity for a review and "refresher" of the training topics and material after they have had some experience using the system.
  - 2) Mutually schedule and develop the content of these classes with the OWNER no later than 1 month before the beginning of the first session:
    - a) Schedule at the OWNER'S discretion on non-consecutive days spaced out over the process start-up and warranty period.
- h. Instrumentation training:
  - 1) Furnish training covering all instruments and control panels.
  - 2) Furnish the specified quantity of training, allocated to cover new instruments and hardwired controls as specified in this Section and specifically determined in the accepted training plan.
  - 3) Train maintenance staff in the use, cleaning, calibration, maintenance, and troubleshooting of all the instruments furnished within this Project.
  - 4) Furnish training on the operation of new hardwired controls.
- i. Analytical instrument training:
  - 1) Furnish training covering all analytical instruments.
  - 2) Furnish the specified quantity of training, allocated to cover new analytical instruments as specified in this Section and specifically determined in the accepted training plan.
  - 3) Train maintenance staff in the use, cleaning, calibration, maintenance, and troubleshooting of all the analytical instruments furnished within this Project.
  - 4) Provide training by manufacturer.
- 4. Recording training sessions:
  - a. Record all training.
  - b. Produce audio-visual presentations by recording the actual training sessions of the OWNER'S personnel.
  - c. Furnish digital video disk (DVD) format.
  - d. These disks become the property of the OWNER and cover, in detail, the training for the specific hardware and software of all the systems provided for the Project.
e. Provide all the necessary cameras and recording equipment.

#### 3.08 FIELD QUALITY CONTROL

- A. Inspection:
  - 1. Allow for inspection of PCIS installation.
  - 2. Provide any assistance necessary to support inspection activities.
  - 3. ENGINEER inspections may include, but are not limited to, the following:
    - a. Inspect equipment and materials for physical damage.
    - b. Inspect installation for compliance with Drawings and Specifications.
    - c. Inspect installation for obstructions and adequate clearances around equipment.
    - d. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.
    - e. Inspect equipment nameplate data to verify compliance with design requirements.
    - f. Inspect cable terminations.
    - g. Inspect/witness instrument calibrations/verifications.
  - 4. Inspection activities conducted during construction do not satisfy inspection requirements.
- B. Instrument Installation Inspection:
  - 1. Provide any assistance necessary to support inspection activities.
  - 2. Inspections may include, but are not limited to, the following:
    - a. Inspect equipment and materials for physical damage.
    - b. Inspect the installed arrangement, lay lengths, orientation, piping obstructions etc. that could affect the instruments accuracy or repeatability.
    - c. Inspect installation for compliance with Drawings and Specifications.
    - d. Inspect installation for obstructions and adequate clearances around equipment.
    - e. Inspect equipment installation for proper leveling, alignment, anchorage, and assembly.
    - f. Inspect equipment nameplate data to verify compliance with design requirements.
    - g. Inspect cable terminations.
    - h. Inspect/witness instrument calibrations/verifications.
  - 3. Inspection activities conducted during construction do not satisfy inspection requirements.
- C. Installation supervision:
  - 1. Ensure that the entire PCIS is installed in a proper and satisfactory manner. At a minimum, the ICSC shall provide the following services:
    - a. Installation resources:
      - 1) Coordinate with the CONTRACTOR regarding installation requirements of the Contract Documents.
    - b. Provide technical assistance to installation personnel by telephone:
      - 1) Furnish installation personnel with at least one copy of the accepted submittals, including all installation details.
    - c. Periodic inspections during the construction period.

- d. A complete check of the completed installation to ensure that it is in conformance with the requirements of the equipment manufacturer and the Contract Documents.
- e. Field verify accuracy and calibration of all instruments.

#### 3.09 ADJUSTING

- A. Control valves:
  - 1. Stroke all control valves, cylinders, drives and connecting linkages from the control system as well as local control devices and adjust to verify proper control action, hand switch action, limit switch settings, torque settings, remote control actions, and remote feedback of valve status and position.
  - 2. Check control valve actions and positioner settings with the valves in place to ensure that no changes have occurred since the bench calibration.
- B. Make all revisions necessary to the control system software, as directed by the ENGINEER:
  - 1. It is understood that the CONTRACTOR knows and agrees that changes will be required in the control system software during the Source Testing, Functional Testing, Process Operational Period, Process Start-up and during the Project Correction Period.

#### 3.10 CLEANING

- A. Vacuum clean all control panels and enclosures before process start-up and again after final completion of the project.
- B. Clean all panel surfaces.
- C. Return to new condition any scratches and/or defects.
- D. Wipe all instrument faces and enclosures clean.
- E. Leave wiring in panels, manholes, boxes, and other locations in a neat, clean, and organized manner:
  - 1. Neatly coil and label all spare wiring lengths.
  - 2. Shorten, re-terminate, and re-label excessive spare wire and cable lengths, as determined by the ENGINEER.
- F. As specified in other sections of the Contract Documents.
- 3.11 PROTECTION
  - A. Protect all Work from damage or degradation until date of Substantial Completion.
- 3.12 SCHEDULES (NOT USED)

#### END OF SECTION

#### 17050-35

### **SECTION 17302**

#### FLOW MEASUREMENT: MAGNETIC FLOWMETERS

#### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes:
  - 1. Full-body magnetic flowmeters.

#### B. Related sections:

- 1. Section 1300 Submittals.
- 2. Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- C. Provide all instruments identified in the Contract Drawings.

#### 1.02 REFERENCES

- A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- B. NSF International (NSF).

#### 1.03 DEFINITIONS

A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.

#### 1.04 SUBMITTALS

A. Furnish submittals as specified in Sections 1300 Submittals and 17050 Common Work Results for Process Control and Instrumentation Systems.

#### 1.05 QUALITY ASSURANCE

- A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- B. Examine the complete set of Contract Documents and verify that the instruments are compatible with the installed conditions including:
  - 1. Process conditions: Fluids, pressures, temperatures, flows, materials, etc.
  - 2. Physical conditions:
    - a. Installation and mounting requirements.
    - b. Location within the process.

17302-1

- c. Accessories: Verify that all required accessories are provided and are compatible with the process conditions and physical installation.
- C. Notify the ENGINEER if any installation condition does not meet the instrument manufacturer's recommendations or specifications.
- 1.06 DELIVERY, STORAGE, AND HANDLING
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- 1.07 PROJECT OR SITE CONDITIONS
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- 1.08 WARRANTY
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- 1.09 MAINTENANCE
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.

#### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. One of the following or equal:
  - 1. Endress+Hauser: Promag 53.
  - 2. Rosemount: 8750W.
  - 3. Krohne: IFC.
  - 4. Yokogawa: AXF.
  - 5. ABB: Watermaster.

#### 2.02 MANUFACTURED UNITS

- A. Magnetic flowmeter:
  - 1. General:
    - a. Magnetic flowmeters obtain the flow velocity by measuring the changes of induced voltage of the conductive fluid passing across a controlled magnetic field.
    - b. Complete zero stability shall be an inherent characteristic of the flowmeter system.
    - c. Include for each magnetic flow metering system:
      - 1) A metering tube with electrodes (sensor).
      - 2) Signal cable.
      - 3) Transmitter integral or remote as indicated on the Drawings.

- 4) Flowmeter grounding rings.
- 2. Performance requirements:
  - a. Accuracy:
    - 1) 0.25 percent of flow rate from 10 to 100 percent of full scale for velocities ranging between 1.9 to 10 feet per second.
  - b. Repeatability:
    - 1) 0.25 percent of rate.
- 3. Element:
  - a. Metering tube:
    - 1) Constructed of carbon steel or Type 304 stainless steel (unless specifically noted otherwise in the instrument data sheets) with flanged connections to match with piping material.
    - 2) Liner material in conformance with:
      - a) Manufacturer's recommendations for the intended service.
      - b) NSF certified for all drinking water applications.
    - 3) Electrodes type and material in conformance with:
      - a) Manufacturer's recommendations for the intended service.
      - b) Utilize a minimum of 2, self-cleaning electrodes.
    - 4) Meter terminal housing NEMA Type 4X unless specifically noted otherwise in the instrument data sheets.
    - 5) Meter coating consisting of epoxy painted finish.
    - 6) Components:
      - a) 2 grounding rings:
        - 1. Which are in conformance with the manufacturer's bore and material recommendation for the meter's intended service.
        - 2. Designed to protect and shield from abrasion of the liner's edge interface at the meter's end.
- 4. Transmitter:
  - a. Power supply:
    - 1) 120 VAC.
    - 2) Power consumption: 60 VA maximum.
  - b. Outputs:
    - 1) As noted in the instrument data sheets.
    - 2) For all instruments with 4 to 20 mA HART or digital bus protocol, provide a Device Type Manager (DTM) certification by FDT group.
  - c. Microprocessor-based signal converter/transmitter.
  - d. Utilize DC pulse technique to drive flux-producing coils.
  - e. Contain a 6-digit display for flow rate, percent of span, and totalizer.
  - f. Operator keypad interface.
  - g. Integral zero return to provide consistent zero output signals in response to an external dry contact closure.
  - h. Integral low flow cut-off zero return.
  - i. Programmable parameters including:
    - 1) Meter size.
    - 2) Full-scale flow rate.
    - 3) Magnetic field frequency.
    - 4) Time constant.
  - j. Data retention for a minimum of 5 years without auxiliary main or battery power.
  - k. Self-diagnostics and automatic data checking.

- I. Protected terminals and fuses in a separate compartment which isolates field connection from electronics.
- m. Ambient operating temperature limits of -5 to 140 degrees Fahrenheit (-20 to 60 degrees Celsius).

#### 2.03 ACCESSORIES

- A. Stainless steel tag labeled as specified in the Contract Documents.
- B. Provide sunshades for all transmitters located outdoors.
- C. Provide galvanic isolation gaskets, nylon/Teflon flange bolt insulation bushings and nylon washers on all meters installed on pipes with cathodic protection.
- D. Furnish 1 spool piece for every size of magnetic flow tube being provided.

#### 2.04 SOURCE QUALITY CONTROL

- A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- B. Factory calibrate each flow metering system at a facility that is traceable to the NIST.
- C. A real-time computer-generated printout of the actual calibration date indication actual velocities and as read values of the flow tube:
  - 1. Flow calibration report of the manufacturers flow lab calibration procedure shall be shipped with the meter system.
  - 2. Minimum calibration shall be a 3-point calibration including 1, 3, and 10 feet per second velocities for every meter and transmitter system.
  - 3. Manufacturer shall archive all calibration reports for future reference.

#### PART 3 EXECUTION

- 3.01 EXAMINATION (NOT USED)
- 3.02 PREPARATION (NOT USED)
- 3.03 INSTALLATION
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- 3.04 FIELD QUALITY CONTROL
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
  - B. Provide manufacturer's services to perform installation inspection.

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#### 3.05 ADJUSTING

- A. Verify factory calibration of all instruments in accordance with the manufacturer's instructions:
  - 1. Return factory calibrated devices to the factory if they do not meet the field verification requirements for calibration.

#### 3.06 CLEANING

- A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
- 3.07 DEMONSTRATION AND TRAINING.
  - A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.
  - B. Demonstrate performance of all instruments to the ENGINEER before commissioning.

#### 3.08 PROTECTION

A. As specified in Section 17050 Common Work Results for Process Control and Instrumentation Systems.

#### 3.09 SCHEDULES

- A. Instrument Data Sheets included in this Section.
- B. The provided information does not necessarily include all required instruments.
- C. Provide all instruments identified in the Contract Documents:
  - 1. Instruments may be indicated on the Drawings, specified in the Specifications, or both.

#### END OF SECTION

## **ATTACHMENT 1**

## COVERT LIFT STATION AS-BUILT DRAWINGS, 1991



# SEWER PUMP STATION No. 3 SALIDA, CALIFORNIA



SITE LOCATION SCALE: 1"=40'



**RAYMOND VAIL AND ASSOCIATES** ENGINEERING • PLANNING • ARCHITECTURE • SURVEYING WALNUT CREEK TAHOE CITY ANTIOCH

SEW

### **GENERAL NOTES:**

- CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER, THE ENGINEER, AND THE CITY HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
- 2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION OF ALL EXISTING FACILITIES.
- 3. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY FIELD CHANGES MADE WITHOUT WRITTEN AUTHORIZATION FROM THE CITY ENGINEER.
- 4. ALL WORK TO BE PERFORMED UNDER THIS CONTRACT SHALL BE IN STRICT ACCORDANCE WITH THE ACCOMPANYING PLANS AND TECHNICAL SPECIFICATIONS.
- CONTRACTOR SHALL LAY OUT HIS OWN WORK BASED ON DIMENSIONS SHOWN 5. ON THESE DRAWINGS.
- THE TYPES, LOCATIONS, SIZES, AND DEPTHS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE IMPROVEMENT PLANS WERE OBTAINED FROM AVAILABLE RECORDS. A REASONABLE EFFORT HAS BEEN MADE TO LOCATE AND DELINEATE ALL KNOWN UNDERGROUND UTILITIES. HOWEVER, THE ENGINEER CAN ASSUME NO RESPONSIBILITY FOR THE COMPLETENESS OR ACCURACY OF ITS DELINEATION OF SUCH UNDERGROUND UTILITIES NOR FOR THE EXISTENCE OF OTHER BURIED OBJECTS OR UTILITIES WHICH MAY BE ENCOUNTERED BUT WHICH ARE NOT SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS OF THOSE UTILITIES SHOWN AND ANY THAT MAY EXIST AND ARE NOT SHOWN PRIOR TO COMMENCEMENT OF ANY WORK. THE CONTRACTOR SHALL EXPOSE ALL UNDERGROUND FACILITIES THAT ARE TO BE CONNECTED TO OR THAT ARE IN THE PATH OF THE PROPOSED IMPROVEMENTS FOR VERIFICATION OF LOCATION AND ELEVATION PRIOR TO COMMENCING CONSTRUCTION. IN ADDITION, THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICES ALERT (U.S.A.) 48 HOURS PRIOR TO ANY EXCAVATION WORK FOR DETERMINATION AND LOCATION OF UNDERGROUND UTILITIES (PHONE: 800-642-2444).
- 7. THE CONTRACTOR SHALL NOTIFY THE FOLLOWING PARTIES BY THE TIME SPECIFIED PRIOR TO BEGINNING WORK WITHIN THEIR JURISDICTIONS:

ENGINEER (BEGINNING CONSTRUCTION) SALIDA SANITARY DISTRICT

5 DAYS **48 HOURS** 

BUIL

S

5

- THE CONTRACTOR SHALL SECURE A TRENCH PERMIT FROM THE CALIFORNIA DIVISION OF INDUSTRIAL SAFETY PRIOR TO EXCAVATION OF ANY TRENCH OVER FIVE FEET IN DEPTH.
- 9. THE CONTRACTOR SHALL CONTACT AND COORDINATE WITH ALL UTILITY COMPANIES AND/OR DISTRICTS LOCATIONS AND PLACEMENT OF UTILITIES DURING CONSTRUCTION OPERATIONS.
- 10. CONTRACTOR SHALL EXCAVATE IN SUCH A MANNER AS TO AVOID ANY DAMAGE TO EXISTING STRUCTURES AND TREES IF AT ALL POSSIBLE. ANY DAMAGED STRUCTURES SHALL BE RESTORED OR REPLACED IN A MANNER ACCEPTABLE TO THE OWNER AT THE EXPENSE OF THE CONTRACTOR.
- 11. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND SHALL CONTACT THE RESPECTIVE UTILITY COMPANIES PRIOR TO COMMENCEMENT OF WORK. HE SHALL BE RESPONSIBLE FOR THE LOCATION AND PRESERVATION OF ALL SUCH FACILITIES IN THE AREA OF CONSTRUCTION AND SHALL NOTIFY UTILITIES FORTY-EIGHT (48) HOURS IN ADVANCE OF ANY CONSTRUCTION.
- 12. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST **REGULATIONS OF:** 
  - NATIONAL ELECTRIC CODE
  - UNIFORM BUILDING, MECHANICAL AND PLUMBING CODES
  - CALIFORNIA ADMINISTRATION CODE CALIFORNIA OSHA
  - ALL ELECTRICAL MATERIALS SHALL BEAR THE U.L. LABEL WHERE APPLICABLE.
- 13. ALL CONCRETE SHALL BE CLASS "A", 3000 PSI MINIMUM COMPRESSIVE STRENGTH AT 7 DAYS.
- 14. 3/4-INCH CHAMFER, ALL EXPOSED EDGES OF CONCRETE.
- 15. ALL VALVES SHALL BE FLANGED TO TEES AND/OR CROSSES.

	16.	CONTRACTOR TO MAINTAIN 2 SE NOTED IN RED. BOTH SETS TO BE AT JOB COMPLETION FOR INSPECT WHICH TIME THEY WILL BE DETE DEFICIENCIES ARE FOUND IN ANY OF THESE DEFICIENCIES IN WRITH WORK, CONTRACTOR SHALL RES COMPLETION AND A NEW FINAL IN BEEN CORRECTED TO THE ACCE LETTER OF FINAL ACCEPTANCE WI	TS OF AS-BUILT D TURNED OVER TO TION BY THE OWNE ERMINED TO BE A OF THE WORK, THE NG, STATING REASO UBMIT A REQUEST NSPECTION. AFTEL PTANCE OF THE O LL BE ISSUED.	RAWINGS WITH CHA SALIDA SANITARY DIS ER AND THE ENGINE CCEPTABLE OR NOT OWNER WILL MAKE ONS. AFTER COMPLI FOR CERTIFICATIO R ALL DEFICIENCIES OWNER AND ENGINE	NGES TRICT ER AT F. IF NOTE ETING N OF HAVE ER, A
SALIDA SANITARY	DIST	RICT	DATE		SHEET
<b>ER PUMP ST</b>	TAT	ION NO. 3		SCALE: AS SHOWN	41,46

CALIFORNIA W.O. NO. 2424.14A

FILE NO.

SHEETS

SITE PLAN





CONDUIT & WIRE ROUTING SCHEDULE									
<u>I.D.</u>	<u>CON</u> NO.	DUIT SIZE	CONDUCTOR NO. SIZE	FROM	TO	REMARKS			
1	1	4ª	PULLWIRE	UTILITY CO. TRANSFORMER	SEWAGE PUMP SERVICE PEDESTAL	CONDUCTORS BY UTILITY CO.			
2	1	1 1/2"	3 4 CU POWER 6 12 CU CONTROL 1 8 CU GROUND	SEWAGE PUMP SERVICE PEDESTAL	PUMP # 1				
3	1	1 1/ <b>2°</b>	34CU POWER612CU CONTROL148CU GROUND		PUMP # 2				
4	1	1"	10 <b>#1</b> 2 CU		DRY WELL				
5	1	1"	1/4" POLY TUBING		WET WELL				
				-					

WET WELL-\_\_\_\_\_

\_\_\_\_\_

DRY WELL-

File: 89137—1 Date: 05/08/89 REVISION DATE DESCRIPTION design by: A. BRIONES DRAWN BY: R. YOAST CHECK BY: A. BRIONES

ABBREVIATIONS	
BARE COPPER	
CONDUIT	
CONTROL	
000050	

CPT	CONTROL
CU	COPPER
G	GROUND
HOA	HAND-OFF-AUTOMATIC
MA	MILLIAMPERE
МТС	EMPTY CONDUIT W/PULLWIRE
OL	OVERLOAD DEVICE
PS	PRESSURE SWITCH
SS	SELECTOR SWITCH
TYP	TYPICAL
VM	VOLTMETER
WP	WEATHERPROOF



### LIFT STATION SITE PLAN - ELECTRICAL SCALE: $1^{*} = 40^{\circ}$



RAYMOND VAIL AND ASSOCIATES ENGINEERING • PLANNING • ARCHITECTURE • SURVEYING WALNUT CREEK TAHOE CITY ANTIOCH

	STMBULS LIST
	UNDERGROUND CONDUIT
	CONDUIT TURNED UP
$\sim$	FLEXIBLE CONDUIT
	LANDING LUGS
	TRANSFORMER
200/3	CIRCUIT BREAKER, 200 AMP, 3 POLE
٥	JUNCTION BOX
	DUPLEX CONVENIENCE OUTLET
1	CONDUIT TAG, SEE CONDUIT SCHEDULE
WHM	WATT HOUR METER AND SOCKET
CRI	CONTROL RELAY #1
Ū.S	LIMIT SWITCH
(M)	MAGNETIC STARTER HOLDING COIL
PS	PRESSURE SWITCH
SV	SOLENOID VALVE
TM	ELAPSED TIME METER
AM	AMMETER
	FUSE, AMPERE SIZE SHOWN
	CONTROL RELAY #1 CONTACT, NORMALLY CLOSED
CR 1 ⊣⊢	CONTROL RELAY #1 CONTACT, NORMALLY OPEN
OL 	OVERLOAD DEVICE CONTACT
	TEMPERATURE SENSOR, NORMALLY CLOSED
	PRESSURE SWITCH, NORMALLY OPEN CLOSES ON DECREASING PRESSURE
	PRESSURE SWITCH, NORMALLY OPEN CLOSES ON INCREASING PRESSURE
R	PUSH TO TEST PILOT LIGHT
100	MOTOR, HORSEPOWER NOTED
T	THERMOSTAT

### ELECTRICAL SERVICE NOTES

CONTRACTOR SHALL INCLUDE IN HIS BID ALL COSTS CHARGED BY THE UTILITY COMPANIES. ALL WORK REQUIRED FOR UTILITY SERVICES SHALL BE IN ACCORD WITH CONTRACT DOCUMENTS, SPECIFICATIONS, DRAWINGS AND AS REQUIRED BY THE UTILITY COMPANIES.

COORDINATE REQUIREMENTS WITH ....

POWER COMPANY:

MODESTO IRRIGATION DISTRICT P.O. BOX 4060 MODESTO, CA. 95353

CONTACT:

BILL COATES (209) 578–1212



04/27/89 SHEET SALIDA SANITARY DISTRICT **44**<sub>0F</sub> **46** SCALE: PUMP STATION NO. 3 AS NOTED **ELECTRICAL SITE PLAN & DETAILS** CALIFORNIA W.O. NO. 2424.14A SHEETS FILE NO.



. a	P	AN	EL		A		5 18	2	
VOLTAGE: 120/240V	MOUN	TING:	IN F	ÉD	EST	AL			KVA: <b>44</b>
BUS: 100A	TYPE	:	1ø,	<b>3</b> W					CURRENT: 10.5 AMPS
LOAD	KVA	CB	NO			NO	CB	KVA	LOAD
PUMP CONTROLS	0.5	20/1	1	+	+	2	20/1	0.2	PEDESTAL LIGHTING
SPACE HEATER-PEDESTAL	1.0		3	-	+	4		0.2	GFI RECEPTACLE-PEDESTAL
SUMP PUMP	1.0		5	-	+	6		0.3	DRY WELL LIGHTING
EXHAUST FAN	1.0		7		+	8	1	0.2	DRY WELL RECEPTACLES
SPARE			9	-+-	+-	10		2 11	SPACE
SPARE			11		+	12			SPACE
			13	+		14			
			15		+	16			
			17	+	+	18			
			19		-	20			
			21	-+-	+	22			
			23	+	+	24			
			25	+	+	26			
	-		27	$\checkmark$	$\mathbf{+}$	28			4
			29	4		30			
			31	+	+	32			
			33	+	+	34			
			35		+	36			
			37	+	+	38			
			39		+	40			
			41	-+		42			

-SUPPORT CONDUIT UNDER ALUMINUM

### SHEET NOTES

1. DRY WELL OF PUMP STATION IS CLASSIFIED A HAZARDOUS LOCATION, CLASS 1, DIVISION 1. ALL ELECTRICAL WORK AND MATERIAL SHALL COMPLY WITH NEC ARTICLE 500 AND 501.

2. ALL CONDUIT RUNS SHALL BE EXPOSED, RIGID GALVANIZED STEEL ON

CEILING OR WALL AND SHALL BE PACKED NEATLY IN PARALLEL AND

PERPENDICULAR RUNS. BOXES SHALL BE CAST GALVANIZED STEEL.

PROVIDE LOCKOUT STOP & JOG CONTROL STATION FOR EACH PUMP.

> 3. COORDINATE WITH UTILITY CO. ALL 240V CIRCUIT BREAKERS SHALL, BE RATED FOR AVAILABLE AIC (SYM) VALUE AS INDICATED BY UTILITY CO.

FLOODED STATION ALARM SWITCH SEALED MERCURY FLOAT.

70 W HIGH PRESSURE SODIUM CAST ALUMINUM VAPOR PROOF LIGHT FIXTURE WITH INSTANT RESTRIKE BALLAST CROUSE HINDS VMVS2C070GP-1R OR EQUAL, TYP. OF 5.

- PROVIDE LOCKOUT STOP & JOG CONTROL STATION FOR EACH PUMP

BATTERY POWERED EMERGENCY LIGHT NEMA 4X UNIT SURE-LITES UMB-1 OR EQUAL. MOUNT AT 7-0".

FLOODED STATION ALARM SWITCH SEALED MERCURY FLOAT.



BUIL

SALIDA SANITARY DISTRICT	DATE 04/17/89	SHEET
PUMP STATION NO. 3	SCALE:	45 46
NE DIAGRAM & PUMP STA. DETAILS	AS NOTED	OF
CALIFO	W.O. NO. 2424.14A	SHEETS
	FILE NO.	



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PROVIDE ENGRAVED NAMEPLATE NEXT TO EACH PAIR OF TERMINALS. INSCRIBE AS INDICATED.

TERMINAL STRIP LOCATED IN TELEMETRY SECTION OF THE SERVICE PEDESTAL. PROVIDE NAMEPLATE ABOVE TERMINAL STRIP ENGRAVED, "TELEMETRY CONNECTIONS"

### TELEMETRY INTERCONNECTION WIRING DIAGRAM

NO SCALE

File: 89137-3 Date: 05/08/89

DESIGN BY: A. BRIONES DRAWN BY: R. YOAST

CHECK BY: A. BRIONES

REVISION DATE DESCRIPTION



SALIDA, STANISLAUS COUN

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SALIDA SANITARY DISTRICT	Covert	DATE	SHEET
PLIMP STATION NO 3		SCALE	16 16
WIRING DIAGRAMS		AS NOTED	
NTY	CALIFORNIA	W.O. NO2424.14A	SHEETS
	~	FILE NO.	

## END OF TECHNICAL SPECIFICATIONS