

JORDAN VALLEY WATER CONSERVANCY DISTRICT

SERWTP PEC Bulk Tank

March 2023

DESCRIPTION OF WORK: This project consists of providing and installing one chemical bulk tank, along with the piping and equipment for a fully functional chemical storage system. This includes some concrete and electrical work.

PROJECT SCHEDULE: The work shall be completed within 170 days from the date of acceptance of the Award of Purchase Order. If the work is not completed within the specified time frame, the bidder herein agrees to accept liquidated damages in the amount of \$50 per day.

RECEIPT OF BIDS: Bids will be received by Jordan Valley Water Conservancy District, attention Conor Tyson at 8215 South 1300 West, West Jordan, Utah 84088 until **March 21, 2023, at 2:30 pm**. Electronic bids may also be submitted in adobe .pdf format to ellisad@jvwcd.org. JWCD requests that electronic bids be submitted 15 minutes prior to the bid opening deadline. A public bid opening will be held at the bid due time. Attendance is not required. Bid results will be posted to the District's website within 24 hours of the bid opening.

OBTAINING CONTRACT DOCUMENTS: All Contract Documents may be obtained on the District's website (www.jvwcd.org), under the project "SERWTP PEC Bulk Tank Installation". Prospective bidders must register at the District's web site under the project to receive project notifications and addenda, if any. Contractors are required to check the District's web site for any addenda prior to submitting a responsive bid. Bids determined to be non-responsive may be rejected.

JWCD project manager/contact person: Conor Tyson, EIT; conort@jvwcd.org, telephone Number: (385) 236-2510

SITE OF WORK: Southeast Regional Water Treatment Plant, 11574 S. Wyndcastle Dr., Sandy, Utah 84092.

PRE-BID SITE VISIT: A non-mandatory pre-bid site visit will be held on **Wednesday, March 15th, 2022**, at the site of the work, at 1:30 pm.

AWARD OF CONTRACT: An Award of Purchase Order, if awarded, will be made within 60 calendar days of the opening of bids, based upon the lowest cost responsive bid.

BONDS: A Bid bond, Performance Bond, and payment bond are required for any bid exceeding \$50,000 as required by Utah state law.

ADDRESS AND MARKING OF BID: The envelope enclosing the bid shall be sealed and addressed to the Jordan Valley Water Conservancy District and delivered or mailed to 8215 South 1300 West, West Jordan, Utah 84088. The envelope shall be plainly marked in the upper left-hand corner with the name and address of the bidder and shall bear the words "Bid for," followed by the title of the Contract Documents for the work and the date and hour of opening of bids. Electronic bids shall be submitted to the engineering administrative assistant, ellisad@jvwcd.org as an email attachment with the words "Bid for," followed by the title of the Contract Documents for the work and the date and hour of opening of bids in the subject line of the email.

PROJECT ADMINISTRATION: All questions relating to this project prior to the opening of bids shall be directed to the Project Manager for the project.

OWNER'S RIGHTS RESERVED: The Owner reserves the right to reject any or all bids, to waive any informality in a bid, and to make awards in the interest of the Owner.

Owner/ Engineer
Jordan Valley Water Conservancy District
Project Manager: Conor Tyson
8215 South 1300 West
West Jordan, Utah 84088
Telephone: (801) 565-4300
Email: conort@jvwcd.org

JORDAN VALLEY WATER CONSERVANCY DISTRICT

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INSTRUCTIONS TO BIDDERS

WARRANTY: The successful bidder shall warrant the equipment and installation to be free of defects in materials and workmanship for a period of one (1) year following satisfactory start-up and testing of the equipment.

INSURANCE REQUIREMENTS: Prior to awarding a purchase order the bidder must furnish certificates of insurance to include the following policies. The limits of liability for the insurance required in this project shall provide for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation

A. State: Utah Statutory

2. Comprehensive General Liability

A. Bodily Injury (including completed operations and products liability):

\$500,000	Each Occurrence
\$1,000,000	Annual Aggregate
or a combined single limit of	\$1,000,000

B. Property Damage liability insurance including Explosion, Collapse and Underground coverages where applicable.

C. Personal Injury, with employment exclusion deleted.

\$1,000,000	Annual Aggregate
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3. Comprehensive Automobile Liability:

A. Bodily Injury

\$500,000	Each Person
\$1,000,000	Each Occurrence

B. Property Damage:

\$500,000	Each Occurrence
or combined single limit of	\$1,000,000

BID SCHEDULE

<u>Item</u>	<u>Units</u>	<u>Quantity</u>	<u>Extended Price</u>
Provide and Install Bulk Tank	EA	1	\$ _____
Mechanical Work as indicated on the drawings	LS	1	\$ _____
Electrical work as indicated on the drawings.	LS	1	\$ _____
		TOTAL BID	\$ _____

Bidder (Company name): _____

By: _____
(Signature)

Dated: _____

Name: _____
(Print)

Title: _____

The Bidder shall furnish the following information. Failure to comply with this requirement may render the Bid non-responsive and subject to rejection. Additional sheets shall be attached as required. No bid for the work will be considered from a bidder who does not hold an active license in good standing applicable to the type of work bid upon at the time of submission of the bid.

Contractor's name: _____

Contractor's address: _____

Contractor's Fax: _____

Contractor's Primary Contact: _____

Email address of primary contact: _____

Telephone number of primary contact: _____

BIDDER REQUIREMENTS: The bidder shall have:

- (1) a valid Utah Business license
- (2) a valid Utah Contractors license appropriate for the work,
- (3) have completed a minimum of three similar construction projects including electrical work each with a final contract cost in excess of \$50,000. The Owner shall be entitled to contact each reference listed by the contractor.

1. Utah Department of Commerce Information
Business Entity Number: _____
Delinquent Date: _____

2. Contractor's Utah License Number: _____
Expiration Date: _____
Primary Classification: _____
Supplemental Classification held, if any: _____

3. Number of years as a contractor in work of this type:

4. Qualifying Projects:

Qualifying Project 1 _____ Completion Date _____

Description of Project

Final Cost _____ Owner _____

Owner Phone # _____ Owner email _____

Qualifying Project 2 _____ Completion Date _____

Description of Project

Final Cost _____ Owner _____

Owner Phone # _____ Owner email _____

Qualifying Project 3 _____ Completion Date _____

Description of Project

Final Cost _____ Owner _____

Owner Phone # _____ Owner email _____

5. As necessary, attach to your bid technical information showing compliance with the defined scope of work and/or technical specifications.

Scope of Work:

This project involved installing one bulk chemical tank with related equipment.
This equipment includes:

- One Pump
- One radar level
- One Concrete Pad
- Valves and Piping
- Electrical Control Box

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____
as Principal, and _____
as Surety, are held and firmly bound unto the Jordan Valley Water Conservancy District
(hereinafter called "Owner") in the sum of _____
dollars, (not less than five percent of the total amount of the bid) for the payment of which
sum, will and truly to be made, we bind ourselves, our heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has submitted a bid to Owner to perform all work required under the
bidding Schedule of the Owner's Contract Documents entitled "SERWTP PEC Bulk Tank",
(hereafter called the "Project Title").

NOW THEREFORE, if Principal is awarded Contract by Owner for the Construction of the
Project and, within the time and in the manner required under the heading "Instructions to
Bidders" enters into the written contract entitled "Agreement" bound with said Contract
Documents, furnishes the required certificates of insurance, and furnishes the required
Performance Bond and Payment Bond within 10 calendar days after receipt of such
contract from Owner, then this obligation shall be null and void, otherwise it shall remain in
full force and effect. In the event suit is brought upon this bond by Owner and judgment is
recovered, Surety shall pay all costs incurred by Owner in such suit, including a reasonable
attorney's fee to be fixed by the court.

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

By: _____ By: _____

Its: _____ Its: _____

(SEAL)

(SEAL)

NOTICE OF AWARD

To: **Contractor's Name and Address**

Re: SERWTP PEC Bulk Tank

You are hereby notified that the OWNER has accepted your bid for the above referenced project in the amount of \$.

Furnish the required Contractor's Performance Bond, Payment Bond, and Certificates of Insurance within ten calendar days from the date of this notice to you. An acknowledged copy of this Notice of Award, together with all future correspondence regarding this project, shall be sent to the District's Project Manager: Conor Tyson, Staff Engineer

When the Agreement is provided, sign and return it within ten calendar days from receipt of the agreement.

Dated this ____ day of _____, 2023.

Shane K. Swensen, PE
Chief Engineer

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged by:

Contractor's Name _____

This _____ day of _____, 2023.

Signature: _____

Printed Name: _____

Title: _____

AWARD OF PURCHASE ORDER

The Jordan Valley Water Conservancy District (Owner) hereby accepts your Bid dated _____ . In accordance with your Bid and the Owner’s Documents dated _____ , the Owner has created a purchase order in the amount of \$ _____ for the project entitled “SERWTP PEC Bulk Tank”. **The completion date is 170 days from the date of acceptance of this Award of Purchase Order.**

You should sign and return this Award of Purchase Order within 10 calendar days from the date of this notice to you.

Sincerely,

Shane K Swensen, PE
AChief Engineer

Award Date

ACCEPTANCE OF AWARD

_____, a corporation qualified to do business in the State of Utah, hereby agrees to perform as specified in its Bid, the Owner’s Contract Documents, and this Award of Purchase Order.

Signature

Title

Acceptance Date

Attachments: Bid

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____, as Contractor, and _____ as Surety, are held firmly bound unto the Jordan Valley Water Conservancy District hereinafter called "Owner," in the sum of \$_____ for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has been awarded and is about to enter into the annexed Agreement with Owner to perform all work required under the Bidding Schedule(s) of the Owner's Contract Documents entitled "SERWTP PEC Bulk Tank"

NOW THEREFORE, if Contractor shall perform all the requirements of the Agreement required to be performed on his part, at the times and in the manner specified therein, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, that any alterations in the work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of the Agreement, shall not in any way release Contractor or Surety thereunder, nor shall any extensions of the time granted under the provisions of the Agreement release either the Contractor or Surety, and notice of such alterations or extensions of the work, materials or time to complete made under the Agreement is hereby waived by Surety. This Bond is furnished in compliance and in accordance with 14-1-18, Utah Code Ann., as amended, and 63-56-38 Utah Code Ann., as amended.

SIGNED AND SEALED, this _____ day of _____, 20__.

By: _____

By: _____

Its: _____

Its: _____

(SEAL)

(SEAL)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____ as Contractor, and _____ as Surety, are held firmly bound unto the Jordan Valley Water Conservancy District hereinafter called "Owner," in the sum of \$_____ for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has been awarded and is about to enter into the annexed Agreement with Owner to perform all work required under the Bidding Schedule(s) of the Owner's Contract Documents entitled, "SERWTP PEC Bulk Tank"

NOW THEREFORE, if said Contractor, or subcontractor, fails to pay for any materials, equipment, or other supplies, or for rental of same, used in connection with the performance of work contracted to be done, or for amounts due under applicable State law for any work or labor thereon, said Surety will pay for the same in an amount not exceeding the sum specified above, and, in the event suit is brought upon this bond, a reasonable attorney's fee to be fixed by the court. This bond shall inure to the benefit of any persons, companies, or corporations entitled to file claims under applicable State law.

PROVIDED, that any alterations in the work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of the Agreement, shall not in any way release Contractor or Surety thereunder, nor shall any extensions of time granted under the provisions of said contract release either Contractor or the Surety, and notice of such alterations or extensions of the work, materials or time to complete made under the Agreement is hereby waived by Surety. This bond is furnished in compliance and in accordance with 14-1-18 and 19 Utah Code Ann., as amended, and 63-56-38 Utah Code Ann., as amended.

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

By: _____

By: _____

Its: _____

Its: _____

(SEAL)

(SEAL)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

TECHNICAL SPECIFICATIONS

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

101.01 GENERAL

- A. The WORK to be performed under this Contract shall consist of furnishing all plant, tools, equipment, materials, supplies, and manufactured articles and for furnishing all transportation and services, including fuel, power, water, and essential communications, and for the performance of all labor, WORK, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents.

101.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The WORK of this Contract includes furnishing and installing three new fluoride tanks (two bulk one day tank) and associated piping and electrical work in accordance with the drawings and these specifications. Appurtenant items include but are not limited to:
1. Supply and install one bulk tank for storing polymer (PEC).
 2. Extend line for PEC to bulk tank. Install new line from bulk tank to existing day tank.
 3. Supply and installation of radar level sensor and transfer pump.
 4. Install conduit and wiring from power source shown on drawings.
 5. Install conduit and wiring from new instruments to RTU pad for telemetry communication.

101.03 CONTRACT METHOD

- A. The WORK, hereunder, will be constructed based on the bid schedule.
- B. The CONTRACTOR shall include the General Conditions and Supplementary General Conditions of the Contract as a part of all of its subcontract agreements.

101.04 WORK BY OTHERS – Not Used

101.01 WORK SEQUENCE

- A. WORK under the Contract shall be scheduled and performed in such a manner as to result in the least possible disruption of service.

SECTION 01010 - SUMMARY OF WORK

- B. The CONTRACTOR shall have all of his materials necessary to perform the work at the site of WORK prior to interrupting service.

101.02 CONTRACTOR USE OF PROJECT SITE

- A. The CONTRACTOR's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities, and field offices.
- B. The CONTRACTOR shall limit construction operations to areas within the OWNER's property described in the drawings and shall maintain public access to driveways.
- C. The CONTRACTOR shall provide their own sanitation facilities.

101.03 OWNER USE OF THE PROJECT SITE

- A. During CONTRACTOR's WORK the OWNER may utilize all or part of the existing site and existing facilities during the entire period of construction for the conduct of the OWNER's normal operations. The CONTRACTOR shall cooperate with the OWNER/ENGINEER to minimize interference with the CONTRACTOR's operations and to facilitate the OWNER's operations. In any event, the OWNER shall be allowed access to the project site during the period of construction.

101.04 PROJECT MEETINGS

- A. PRECONSTRUCTION CONFERENCE:

Prior to the commencement of WORK at the site, a preconstruction conference will be held at a mutually agreed time and place which shall be attended by the CONTRACTOR, its superintendent, and its subcontractors as appropriate. Other attendees will include OWNER Representative, ENGINEER and designated project representative, representatives of other utilities affected by the WORK, others as requested by CONTRACTOR, OWNER or ENGINEER.

- B. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. This agenda will include the following:
 - 1. CONTRACTOR'S tentative schedules.
 - 2. Transmittal, review, and distribution of CONTRACTOR's submittals.
 - 3. Processing applications for payment.

SECTION 01010 - SUMMARY OF WORK

4. Maintaining record documents.
 5. Critical Work sequencing.
 6. Field decisions and Change Orders.
 7. Use of project site, office and storage areas, security, housekeeping, and OWNER's needs.
 8. Major equipment deliveries and priorities.
 9. CONTRACTOR's assignments for safety and first aid.
- C. The ENGINEER will conduct the preconstruction conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.
- D. **PROGRESS MEETINGS:**

The CONTRACTOR shall schedule and hold regular on-site progress meetings as required by progress of the WORK. The CONTRACTOR and OWNER shall be represented at each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers, and subcontractors.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

101.01 SCOPE

- A. Payment for various items of the Bid Sheets, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the item of WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenant items of WORK.

101.02 APPLICATION FOR PAYMENT

- A. Application for Progress Payment shall be submitted in accordance with Article 14 of the General Conditions of this Contract.

101.03 LUMP SUM ITEMS

- A. No separate measurement of quantities will be made for those items of WORK performed on a lump sum basis, but the item will be constructed, complete, as required to complete the WORK shown on the Drawings and as described in the Specifications.
- B. Bid prices for lump sum items represent the total cost to the OWNER. Such price shall constitute full compensation for furnishing and placing of materials required to complete the item, and for all labor, equipment, tools, and incidentals needed to complete the WORK in conformity with the plans and specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01300 - CONTRACTOR SUBMITTALS

PART 1 - GENERAL

101.01 REQUIREMENT

- A. Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the ENGINEER.
- B. Within 14 days after the award of Construction Contract, the CONTRACTOR shall submit the following items to the ENGINEER for review:
 - 1. A preliminary construction schedule indicating the starting and completion dates of the various stages of the WORK.
 - 2. The manufacturer's technical submittal information for the following items:
 - a. Bulk Tank.
 - b. Transfer pump.
 - c. Radar level sensor.
 - d. Valves.
 - e. Electrical conduit and wiring.

101.02 CONTRACTOR'S SCHEDULES

A. TIME OF SUBMITTALS:

At the preconstruction conference, the CONTRACTOR shall submit for acceptance by the ENGINEER, a preliminary construction schedule for the WORK, showing its general plan for orderly completion of the WORK, showing its general plan for orderly completion of the WORK and showing in detail its planned mobilization of plant and equipment, sequence of early operations, and timing of procurement of materials and equipment. The construction schedule produced and submitted shall indicate a project completion date on or before the contract completion date. The ENGINEER within 14 days after receipt of the preliminary construction schedule, shall meet with a representative of the CONTRACTOR to review the preliminary plan and construction schedule. After review by ENGINEER, revise and resubmit as required.

B. CONSTRUCTION SCHEDULE REVISIONS:

Submit revised schedules with each Application of Payment, reflecting changes since previous submittal.

SECTION 01300 - CONTRACTOR SUBMITTALS

101.03 PROPOSED SUBSTITUTES OR EQUAL ITEMS

- A. For convenience in designation in the Contract Documents, any material, product, or equipment to be incorporated in the WORK may be designated under a brand or trade name or the name of a manufacturer and its catalog information. The use of any substitute material, product, or equipment which is equal in quality and utility and possesses the required characteristics for the purpose intended will be permitted, subject to the following requirements:
1. The burden of proof as to the quality and utility of any such substitute material, product, or equipment shall be upon the CONTRACTOR.
 2. The ENGINEER will be the sole judge as to the quality and utility of any such substitute decision shall be final.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

101.01 SITE INVESTIGATION AND CONTROL

- A. The Contractor shall verify all dimensions the field and shall check field conditions continuously during construction. The Contractor shall solely be responsible for any inaccuracies built into the work due to his failure to comply with this requirement.
- B. The Contractor shall inspect related and appurtenant work and shall report in writing to the ENGINEER any conditions which will prevent proper completion of the work. Failure to report any such condition shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at his sole cost and expense.

101.02 DESCRIPTION OF WORK

- A. The work shall be conducted under the general observation of the ENGINEER and shall be subject to inspection by representatives of the OWNER to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop or field inspection, as required. The ENGINEER shall be permitted access to all parts of the WORK, including plants where materials or equipment are manufactured or fabricated.
- B. The presence of the ENGINEER or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the WORK in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor and said duty shall not be avoided by any act or omission on the part of the ENGINEER or any inspector(s).
- C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the WORK until they have been inspected and accepted by the ENGINEER or his authorized representative. No WORK shall be backfilled, buried, cast in concrete, hidden, or otherwise covered until it has been inspected by the ENGINEER or is authorized representative. Any WORK so covered in the absence of inspection shall be subject to uncovering. Where uninspected WORK cannot be uncovered, such as in concrete cast over reinforcing steel, all such WORK shall be subject to demolition, removal, and reconstruction under proper inspection, and no addition payment will be allowed, therefore.

SECTION 01400 - QUALITY CONTROL

101.03 TIME OF INSPECTION AND TESTS

- A. Except as otherwise provided in these specifications, performance of the required tests will be by the OWNER, and all costs therefore will be borne by the OWNER at no cost to the Contractor; except, that the costs of any test which shows unsatisfactory results shall be borne by the Contractor. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover any WORK under the contract, he shall notify the ENGINEER not less than 24 hours in advance to request inspection before beginning any such WORK of covering. Failure of the Contractor to notify the ENGINEER at least 24 hours in advance of any such inspection shall be reasonable cause for the ENGINEER to order a sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective WORK required, and all costs of such delays, including its effect upon other portions of the WORK, shall be borne by the Contractor.

101.04 RIGHT OF REJECTION

- A. The ENGINEER, acting for the OWNER shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of these specifications, regardless of whether the defects in such articles of materials are detected at the point of manufacture or after completion of the WORK at the site. If the ENGINEER or inspector, through an oversight or otherwise, as accepted materials or WORK which is defective or which is contrary to the specifications, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected by the ENGINEER for the OWNER.
- B. The Contractor shall promptly remove rejected articles or materials from the site of the WORK after notification of rejection.
- C. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01500 - CONSTRUCTION FACILITIES AND ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

101.01 GENERAL

- A. The Contractor shall provide and maintain adequate construction facilities and perform the necessary work to minimize the impact and inconvenience of the construction activities.

101.02 SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures in accordance with Part 1926 of the OSHA Standards for Construction.

101.03 BARRIERS AND ENCLOSURES

- A. Provide as required to prevent public entry to construction areas, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Protect against stored materials, dumping, chemically injurious materials, and puddling or continuous running water.

101.04 PROTECTION OF INSTALLED WORK

- A. Provide temporary protection for installed products. Repair or replace at OWNER's option any installed work damaged by Work operations.

101.05 DUST, WATER AND NOISE CONTROL

- A. NOISE CONTROL:
 - 1. Execute construction between the hours as allowed unless otherwise approved by OWNER.

101.06 CONSTRUCTION CLEANING

- A. Through all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work site clean and shall remove daily all refuse, dirt, damaged materials, unusable materials, and all other trash or debris that he has created from his construction activities.
- B. Materials and equipment shall be removed from the site as soon as they are no longer necessary; and upon completion of the work and before final inspection, the entire work site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.

SECTION 01500 - CONSTRUCTION FACILITIES AND ENVIRONMENTAL CONTROLS

101.07 REMOVAL

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of two feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

101.01 GENERAL

- A. It is the responsibility of the Contractor to provide products as specified in the Contract Documents free from manufacturer defects or damage from shipping.

101.02 PRODUCTS

- A. Products include all material, equipment, and systems.
- B. Comply with specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a specification section shall be the same and shall be interchangeable.
- D. Do not use products removed from an existing structure, pipeline, etc., except as specifically required, or allowed, by Contract Documents.

101.03 TRANSPORTATION AND HANDLING

- A. Transport products by methods to avoid product damage; deliver in undamaged condition.
- B. Provide equipment and personnel to handle products by methods to prevent damage.
- C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

101.04 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Arrange storage to provide access for inspection. Periodically inspect to ensure products are undamaged and are maintained under required conditions.

101.05 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only; Any product meeting those standards.

SECTION 01600 - MATERIAL AND EQUIPMENT

- B. Products Specified by Naming One or More Manufacturers with a Provision of Substitutions: Submit a request for substitution for any manufacturer not specifically named.
- C. Product Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications: no options, or substitutions allowed.
- D. Products Specified by Naming Only One Manufacturer: No options, no substitutions allowed.

101.06 PRODUCTS LISTS

- A. Within 10 days after date of Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number (if applicable) of each product.

101.07 SUBSTITUTIONS

- A. Only within 15 days after date established in Notice to Proceed will ENGINEER consider requests from Contractor for substitutions. Subsequently, substitutions will be considered only when a product becomes unavailable due to no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. Request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
 - 2. Will provide the same warranty for substitution as for specified product.
 - 3. Will coordinate installation and make other changes which may be required for WORK to complete in all respects.
 - 4. Waives claims for additional costs which may subsequently become apparent.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.
- E. ENGINEER will determine acceptability of proposed substitution and will notify Contractor of acceptance or rejection in writing within a reasonable time.

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

101.01 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.
- B. When Contractor considers WORK has been reached final completion, submit written certification that Contract Documents have been reviewed, WORK has been inspected, and that WORK is complete in accordance with Contract Documents and ready for ENGINEER's review.
- C. In addition to submittals required by the conditions of the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.
- D. ENGINEER will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

101.02 FINAL CLEANING

- A. Execute prior to final inspection.
- B. Clean and flush drainage systems.
- C. Clean site: sweep paved areas, rake clean other surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

101.03 PROJECT RECORD DOCUMENTS

- A. Provide completed record drawings and other required closeout documents prior to requesting final payment.
- B. Store record documents separate from those used for construction.
- C. Keep documents current; do not permanently conceal any WORK until required information has been recorded.
- D. At Contract closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

SECTION 01700 - CONTRACT CLOSEOUT

101.04 OPERATION AND MAINTENANCE DATA

- A. Provide data for:
 - 1. Mechanical equipment and controls.
- B. Submit prior to final inspection, bound in 8-1/2 X 11-inch three-ring side binders with durable plastic covers.

101.05 MAINTENANCE AND GUARANTEE

- A. The Contractor shall comply with the maintenance and guarantee requirements contained in Article 13.01 of the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the Contractor which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the Contractor fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the Contractor and his surety shall be liable to the OWNER for the cost thereof.
- D. Comply with General Conditions and ordinances of local jurisdictions having authority.
- E. Make periodic inspections during guarantee period and correct defective work or correct defective work as directed by the OWNER or appropriate governing authority.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 01720 - RECORD DRAWINGS

PART 1 - GENERAL

101.01 RECORD DRAWINGS

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the Contract Drawings, including buried or concealed construction and utility features which are revealed during construction. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like shall be maintained up-to-date during the progress of the WORK.
- B. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
- C. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER upon completion of the WORK.
- D. Requests for partial payments will not be approved if the record drawings are not kept current. Final payment will not be approved until the CONTRACTOR-prepared record drawings have been delivered to the ENGINEER and the completed record drawings, showing all variations between the WORK as actually constructed and as originally shown on the Contract Drawings or other Contract Documents, have been inspected by the ENGINEER. Said up-to-date, record drawings may be in the form of a set of prints with carefully plotted information overlaid in pencil.
- E. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall complete and deliver a complete set of record drawings to the OWNER, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected plans showing the reported location of the WORK. The information submitted by the CONTRACTOR and incorporated by the ENGINEER into the Record Drawings will be assumed to be reliable, and the ENGINEER will not be responsible for the accuracy of such information, nor for any error or omissions which may appear on the Record Drawings as a result.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 02590 - PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS

PART 1 - GENERAL

101.01 GENERAL

- A. The WORK of this section includes the restoration of all existing improvements damaged or altered by the construction of the project.
- B. Existing improvements shall include but are not limited to permanent surfacing, curbs, existing equipment, and walls. All improvements shall be reconstructed to equal or better, in all respects, the existing improvements removed. Said existing improvements shall be reconstructed in accordance with the notes and details shown on the drawings and/or the applicable provision of these Specifications.

101.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are trained and experienced in the type of construction required.
- B. The quality of the finished restored improvement, as determined by the OWNER, shall be of equal or better quality than was said improvement prior to being damaged or removed.

PART 2 - PRODUCTS

202.01 CONCRETE

- A. Concrete for curbs, shelves, and pedestals cement shall be class A cement, unless otherwise directed by the Engineer or these Specifications. Do not use cement containing lumps, or cement which has partially set. Do not mix cements originating from different sources or manufacturers.

PART 3 - EXECUTION

303.01 PREPARATION

- A. Obtain any permits required for the improvements. All permit fees shall be included in the bid.

303.04 CONCRETE CURBS, GUTTER, SIDEWALKS AND DRIVEWAYS

- A. All new concrete shall match, as nearly as possible, the appearance of adjacent concrete improvements. Where necessary, lampblack or other pigments shall be added to the new concrete to obtain the desired results.

**SECTION 02590 - PROTECTION AND RESTORATION
OF EXISTING IMPROVEMENTS**

- B. Concrete forms shall be true to line and of sufficient strength to ensure against bulging or displacement.
- C. Contraction and expansion joints shall match original construction in placement and size, unless otherwise required by local jurisdiction having authority.
- D. Reinforcement shall be replaced as in original construction, and doveled into edges of existing concrete, unless otherwise required by local jurisdiction having authority, and shall be installed in accordance with applicable CRSI and ACI Standards.

- END OF SECTION -

SECTION 15200 - TANKS

PART 1 - GENERAL

1.01 Requirements

1. The CONTRACTOR shall provide a high-density cross-linked polyethylene tank and accessories per section 2.04, complete and in place, in accordance with the Contract Documents.
2. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the tanks and accessories for chemical storage as indicated.

1.02 REFERENCES, CODES AND STANDARDS

- A. American Society of Testing Materials (ASTM).
 1. D638 Tensile Properties of Plastics
 2. D883 Standard Definitions of Terms Relating to Plastics
 4. D1505 Density of Plastics by the Density-Gradient Technique
 5. D1693 ESCR Specification Thickness 0.125" F50-10% Igepal
 6. F412 Standard Terminology Relating to Plastic Piping Systems
- B. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings
- C. Building Code: International Building Code - IBC 2009
- D. ARM: Low Temperature Impact Resistance (Falling Dart Test Procedure).
- E. NSF/ANSI Standard 61, AWWA – Drinking Water System Components
- F. ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

1.03 SUBMITTALS

- A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the tanks. Submit the following as a single complete initial submittal. Sufficient data shall be included to show that the product conforms to Specification requirements. Provide the following additional information:
 1. Tank and Fitting Material
 - a. Resin Manufacturer Data Sheet
 - b. Fitting Material
 - c. Gasket style and material
 - d. Bolt material
 2. Dimensioned Tank Drawings
 - a. Location and orientation of molded in fitting openings, fittings, accessories,

SECTION 15200 - TANKS

restraints and supports.

- b. Details of inlet and outlet, manways, flexible connections, and vents.
- B. Manufacturer's warranty
- C. Manufacturer's unloading procedure
- D. Manufacturer's installation instructions
- E. Supporting information of Quality Management System
- F. Supporting documentation of Manufacturer's certification to NSF/ANSI Standard 61 – Drinking Water System Components for water treatment chemicals.
- G. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.
- I. Factory Test Report
 - 1. Wall thickness verification.
 - 2. Fitting placement verification
 - 3. Visual inspection
 - 4. Impact test
 - 5. Gel test
 - 6. Hydrostatic test

1.04 QUALITY ASSURANCE

- A. The CONTRACTOR shall provide a vertical, high density cross-linked polyethylene tank with full drain capability and molded in flange. The tanks of the same material furnished under this Section shall be supplied by Poly Processing Company or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.
- B. Tanks shall be manufactured from virgin materials.
- C. Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage and submit form from NSF supporting chemical certification.

1.05 WARRANTY

- A. The warranty shall be provided upon request for the specific service application.

SECTION 15200 - TANKS

PART 2 - PRODUCTS

2.01 GENERAL

- A. Tanks shall be rotationally molded, high density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section and vertical with flat / sloping bottoms in axis. Tanks shall be adequately vented, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer and date of manufacture. Serial numbers must be permanently embossed into the tank.

2.02 POLYETHYLENE STORAGE TANKS

- A. Service: Chemical storage tanks shall be suited for the following operating conditions per this section.
- B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ or equal and shall contain ultraviolet stabilizer as recommended by resin manufacturer. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacture.
- C. For sodium hypochlorite, sulfuric acid storage, and other oxidizing chemicals, tank resin shall include an antioxidant polyethylene system (OR-1000) with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process.
- D. **Wall thickness** for a given hoop stress is to be calculated in accordance with ASTM D 1998. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

1. The wall thickness of any cylindrical portion at any fluid level shall be determined
by the following equation:

$$T = P \times OD/2SD \text{ or } 0.433 \times SG \times H \times OD/2SD$$

Where:	T	=	wall thickness, in
	P	=	pressure, psi
	SG	=	specific gravity, gm/cc
	H	=	fluid head, ft
	OD	=	outside diameter, ft
	SD	=	hydrostatic design stress

SECTION 15200 - TANKS

- a. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.
 2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.
 3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be 1".
- E. Tank colors shall be natural (un-pigmented) or as specified by the ENGINEER with written agreement by the tank manufacturer.

2.03 TANK ACCESSORIES

- A. Restraint System:
1. Metal components to be [galvanized], [stainless steel], or [painted clips].
 2. Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of tank installation. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer.

2.04 TANKS:

- A. Fittings
1. Tank fittings shall be according to the fitting schedule in 2.05B above. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation.
 2. Outlet must be an integral part of the tank, molded from the same material as the tank and provide complete drainage of liquid through the sidewall of the tank. Metal and alloy inserts shall not be used.
 3. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-

SECTION 15200 - TANKS

276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

4. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.
5. U-Vents: Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F) (iii)(2)(IV)(9). U-vents shall be sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the vent capacity by 1/3) in accordance with the venting schedule listed above.
7. All fittings on the 1/3 lower sidewall of tanks with capacities ≥ 1000 gallons shall have 100% virgin PTFE Flexi-joint® expansion joint. Expansion joint to have a minimum of 3 convolutions, stainless steel limit cables and FRP composite flanges. Galvanized parts will not be accepted.

Expansion joint to meet the following minimum performance requirements:

Axial Compression $\geq 0.67''$

Axial Extension $\geq 0.67''$

Lateral Deflection $\geq 0.51''$

Angular Deflection $\geq 14^\circ$

Torsional Rotation $\geq 4^\circ$

2.05 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.
2. Degree of Cross-linking. Use Method C of ASTM D 1998- Section 11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.
2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking

SECTION 15200 - TANKS

3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

- A. The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.
- B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.
- C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred manufacturer shall be notified immediately.

3.02 INSTALLATION

- A. Install the tanks in strict accordance with manufacturers Installation Manual and shop drawings.
- B. Installation will be inspected by manufacturer to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.
- C. Manufacturer's trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as ladders, restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.
- E. Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

- END OF SECTION -

SECTION 16000 - ELECTRICAL PROVISIONS

PART 1 - GENERAL

101.01 WORK INCLUDED

- A. Furnish all labor, materials, and equipment as required by the plans and specifications to provide a complete and workable electrical system. This specification describes the types of materials, methods, and management to be utilized. This includes the work listed in this division as well as equipment furnished under other divisions not specifically mentioned herein.

101.03 CODES AND STANDARDS

- A. All equipment, materials, and methods of design and installation are to comply with the National Electrical Code, the basic Electrical Regulations of the State of Utah, the Occupational Safety and Health Act (OSHA), and the requirements of any local codes at the site. Codes and standards of the following organizations may be referred to in this section and shall be considered as the minimum acceptable. A reference herein to any portion of the standard or code is not to be considered as negating any other portion of the standard or code.
1. American National Standards Institute, Inc. (ANSI)
 2. Institute of Electrical & Electronic Engineers (IEEE)
 3. American Society for Testing & Materials (ASTM)
 4. Underwriters Laboratories, Inc. (UL)
 5. National Electrical Manufacturers Association (NEMA)
 6. Insulated Cable Engineers Association (ICEA)
 7. National Electrical Code (NEC)
 8. Illuminating Engineering Society (IES)
 9. International Society for Measurement and Control (ISA)
- B. Where the plans or these specifications require a higher degree of workmanship or quality of material than the above codes and standards imply, then these plans and specifications will prevail.

101.04 EQUIPMENT, MATERIAL AND WORKMANSHIP

- A. All equipment and material are to be new, free from defects, of current manufacture, and listed by Underwriters Laboratories, Inc., (UL) where UL

SECTION 16000 - ELECTRICAL PROVISIONS

requirements apply. All materials are to be products of reputable and experienced manufacturers. Similar items in the project are to be of the same manufacturer. Use only equipment and materials of industrial quality and durability, and capable of long, reliable, trouble free service.

- B. The Owner reserves the right to operate defective equipment or that equipment which fails to conform to detailed specifications or does not operate satisfactorily until the defects are corrected or the equipment is repaired or replaced, without cost for depreciation, use or wear. Rejected equipment will be removed from operation only at times approved by the Owner. All equipment furnished under this section will be guaranteed for a minimum period of one (1) year from date of acceptance against defective materials, design, and workmanship in accordance with the provisions of the General Conditions.
- C. Provide protection for materials and equipment against loss or damage throughout the contract. Protect everything from the effect of weather prior to installation. Store items to be installed in indoor location.
- D. Any item subject to corrosion under damp conditions and items containing insulation such as transformers and motors are to be kept in heated locations.
- E. Following installation, protect materials and equipment from corrosion, physical damage and effects of moisture on insulation.
- F. Cap all conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed.
- G. Lay out work carefully in advance.
- H. Do not cut or notch any structural member or building surface without specific approval of the Engineer. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, pavings, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical equipment. Following such work, restore surfaces neatly to new conditions using skilled craftsmen of the trades involved at no additional cost to the Owner.
- I. All work will be performed by accomplished, qualified and experienced personnel working under continuous competent supervision.

101.05 PERMITS

SECTION 16000 - ELECTRICAL PROVISIONS

- A. Obtain and pay for all permits and inspections pertinent to the electrical installation and obtain such permits from the proper governing body before any progress payment will be certified for electrical work.

101.06 SITE INSPECTION

- A. Prior to submitting a bid, visit the project site and ascertain conditions affecting the proposed work and all existing electrical facilities.

101.07 TEMPORARY INSTALLATION

- A. Temporary installation is to conform to the requirements of the National Electrical Code and the State and local governing bodies.

101.08 SHOP DRAWINGS

- A. Make all submittals in accordance with Section 01300.
- B. Submittals shall include manufacturer and brand name of each class of material.
- C. Submit complete shop drawings for review prior to manufacture of power distribution and control equipment.
 - 1. Drawings will show:
 - a. Elevations
 - b. Plan layout and dimensions
 - c. Construction details
 - d. Elementary diagrams
 - e. Connection and interconnection diagrams
 - f. Bill of Material
 - g. Finish and name plates
- D. Motor control center diagrams, motor controller diagrams, and package drive diagrams are to be of the elementary type and show terminal identifications and associated field connections for each drive.
- E. Schematics for all control circuits are to be laid out as a ladder diagram with each line numbered in a sequential manner and all relays having their

SECTION 16000 - ELECTRICAL PROVISIONS

contact location summary on the line with the relay coil, (per JIC standards). Clearly show and identify interconnection with other systems.

- F. Provide and submit for review complete interconnection diagrams for all equipment showing:
 - 1. Terminal blocks of all distribution and control equipment
 - 2. All power, control and signal raceways
 - 3. Conduit sizes, wire number, wire sizes

101.9 RECORD DRAWINGS

- A. Maintain a neatly marked set of record drawings showing installation location, and/or routing of conduits, depth of buried cables, pull boxes, junction boxes, and outlets. Mark this set to show current job progress and any deviation from the contract drawings. These drawings will be available upon demand of the Engineer. After final inspection, transfer all record information to the Engineer as required in General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

103.01 INSTALLATION

- A. The electrical plan drawings show general arrangements and locations for equipment, conduit, outlets, etc. Unless detailed or dimensioned, exact locations of conduit, routing of cables, and placement of equipment will be governed by structural conditions, physical interferences, and locations of electrical termination on equipment. Examine architectural, structural and mechanical plans and shop drawings for the various equipment in order to determine exact routing and placement of all raceways, cables, and equipment, to assure a workable installation.
- B. Allowances have been made in the design for the number of raceways and conductors which the Engineer considers minimum for powering and controlling all electrical equipment. If the installed equipment is of larger horsepower than shown, or if characteristics require increased power and/or conductors, resize the raceway and conductors to allow for the changed conditions and remit the information for review prior to installation.
- C. Provide conduits, cables, and conductors necessary to meet requirements of all electrical equipment and devices. Determine final sizing of conduits and

SECTION 16000 - ELECTRICAL PROVISIONS

number and size of all required conductors after review of required drawings.
Conduit sizes shown on drawings are minimum sizes.

103.01 CLEAN-UP

- A. Continuously remove debris, cuttings, crates, cartons, etc.
- B. Before acceptance, carefully clean all cabinets, panels, boxes, wiring devices, cover plates, etc. Replace all damaged or blemished fixtures.

- END OF SECTION -

SECTION 16123 - WIRE AND CABLE

PART 1 - GENERAL

101.01 SECTION INCLUDES

- A. Wire and cable.
- B. Wiring connectors and connections.

101.02 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16130 - Boxes.
- C. Section 16195 - Identification.

101.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

PART 2 - PRODUCTS

201.01 GENERAL

- A. All conductors, include grounding conductors, shall be copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers shall conform to the requirements of Article 310 of the National Electrical Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400 and fixture wires shall conform to Article 402. All wiring shall have wire markers at each end.

201.02 LOW VOLTAGE WIRE AND CABLE

- A. Power and Lighting Wire
 - 1. All wire rated for 600 Volts in duct or conduit for all power and lighting circuits shall be Class B stranded Type THHN or THHW.
 - 2. Wiring for 600 volt class power and lighting shall be as manufactured by BICC Cables, Okonite, or equal.
- B. Control Wire

SECTION 16123 - WIRE AND CABLE

1. Control wire in duct or conduit shall be the same type as power and lighting wire indicated above, or as indicated on the drawings.
 2. Control wiring shall be No. 16 AWG, or as indicated on the drawings.
 3. Control wires at panels and cabinets shall be machine tool grade type MTW, UL approved, rated for 90 degrees C at dry locations, and be as manufactured by American, Carol Cable, or equal.
- C. Instrumentation Cable
1. Instrumentation cable shall be rated at 300 volts.
 2. Individual conductors shall be No. 18 AWG stranded, tinned copper, unless otherwise indicated. Insulation shall be color coded PVC with nylon overcoat: black-white for two-conductor cable and black-red-white for three-conductor cable.
 3. Instrumentation cables shall be composed of the individual conductors, an aluminum polyester foil shield, a No. 20 AWG stranded tinned copper drain wire, and a PVC outer jacket.
 4. Two conductor shielded cable shall be Belden Type 9318.
 5. Three conductor shielded cable shall be Belden Type 9366.
 6. Instrumentation cable shall not be larger size than what is specified.

201.03 CABLE TERMINATIONS

- A. Compression connectors shall be Burndy Hi Lug, Thomas & Betts Sta-Kon, or equal. Aluminum connectors will not be acceptable. Threaded connectors shall be split bolt type of high strength copper alloy. Pressure type, twist-on connectors will not be acceptable except for lighting circuits.
- B. Pre-insulated fork tongue lugs shall be Thomas & Betts, Burndy, or equal.
- C. General purpose insulating tape shall be Scott No. 33, Plymouth Slip-knot, or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or equal.
- D. Pre-printed self-sticking labels for coding all wiring shall be as manufactured by W.H. Brady, 3M, or equal.

SECTION 16123 - WIRE AND CABLE

PART 3 - EXECUTION

301.01 GENERAL

- A. The Contractor shall provide and terminate all power, control, and instrumentation conductors except where indicated.

301.02 INSTALLATION

- A. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.
- B. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.
- C. Instrumentation wire shall not be run in the same raceway with power and control wiring except where specifically indicated.
- D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

301.03 SPLICES AND TERMINATIONS

- A. General
 - 1. All wire taps and splices shall be properly taped and insulated according to their respective classes.
 - 2. Stranded conductors shall be terminated directly on equipment box lugs making sure that all conductor strands are confined within lug. Use forked-tongue lugs where equipment box lugs have not been provided.
 - 3. Excess control and instrumentation wire shall be properly taped and terminated as spares.
- B. Control Wire and Cable
 - 1. Control conductors shall be spliced or terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment.
 - 2. In junction boxes, motor control centers, and control panels, all control wire and spare wire shall be terminated to terminal strips.
- C. Instrumentation Wire and Cable

SECTION 16123 - WIRE AND CABLE

1. Shielded instrumentation cables shall be grounded at one end only, preferably the receiving end on a 4-20 mA system.

D. Power Wire and Cable

1. All 120/208-volt branch circuit conductors shall not be spliced.

301.04 CABLE IDENTIFICATION

- A. General: Wires and cables shall be identified for proper control of circuits and equipment and to reduce maintenance effort.

- B. Identification Numbers: The CONTRACTOR shall assign to each control and instrumentation wire and cable a unique identification number. Numbers shall be assigned to all conductors having common terminals and shall be shown on all as built drawings. Identification numbers shall appear within 3 inches of conductor terminals. Control shall be defined as any conductor used for alarm, annunciator, or signal purposes.

1. All 120/208-volt system feeder cables and branch circuit conductors shall be color coded as follows: Phase A-black, Phase B-red, Phase C-blue, and Neutral-white. The 480/277-volt system conductors shall be color coded as follows: Phase A-brown, Phase B-orange, Phase C-yellow, and Neutral-Gray. Color coding tape shall be used where colored insulation is not available. Branch circuit switch shall be yellow. Insulated ground wire shall be green, and neutral shall be gray. Color coding and phasing shall be consistent throughout the site. Bus bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.
2. General purpose AC control cables shall be pink. General purpose DC control cables shall be blue.
3. All spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
4. Terminal strips shall be identified by computer printable, cloth, self-sticking marker strips attached under the terminal strip.

301.05 TESTING

- A. All cables rated at 600 volts shall be tested for insulation resistance between phases and from each phase to a ground using a megohmmeter.
- B. All field testing shall be done after cables are installed in the raceways.

SECTION 16123 - WIRE AND CABLE

- C. Cables failing the tests shall be replaced with a new cable.
- D. Continuity Test: All control and instrumentation cables shall be tested for continuity, polarity, undesirable ground, and origination. Such tests shall be performed after installation and prior to placing cables in service.

- END OF SECTION -

2

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

101.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

101.02 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

101.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

201.01 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Stainless Steel Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use expansion anchors.
 - 4. Solid Masonry Walls: Use expansion anchors.
 - 5. Sheet Metal: Use sheet metal screws.
 - 6. Wood Elements: Use wood screws.

201.02 CHANNEL

- A. Description: Fiberglass.

SECTION 16190 - SUPPORTING DEVICES

PART 3 - EXECUTION

301.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Obtain permission from Engineer before drilling or cutting structural members.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

- END OF SECTION -

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

101.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.

101.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

101.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

PART 2 - PRODUCTS

201.01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
- C. Letter Size:
 - 1. Use 1/4 inch letters for identifying equipment.

PART 3 - EXECUTION

301.01 PREPARATION

- A. Degrease and clean surfaces to receive nameplates.

301.02 APPLICATION

- A. Install nameplate parallel to equipment lines.
- B. Secure nameplate to equipment front using screws.

- END OF SECTION -