



August 25, 2026

**CITY OF ROMA
ROMA, TEXAS
Wastewater Treatment Plant Improvements**

Addendum No. 1

Attention is called to the following modifications to the referenced Plans, Specification and Contract Documents for the above referenced project. The City of Roma (City) will receive sealed Proposals for Wastewater Treatment Plant Improvements at Roma City Hall, located at 201 W Convent Blvd., Roma, TX 78584, by 1:30 p.m., local time on **Wednesday, September 2, 2026**, at which time the sealed Proposals received will be publicly opened and read. We hereby modify the documents as follows:

CONTRACT DOCUMENTS:

1. **REMOVE** and **REPLACE** Bid Form attached to this Addendum. Updated to address minor clarifications on bid acceptance timeline.

SPECIFICATIONS:

1. Section 11075 "Mechanical Screen", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.
2. Section 11199 "Sludge Dewatering Belt Filter Press", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.
3. Section 11320 "Aerated Grit and Grease Removal Units", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.
4. Section 11345 "Ultraviolet Disinfection", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.
5. **DELETE** Section 11410 "Polymer System" from Project Manual.
6. Section 14551 "Screw Conveyors", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.
7. Section 15100 "Valves-Basic Requirements", **DELETE** the existing specification and **REPLACE** with the **PROPOSED** specification included in this addendum.

PLANS:

1. **REMOVE** and **REPLACE** Sheet 02D-01 with plan sheet attached to this Addendum. Updated to address minor clarifications.
2. **REMOVE** and **REPLACE** Sheet 02D-02 with plan sheet attached to this Addendum. Updated to address minor clarifications.
3. **REMOVE** and **REPLACE** Sheet 02D-03 with plan sheet attached to this Addendum. Updated to address minor clarifications.

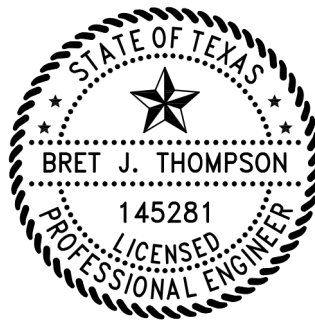
CLARIFICATIONS:

1. Section 11199 "Sludge Dewatering Belt Filter Press", the belt press manufacturer shall be able to use their systems recommended polymer system manufacturer.

This addendum consists of Ninety-one (91) pages and becomes a part of the referenced plans, specifications and contract documents and shall be acknowledged by the proposer and attached to the sealed proposal submitted.

Bret Thompson

By Bret Thompson P.E. #145281
Project Manager



8/25/2026

BID FORM

PROJECT IDENTIFICATION: City of Roma TWDB Project No. 73904 (CID 01) CWSRF Wastewater Treatment Plant Improvements

CONTRACT IDENTIFICATION AND NUMBER:

Wastewater Treatment Plant Improvements

Project Number 8235

THIS BID IS SUBMITTED TO:

City of Roma
201 W. Convent Blvd.
Roma, Texas 78584

- 1.01** The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform and furnish all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.
- 2.01** Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.
- 3.01** In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

- A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____

- B. Bidder certifies Bidder is qualified to do business in the state where the Project is located as required by laws, rules, and regulations or, if allowed by statute, covenants to obtain such qualification prior to contract award.
- C. The Bidder shall provide values for specific performance parameters for the equipment being bid. The Bidder understands and agrees that the values stated in this Section for the associated performance parameters will be compared to the performance standards required in the equipment specifications. Bidders understand and agree to guarantee the performance values stated herein for the equipment bid in accordance with the guidelines specified herein.
- D. Bidder understands and agrees that this PROPOSAL shall form the basis for an agreement with the OWNER. Therefore, the undersigned agrees to enter into an agreement to perform and furnish all Work as specified or indicated in these Specifications for the amount indicated in this Bid and in accordance with the other terms and conditions of these Contract Documents.
- E. Bidder accepts all of the terms and conditions of these Contract Documents including, without limitation, those dealing with the disposition of Bid security, required bonds, and the liquidated damages that may be imposed. This Bid shall remain subject to acceptance for a period of 120 days after the day of Bid opening. The Bidder shall sign and submit the Agreement with the bonds and other required documents within 10 days after the receipt of Notice of Award from the OWNER.
- F. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

ADDENDUM NO. 1

- G. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- 4.01** Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
- 5.01** Bidder will complete the Work in accordance with the Contract Documents for the prices bid in the following Lump Sum Bid Schedule.
- 6.01** Bidder agrees to accept Contract Times as set forth in the Agreement.
- 6.02** Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times specified.
- 7.01** The following documents are attached to and made a condition of this Bid:
- A. Required Bid security;
 - B. Non-Collusion Affidavit of Prime Bidder;
 - C. Debarment / Suspension Certification.
- 8.01** The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.
- 9.01** NOTE: The prices must be shown in words and figures in the proposal and in the event of discrepancy, the words shall control.

**BID PROPOSAL
FOR LABOR, MATERIAL, EQUIPMENT AND INCIDENTALS:**

ITEM NO	ESTIMATED QUANTITY	DESCRIPTION AND UNIT PRICE (Price to be written in words)	UNIT PRICE	TOTAL PRICE
1	1 LS	Mobilization, bonds and insurance (not to exceed 3 percent of bid) for _____ Dollars and _____ Cents per lump sum.		\$ _____
2	1 LS	Prepare, Obtain applicable approvals(s) for, and Implement Stormwater Pollution Prevention Plan and related work as specified in Section 01564 for _____ Dollars and _____ Cents per lump sum.		\$ _____
3	1 LS	Clear and grub and complete site preparation as specified for _____ Dollars and _____ Cents per lump sum.		\$ _____
4	120 LF	Prepare, Obtain applicable approval(s) for, and Implement Trench and Excavation Safety Plan and related work as specified for _____ Dollars and _____ Cents per linear foot.	\$ _____ /LF	\$ _____
5	1 LS	Furnish and install new Coarse Mechanical Screen and Compactor per Specification 11075, and all related appurtenances, as shown and as specified, complete and in place, for _____ Dollars and _____ Cents per lump sum.		\$ _____

ADDENDUM NO. 1

ITEM NO	ESTIMATED QUANTITY	DESCRIPTION AND UNIT PRICE (Price to be written in words)	UNIT PRICE	TOTAL PRICE
6	1 LS	Furnish and install new Vertical Ultraviolet Disinfection System per Specification 11345, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
7	1 LS	Furnish and install new Belt Filter Press, Polymer System and Conveyor per Specification 11199, 11410, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
8	1 LS	Furnish new Progressive Cavity Pump per Specification 11350, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
9	1 LS	Removal of Grit Removal System equipment, piping, metals and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
10	1 LS	Provide programming of SCADA Improvements (Refer to Appendix A), and all related appurtenances, as shown and as specified, complete and in place, for <u>six hundred eighty-nine thousand nine hundred and eighty five</u> _____ Dollars and _____ No _____ Cents per lump sum.		\$ 689,985.00
11	1 LS	Furnish and install Electrical Improvements shown in the contract documents, all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
12	1 LS	Furnish and install listed equipment above and remaining improvements shown in the contract documents, all related appurtenances, as shown and as specified, complete and in place, for _____ _____ Dollars and _____ Cents per lump sum.		\$ _____
13	1 LS	Allowance for work directed in writing by the City for legitimate project related issues at the direct cost for such work (NOTE: Contractor's cost for bonds, insurance, profits, etc. associated with this allowance shall be included in the lump sum for Bid Item 11 above), for <u>one hundred thousand</u> _____ Dollars and _____ zero _____ Cents per lump sum.		\$ 100,000.00
TOTAL BASE BID (Items 1 thru 13)			\$ _____	

ALTERNATIVE BID PROPOSAL – CIRCLE ADDITIVE OR DEDUCTIVE

ITEM No.	EST QTY	DESCRIPTION AND UNIT PRICE (Price to be written in words)	Additive or Deductive	TOTAL AMOUNT
A1	1 LS	Replace Line Item 6: Furnish and install new Inclined Ultraviolet Disinfection System per Specification 11345, all channel modifications, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ _____ Dollars and _____ Cents per lump sum.	Additive or Deductive	\$ _____
A2	1 LS	Replace Line Item 6: Furnish and install new Horizontal Ultraviolet Disinfection System per Specification 11345, channel modifications, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ _____ Dollars and _____ Cents per lump sum.	Additive or Deductive	\$ _____
A3	1 LS	Replace Line Item 9: Furnish and install new Aerated Grit and Grease Removal Unit per Specification 11320, plans, electrical, SCADA, and all related appurtenances, as shown and as specified, complete and in place, for _____ _____ _____ Dollars and _____ Cents per lump sum.	Additive or Deductive	\$ _____

SUBMITTED on _____, 2026.

State Contractor License No. _____. (If applicable)

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual=s signature)

Doing business as: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email Address: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email address: _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Attest _____
(Signature of Corporate Secretary)

(CORPORATE SEAL)

Business address: _____

Phone No.: _____ FAX No.: _____

Email address: _____

Date of Qualification to do business is _____.

A Joint Venture

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email address: _____

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Phone and FAX Number, and Address for receipt of official communications:

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

SECTION 11075

MECHANICAL SCREENS

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Fully automatic, rake-cleaned, rear-discharge, in-channel, influent Screen, slotted opening type.
2. Control panels and instrumentation.

1.2 SYSTEM DESCRIPTION:

- A. Rehabilitate one (1) mechanical automatic bar screen and washer/compactor at the City of Roma Wastewater Treatment Facility. The screen shall be rehabilitated in a concrete channel. The screen shall accomplish screening by means of continuous slotted openings.
- B. The equipment shall be of latest design and shall be fabricated of materials and in a fashion which will fully perform the functions described below. The screen shall have 1/4-inch screen openings.

General equipment requirements shall be met by all suppliers. The manufacturer shall be responsible for coordinating the components and connections of the rake-cleaning screen, transport spiral or screw conveyor, and all discharge chutes so that screened material is delivered to the container without spillage or water leakage.

- C. The equipment provided under this section shall be furnished complete and operable with all necessary controls, safety devices, interlocking devices, anchors, supports, motor and drive assemblies, housings, base plates, frames, discharge chutes and all appurtenances required to make the system operative in the automatic mode. The compactors shall be controlled and operated in conjunction with the appropriate screen unit.
- D. The equipment provided under this section shall be rehabilitated to fully comply with the following:
 1. One (1) Rake-Cleaned Mechanical Bar Screen
 2. One (1) Washer / compactors.
- E. Equipment Manufacturer shall be responsible to coordinate the testing and installation of the equipment and shall be responsible for the adequacy and compatibility of the equipment and controls.
- F. This equipment has been pre-selected by the OWNER for installation by the CONTRACTOR, as described in this Section.

1.3 SUBMITTALS:

A. The following submittals are required, at a minimum:

1. Shop drawings specific to project and applicable product data bound neatly in a single package. The following information shall be included as a minimum:
 - a. Manufacturer and model number of equipment.
 - b. Layout drawings including all proposed system components with dimensions, loads, clearances required and sized indicated, and total weights of the product, location and size of each connection, method of field assembly, as well as coatings for each item furnished.
 - c. Detailed specifications and data describing the materials of construction.
 - d. Complete wiring diagrams for power, timers, signal and control, and data on controls to be furnished, including terminals and numbers.
 - e. Complete information on electric motors furnished including make and type of motor, brake horsepower and locked rotor current at full voltage.
 - f. Specific design parameters for the screens, including flow rates and head losses for clean and partially blinded conditions.
 - g. Layout, sizes, types and materials for anchor bolts to be furnished.
 - h. Color selection charts for coatings and descriptive literature on surface preparation and shop coating.
 - i. Equipment weights and lifting points.
2. Start-up and Field-Testing procedures and schedule.
3. Information Submittals:
 - a. Manufacturer's Certification of Compliance.
 - b. Special shipping, storage and protection, and handling instructions.
 - c. Manufacturer's instructions for installation.
 - d. Manufacturer's Certificate of Proper Installation.

- e. Manufacturer and manufacturer's representative qualifications.
 - f. Location of nearest stocking distributor of spare parts.
 - g. Suggested spare parts list to maintain the equipment in service for a period of one year. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current pricing information.
 - h. Welding certificates.
 - i. Factory Test Reports: Based on evaluation of comprehensive tests performed by manufacturer.
 - j. Field quality-control reports.
 - k. Warranty: Sample of special warranty.
- 4. Location of nearest stocking distributor of spare parts.
 - 5. Documentation demonstrating factor finish is equivalent to finish system specified in this Section.
 - 6. Coordination Drawings: Screening system, consisting of a ¼-inch screen, screenings conveyor, control panels and instrumentation, and other details, drawn to scale, on which all components of the screening system are shown and coordinated with each other.
 - 7. Complete operation and maintenance data for all equipment and controls.
 - 8. Startup and test schedule with test procedures.
 - 9. Equipment installation report with field test data and test records.
 - 10. Warranties and service agreements.
 - 11. All deviations from contract documents shall be clearly identified and approved in writing by the ENGINEER.
 - 12. Any other information necessary for the ENGINEER to determine compliance with the specifications.

1.4 QUALITY ASSURANCE:

- A. All equipment of each type specified in this section shall be supplied by a single manufacturer.
- B. Manufacturer shall maintain a complete stock of spare parts commonly needed for the equipment specified at a location within the State of Texas or shall furnish spare parts within forty-eight (48) hours of request.

- C. Each major equipment item shall have a stainless-steel manufacturer's nameplate securely affixed in a conspicuous place on the equipment showing the ratings, serial number, model number, manufacturer and other pertinent nameplate data.
- D. Manufacturer Qualifications: No equipment will be supplied by any manufacturer not regularly engaged in the manufacturing and production of mechanically cleaned bar screen equipment for a minimum of five (5) years. The manufacturer must have installed and had in satisfactory use in this application a minimum of ten (10) mechanically cleaned bar screen installations in the United States. Any manufacturer that does not meet these qualifications must provide a five (5) year full parts and service warranty. All manufacturers must provide a reference list with contact names and phone numbers to verify in-channel perforated plate traveling screen installations.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Manufacturer's installation report is required prior to final acceptance.
- G. Excessive vibration of equipment while operating shall be cause for rejection.
- H. The screen shall be factory assembled and shipped to the site as a complete unit. Complete factory performance assurance testing shall be required prior to shipment of screen.
- I. Stainless steel construction:
 - 1. All structural stainless-steel components shall conform to the requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" published by the American Institute of Steel Construction.
 - 2. The equipment manufacturer's shop welds, welding procedures, welders and welding operators shall be qualified and certified in accordance with the requirements of the latest edition of ANSI/AWS D1.1 "Structural Welding Code – Steel" published by the American Welding Society.
 - 3. Fabricate all parts and assemblies from sheets and plates of 316 stainless steel with a 2D finish conforming to AISI 316 and ASTM A666, unless noted otherwise. Fabricate all rolled or extruded shapes to conform to ASTM A276. Fabricate all tubular products and fittings to conform to ASTM A269, A351 and A403.
 - 4. Do all welding in the factory using shielded arc, inert gas, MIG or TIG method. Add filler wire to all welds to provide for a cross section and weld metal equal to or greater than the parent metal. Fully penetrate butt welds to the interior surface and provide gas shielding to interior and exterior of the joint.

5. Field welding of stainless steel will not be permitted.
6. Bolts, nuts, and washers shall be AISI 316 stainless steel furnished in accordance with ASTM A193.
- J. If the equipment being offered differs from these specifications, all revisions in the design and construction of the structure, piping, appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the OWNER.

1.5 REFERENCES:

- A. References: Following is a list of standards, which might be referenced in this Section:
 1. American Bearing Manufacturer's Association (ABMA):
 - a. 9- Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11- Load Ratings and Fatigue Life for Roller Bearings.
 2. American Institute of Steel Construction (AISC)
 3. American Iron and Steel Institute (AISI)
 4. American Society of Mechanical Engineers (ASME)
 5. ASTM International (ASTM):
 - a. A48 – Specification for Gray Iron Castings
 - b. A36 – Specification for Carbon Steel Plate
 - c. A572 – Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
 6. National Electrical Manufacturer's Association (NEMA): MG-1, Motors and Generators.
 7. National Fire Protection Association (NFPA): NFPA 70, National Electric Code.
 8. American Iron and Steel Institute (AISI)
 9. American Gear Manufacturers Association (AGMA)
 10. American National Standards Institute (ANSI)
 11. American Welding Society (AWS)

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Delivery, storage, and handling shall be in full accordance with manufacturer's instructions. Motors, VFD, Controls and other electrical components shall be stored in a weatherproof enclosure.

1.7 WARRANTY:

A. Special Equipment Warranty.

1. The equipment manufacturers shall jointly warrant to the OWNER and to the CONTRACTOR that all equipment, including all components of the complete assembly furnished by it hereunder, complies in all respects with the design and specifications of these Documents and contains no defects of material or workmanship.
2. In the event of failure of any part or parts of the equipment during the warranty period due to defects of design, materials, or workmanship; the CONTRACTOR shall replace affected part or parts shall be replaced promptly upon notification by the OWNER. All replacement parts shall be furnished, delivered, and installed at the expense of the equipment manufacturer.
3. The warranty period shall be interpreted as the 24-month period following substantial completion of the project and shall be exclusive of the time of use of the equipment in installation, testing, adjusting, etc., during the construction period, or of the time in storage, after delivery and prior to installation.
4. If the equipment does not meet the requirements of the Specifications, the equipment manufacturer shall correct or service the equipment at no additional cost to meet the specified requirements, where any such deficiencies are the responsibility of the equipment manufacturer. In the event the equipment is unable to meet the specified requirements within the warranty period, the equipment manufacturer shall refund an amount equal to the purchase price of new equipment, which will meet the specific requirements. The amount of the refund shall not exceed the purchase price of the equipment to be replaced.
5. The CONTRACTOR shall be responsible for ensuring that the manufacturer's special equipment warranty is not voided by acceptance of the terms of purchase agreements between the CONTRACTOR and the MANUFACTURER. In all events, the CONTRACTOR will be held ultimately responsible for enforcement of the requirements of this warranty at his expense.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION:

A. General Requirements:

1. All equipment including electrical panels, instrumentation and controls specified herein shall be specifically designed for wastewater treatment service and the environment encountered in this installation. The environment will be moist and corrosive; exhibiting hydrogen sulfide and other corrosive gases encountered in municipal

wastewater treatment plants. All equipment will be located outdoors and shall be designed and capable of operation at ambient temperatures of 20°F to 120°F.

2. All equipment shall be designed and capable of both continuous or intermittent operation with channel water depth between 4 and 50 inches and all levels in between. The complete mechanical screen device including screen frame, plates, and all moving parts, shall be able to withstand the loading from a 36-inch water differential from upstream to downstream.
3. All equipment, supports, anchors and fasteners shall be of adequate strength to withstand loads associated with starting, turbulence, thrusts from liquid movement, thermal expansion and contraction and other loads encountered under normal operating conditions.
4. The equipment, sizes, materials, and arrangements described in this specification section shall be considered minimum limits of acceptability. The equipment manufacturer shall be responsible for design, arrangement, and performance of all equipment supplied under this section. Arrangements other than those shown on plans shall be subject to ENGINEER's approval.
5. All components of the screen (except drive portion) shall be Type 316 stainless steel or non-metallic for corrosion resistance. All fasteners and equipment hardware shall be Type 316 stainless steel.
6. The screen shall provide positive screening during peak flows for a total peak flow capacity of 7.5 MGD. The structural integrity of the screening equipment shall be maintained throughout this period without causing the channel to overflow or the screening equipment to fail or cease operation.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS:

A. General:

1. Number of screens: One (1)
2. Tag Number: BS-101
3. Number of washer/compactors: One (1)
4. Tag Numbers: WC-101
5. Location: City of Roma

B. Dimensions of Screen:

1. Channel width: 3'-0"
2. Top of Structure Elevation: Approximately 204.00 ft-msl.
3. Channel Bottom Elevation: Approximately 198.07 ft-msl.
4. Bar Screen incline: 30° (From Vertical)
5. Screen opening size: 1/4-inch (6 mm).

C. Design Capacity per Screen:

1. Design flow: 2.0 MGD.
2. Peak flow: 7.5 MGD.
3. Maximum loss of head through screen at maximum flow: 12 inches.
4. Compactor minimum intake capacity: 5 ft³/ hour.

2.3 SCREEN EQUIPMENT:

A. General:

1. The equipment furnished shall positively clean and remove debris from incoming sewage by means of a fully automatic rake-cleaned bar screen. The screen shall be capable of presenting a clear filtration surface to the oncoming liquid stream at all times during continuous operation.
2. The screen mechanism shall be designed so that there are no chains, sprockets, bearings, shafting, or other moving parts permanently below the maximum water level. The screen design shall ensure that all maintenance to the mechanism can be accomplished at the operating floor level.
3. The screen mechanism shall be capable of screening raw sewage and discharging the screenings into a conveyor. The conveyor will then transport the screenings to a common dumpster.
4. All necessary lubrication for operation and maintenance of the screen shall be possible at the operator floor level. Each screen shall have single or dual point lubrication fittings located above the pivoted out of the flow of service.
5. The screen drive unit shall have an electrical overload device that senses motor current draw.
6. The screen arrangement shall be such that the screenings are removed automatically by gravity or with the cleaning action of a rake. As the scraper rotates around the top of the screening discharge assembly, the cleaning mechanism shall positively transfer the screenings into the conveyor.
7. All moving wetted parts, all wetted parts on which the moving parts ride, and all screening surface components under guiding, bearing, or driving loads including but not limited to the shafts, side plates, links, and guide rails shall be fully corrosion-resistant and shall be made of 316 stainless steel except as noted herein.
8. All required piping supports shall be Type 316 stainless steel and shall have Type 316 stainless steel hardware.

B. Frame:

1. Frame width and height will be customized to fit the newly constructed channel width, depth and desired discharge height. Side channel closeouts will be a continuous stainless steel.
2. Frame shall be constructed of Type 316 stainless steel. The frame steel shall have a minimum thickness of 3/16".
3. Manufacturer shall submit a finite element analysis (FEA) demonstrating the maximum deflection and stress of the frame. Loading on the frame shall include all forces including the static weight, hydrostatic and hydraulic forces. Forces shall be considered when the water surface elevation is 36 inches on the upstream side of the screen and 0 feet on the downstream side.

C. Mechanically Cleaned Bar Screen:

1. Bar Screen: The bar screen bars shall be of 316L stainless steel at a minimum, with a minimum of 0.25" x 0.75" x 0.13" tear shaped bar and shall be spaced to maintain a 0.25 inch clear opening. The bar screen anchors and fasteners shall be of stainless steel. The bar screen shall be mounted at 30 degrees from vertical. The mechanically cleaned bar screen unit shall be shipped as a complete assembly or in sections dependent upon site conditions.
2. Scrapers: Scrapers shall be of UV Stable UHMW and stainless steel. Scrapers shall be easily modified by the customer if necessary to suit future changes in debris conditions. At least one scraper every 20.8 inches shall fully penetrate the bar screen, cleaning all three sides of the bars in openings greater than 0.25 inches.
3. Dead Plate: Dead plate shall be minimum 1/4" thick, 316SS. Dead plate shall span the entire width of the screen and transition from bar screen to discharge point.
4. Discharge Chute: The discharge chute shall be 316 stainless steel, with a maximum thickness of 11 gauge and shall be bolted to the deadplate per manufacturer's recommendation. Discharge chute shall allow debris to be transferred from discharge point into the debris container (container by others).

D. Drive Unit:

1. Explosion Proof Drive Unit: Each mechanically cleaned bar screen unit shall operate independently and will have its own drive unit and driven components. The gearbox shall not be vented to outside atmosphere and shall be grease lubricated and sealed for life with no maintenance. The gearbox shall be right angle type and shall incorporate hypoid bevel gearing with a total ratio of 240:1 once coupled with the reducer. The gear reducer output shaft speed shall be approximately 1.82 rpm – 7.29 rpm. The Motor shall be a 1/4 HP,

3/60/240/480 Volt, inverter duty. Standard motor shall be a Marathon motor assembled with a Sumitomo reducer/gearbox assembly or approved equal. Motor shall have N/O thermostat to be field wired to corresponding terminals in control panel for redundant (ambient) overload protection but shall primarily rely on the VFD parameters for overload protection.

2. The motor shall be mounted to the gear reducer by utilizing a quill, "C" Face. It shall be AC induction type, inverter-duty, 1/4 hp, 1750 RPMs base speed, 3 phase, 240/480 volt and have the following characteristics: It shall be explosion proof rated for Class I, Groups C & D, Class II, Groups F & G environments and for use with an inverter. It shall have a 4/1 speed range, EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be at least 1.0 with 1600V, Class F insulation rated for temperatures up to 40 degrees C.
 - a. The motor shall be controlled by an AC Tech, vector type inverter or other per manufacturer's recommendation. Motor shall also have N/O thermostat to be field wired to corresponding terminals in control panel for redundant (ambient) overload protection but shall primarily rely on the VFD parameters for overload protection. The drive unit shall be coated in strict accordance with the paint manufacturer's specification. Surface Preparation shall be done in accordance with SSPC-SP-10 Near White. The three-part coating system shall be manufactured by Tnemec as follows: Prime Coat Series 90-97 Tnemec Zinc at 2.5-3.5 mils DFT, Intermediate Coat Series 27 F.C. Epoxy at 3.0-5.0 mils DFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils DFT. Standard color is 11SF Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.
 - b. Chain Slides: Chain slides to support the upstream link system shall be provided in situations where the unit is longer than 15 feet and will be 20-30 degrees from vertical, or where there is high water velocity or other special site conditions as recommended by the manufacturer.
 - c. Site Fabrication: the screen framework shall be 316 stainless steel bent plate, with a minimum thickness of 0.25" and horizontal members shall be of 316 stainless steel tube or pipe. Support members and frame shall adequately support the bar screen per engineering calculations and site specific requirements.
 - d. Closeouts: Closeouts shall be 316 stainless steel and assure that there is no space wider than the opening between the bars, to prevent passage of larger solids, than allowed through the screen. Closeouts shall be incorporated into the side fabrication framework and return guides as determined by the manufacturer.

- e. Return Guides: Return guides shall be 316 stainless steel and shall be incorporated in the side fabrication and closeouts framework as determined by the manufacturer. Lower return guides shall assure proper alignment of scrapers as they enter the bar screen.
- f. Channel Bottom Plate: 316 stainless steel channel bottom plate with UV Stable UHMW strips shall be utilized as recommended by the manufacturer to fully engage scrapers in the bar screen at the bottom of the channel. The channel bottom plate may require anchoring dependent upon site configuration and as recommended by the manufacturer.
- g. Stripper Assembly: A debris blade assembly shall be installed to assist in removing debris from the scrapers on the mechanically cleaned bar screen as recommended by the manufacturer. The debris blade assembly shall incorporate a return guide proportionate to the speed of the traveling scrapers that allows for a better angle relationship to the scraper for more effective debris removal and zero impact which allows for longer component life. Stainless Steel material shall be utilized to deliver a quiet and easy transition back into position after debris is removed from UHMW passing scraper.

2.4 WASHER/COMPACTORS:

A. General:

- 1. The screw-type washer/compactor shall be a complete assembly consisting of a transition chute between the screen and the washer/compactor, a screenings feed hopper, rotating screw with preliminary and main compaction zones, electrical geared motor, discharge conveyance pipe, and water catchment tray with drain pipe. The screening equipment shall produce dewatered screenings capable of exceeding the Environmental Protection Agency Paint Filter Test as described in method 9095 of Environmental Protection Agency publication SW-486. The screen manufacturer shall provide test data from three (3) separate tests that verify compliance with the Environmental Protection Agency Paint Filter Test.

B. Principle of Operation:

- 1. The screenings shall fall into the screen feed hopper by gravity and transported on a screw conveyor to the washer/compactor. In the washer/compactor, the screenings will be washed to remove fecal matter and dewatered to reduce the water content of the screenings by using a dual auger providing positive displacement action. After the compacting and dewatering process, the screenings shall be conveyed through the discharge conveyance pipe and dropped into a common dumpster. Water from the dewatering process shall drain through conical drainage hole(s) in the bottom of the compaction

chamber. Drainage water shall be piped for gravity drainage back into the raw sewage influent channel, as shown on the drawings.

C. Materials of Construction:

1. The washer/compactor housing shall be made of Type 304 stainless steel at a minimum.
2. The screw shall be made of Type 304 stainless steel.
3. The conveyance tube, washer/compactor body, feed hopper and all flanges shall be of AISI Type 304 stainless steel.
4. The reject water trough shall be made of Type 304 stainless steel.
5. Drive unit shall be of manufacturer's standard coated materials.

D. Support Plates:

1. The support plates shall be integral to the main body of the unit and shall be made of Type 304 stainless steel.

E. Drive Unit:

1. Each Washer Compactor unit shall operate independently and will have its own drive unit and driven components. The gearbox shall not be vented to the outside atmosphere.
2. The gearbox shall be grease lubricated and designed for 5 years (or 20,000 hours of operation) between recommended clean and re-grease services. The gearbox shall be right angle type and shall incorporate cycloidal and spiral bevel gearing with a total ratio of 809:1. The gear reducer output shaft speed shall be 0.5 RPM minimum – 2.2 RPM maximum and controlled by an AC Tech (or approved equal), vector type inverter or greater service factor based on unit torque requirements. It shall be shaft mounted utilizing the keyless Taper-Grip® bushing.
3. The motor shall be mounted to the gear reducer by utilizing a quill, C-Face mounting style. The gearmotor shall be AC induction type, ¾ hp, 3/60/230/460 volt, explosion proof, inverter duty model.

F. Wash Water Connections:

1. The washer/compactor shall be provided with one connection for the wash water supply with a minimum of one (1) washing injection points. Nozzles shall be stainless steel non-plugging suitable for use with treated wastewater. Spray wash water piping shall be Schedule 40 stainless steel. All injection point/s shall be equipped with ¼ turn stainless steel ball valves to regulate the water volume on the different washing points (as required). The injectors shall receive water from the existing non-potable water system. Wash water connections shall

be sized and positioned by the manufacturer. Maximum water consumption shall be 5 gpm with a normal operating condition consuming less than 3 gpm. Allowable water pressure shall range from 40 to 60 psi at all times.

G. Wash Water Supply:

1. The main wash water supply line to the washer/compactor shall be provided through a water solenoid valve (supplied by the screen manufacturer), mounted horizontally, with a maximum operating pressure of 60 psi. The solenoid valve shall be interlocked with the starter for the washer/compactor drive motor. The valve shall be energized to open during drive motor running and close when the motor stops. Solenoid valve shall be rated NEMA 7.

H. Dimensions:

1. The washer/compactors shall have dimensions not greater than the area shown on the plans with angle and dimensions per manufacturer recommendations.

I. Performance Capabilities:

1. The washer/compactor shall be capable of handling wet screenings with a minimum feed concentration of 8-10% dry solids and compact the screenings to achieve a minimum of 50% reduction in volume and not less than an average of 50% dry weight solids.

J. Freeze Protection:

1. Furnish heat tracing and insulation to allow operation of the unit at and below freezing temperatures.

K. Inlet Chute:

1. The washer/compactor manufacturer shall furnish an inlet chute for each compactor. The hopper shall receive screenings from the screen and shall be flanged bolted to the top of the washer/compactor inlet chamber. The chute shall be manufactured of Type 304 stainless steel, having four (4) sides with each side to assist the solids entering the pressing zone.

L. Solids Discharge Piping:

1. Compacted screenings shall discharge through a Type 304 stainless steel discharge conveyance pipe. The conveyance pipe shall be of sufficient length and slope to discharge the washed and compacted screenings into a common dumpster. The discharge piping shall be a minimum of 11 gauge thick, type 304 stainless steel. A 0.5-inch NPT half coupling with pipe plugs shall be provided at increments of max 72 lineal inches of piping or less, to allow the addition of water to re-wet and lubricate solids if required. The entire assembly shall be

designed to allow proper compaction, transport of screenings, field erection, ease of maintenance, disassembly and clean-out if required. Individual sections and additional elbows not welded shall have a flange connection on each end. The diameter of the inlet end of the pipe shall be a minimum of 10 inches with a stepless increase in diameter to a minimum of 15 inches at the screening discharge end.

2.5 ANCHORAGE AND FASTENERS:

- A. Equipment manufacturer shall determine sizes and furnish anchor bolts of sufficient size and strength to securely anchor each item of equipment. All non-embedded anchors shall be capsule or epoxy Type 316 stainless steel. Expansion type anchors are not acceptable. The CONTRACTOR shall set the bolts in accordance with manufacturer recommendations.

2.6 ELECTRICAL DEVICES AND CONTROLS:

- A. All controls, VFDs and motor starters shall be furnished in one (1) control panels, and all equipment and devices shall be factory wired. Panels shall be freestanding and conform to the requirements of Section 11009 with regard to construction, wiring, switches, lights, and other devices that require operator interface.
- B. External Interfaces:
 - 1. Controls: Standard Features- Enhanced VFD Package
 - a. For use with 3PH/480 V incoming power supplies
 - b. Variable frequency drive (also provides torque overload protection)
 - c. 30" W X 24" H X 10" D (or larger as required) NEMA 4X 316SS enclosure with continuous hinge, exterior, lockable door
 - d. HOA Selector Switch with Off Delay Timer for use in "Auto" mode
 - e. Dual-control cycle timer for use in "Auto" mode
 - f. Reversing functionality and variable motor speed
 - g. Main Control Breaker with thru-door operator
 - h. Elapsed Time Meter
 - i. E-stop on outside of enclosure
 - j. Push-To-Test-Pilot Lights, LED type.
 - k. Pilot lights for "Power On", "Forward", "Jog Reverse", "Motor Overtemp" and "VFD Fault"

- l. Accepts digital inputs from remote Forward and Jog Reverse stations
 - m. Accepts digital inputs from remote E-Stop station
 - n. Accepts digital input for remote "Start/Stop" in "Auto" mode
 - o. Includes terminal input for motor thermostat
 - p. Digital outputs for "VFD Fault", "Motor Overtemp", "Rim" and "In Auto" mode status monitoring
 - i. Custom red/white phenolic label for equipment I.D. number
 - 2. Design electrical/control power panel to accept incoming power supply. Control panel power shall be 1PH/120VAC and shall include a step-down transformer to achieve 120V.
 - 3. All wiring between remote devices will be in accordance with Division 16 and the system supplier's shop drawings. Final electrical connections to devices provided in this section and all interface connections with the instrumentation and control system will be in accordance with Division 16.
 - 4. All interface signals shall be wired to an interface terminal board in the control panel. All analog signals shall be 4 to 20 mA dc signals suitable for driving into 600 ohms. Discrete (two-state) signals shall be contact closures rated for 5 amps continuous at 115 volts ac.
- C. Enclosure shall be equipped with a three-point lockable door latch or approved equivalent. All controls necessary for the fully automatic operation of the filter screen shall be provided. A minimum of the following shall be provided for the panel, in addition to the requirements noted in Section B above:
 - 1. Solid state programmable repeat timer and differential liquid level activated switch.
 - 2. Single source circuit breaker power disconnect switch.
 - 3. Alarm silence/reset push button.
 - 4. Provide MCP type circuit breakers for the screen. Motor circuit protectors shall contain a self-test "trip selector" permitting manual simulation of the over current tripping device. The protector shall be quick-make, quick-break and trip free.
 - 5. Equipment Off indicator light.

6. Screen operation shall be controlled by the water level differential as measured in front of and behind the screen. The system shall include a Milltronics Multi-Ranger with two ultrasonic transducers or approved equivalent, to sense differential level across the screen. The screen shall operate when the high head loss level is reached and shall continue operating until the head loss is reduced to less than 6 inches.
 - a. The screen shall be capable of starting automatically and run continuously when temperatures are below 34°F and resume normal operation when temperatures rise above 34°F.
 7. Compactor operation shall be controlled automatically by a counter of the screen revolutions. The counter shall be field adjustable. Once operation is initiated, the conveyor shall continue to operate for a predetermined period to complete the cycle.
 8. Panel heater with adjustable thermostat.
 9. Audible alarm malfunction, over current, and high-water level.
 10. Provide contacts for remote monitoring of filter screen run status and conveyor run, over current, and malfunction.
 11. Elapsed time meters for equipment.
 12. Provide fused control power transformer for control voltage of 120 VAC.
 13. System shall operate at 120 VAC 1-phase 60 Hz.
 14. Provide a screen electronic torque (current) overload relay and motor starter overload trip for automatic shutdown with manual reset and red alarm light indication. Alarm light indicator shall be connected to audible alarm.
 15. Interposing relays, and safety controls and devices as required.
 16. Circuit for heat tracing.
- D. Provide capability to operate screen on liquid level control signal, timed, or continuous basis.
- E. These lists are not intended to completely depict all of the functional requirements of the control system provided under this Section. The system supplier shall provide all additional instrumentation and controls necessary to produce a safe and operable system. The specific control system proposed shall be subject to the approval of the ENGINEER.

2.7 FINISHES:

- A. All equipment items except stainless steel shall receive surface preparation, prime coating and finish coating in the factory. Finish coating colors shall be selected by the OWNER from finish color charts to be provided in shop drawing submittals. Furnish one gallon of touch up paint for installation CONTRACTOR to apply.
- B. All stainless-steel surfaces shall be cleaned and welds shall be brushed with Type 316 stainless steel brushes.
- C. Motors and hydraulic units shall have manufacturer's finish.
- D. Machine, polished, and non-ferrous surfaces shall be coated with corrosion prevention compound.

2.8 TOOLS, SPARE PARTS, AND MAINTENANCE MATERIALS:

- A. The EQUIPMENT MANUFACTURER shall supply one (1) set of spare parts for all components exposed to operational wear during normal equipment service.
- B. Spare parts shall include, but not be limited to (for the equipment supplied):
 - 1. Provide a minimum of one (1) Snap Ring Tool used to install the retaining rings. A minimum of one (1) standard spare parts package shall be provided which includes:
 - a. Drive Clevis Pin (1)
 - b. Snap/Retaining Rings (10)
 - c. Link Clevis Pin (4)
 - d. Scraper Bolts (4)
 - e. Scraper Nuts (4)
 - f. Never Seez, 3 oz. tube (1)
 - 2. Spare parts provided shall include:
 - a. Motor with gearbox
 - b. Two (2) replacement scrapers
 - c. Two (2) each FlexLink castings, with and without mounting
 - d. Eight (8) drive clevis pins
 - e. Four (4) link clevis pins
 - f. Ten (10) retaining rings
 - g. Four (4) scraper bolts and nuts each
 - 3. Any special tools required for maintenance of equipment supplied.
 - 4. Other parts recommended by the manufacturer as typically needed in the first two years of operation.

- C. The EQUIPMENT MANUFACTURER shall indicate and verify types, brands, and quantities of initial lubricants, oil, grease, etc. necessary to startup equipment. CONTRACTOR shall provide and install the recommended lubricants.
- D. Spare parts shall be packed in sturdy containers with clear, indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the project. Each part shall be labeled with part numbers which correspond to the O&M Manuals.

2.9 ACCEPTABLE MANUFACTURERS:

- A. The screens shall be provided by a single manufacturer as listed below for the type of screening equipment supplied:
 - 1. Duperon.
 - 2. Huber.
 - 3. Headworks International.
 - 4. Vulcan.
 - 5. Parksons.
 - 6. Engineer approved equal.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. The screening equipment shall be installed in accordance with the system manufacturer's recommendations as approved by the ENGINEER.

3.2 FIELD QUALITY CONTROL:

- A. Retain a qualified representative of the manufacturer to perform the following services:
 - 1. Oversee installation of the coarse screening equipment specified herein.
 - 2. Inspect the completed installation and note deficiencies.
 - 3. Be present and assist the CONTRACTOR during start-up, adjusting, and site testing of completed installation.
 - 4. Furnish test forms and procedures for field testing.
 - 5. Instruct OWNER's personnel in the operations and maintenance of the equipment with minimum services as follows.
 - a. Installation assistance: As required.
 - b. Owner personnel instruction, classroom and jobsite: 4 hrs.
 - c. Plant startup: 8 hrs.

- d. Coordinate training and plant start-up services with Owner's personnel.
 - e. Owner may videotape training.
 - f. Manufacturer shall make four additional trips to the job site, at 3 months, 6 months, 12 months and 24 months to inspect and provide troubleshooting support of the equipment.
- 6. Prepare manufacturer's installation report and submit within 30 days after completion of field testing. Include the following information:
 - a. Field testing results.
 - b. Descriptions of installation deficiencies not resolved to the manufacturer's satisfaction.
 - c. Description of problems or potential problems.
 - d. Names of OWNER personnel who attended operations and maintenance training sessions.
 - e. Record copy of materials used for training session including outlined summary of course.
- B. Field representatives shall have a minimum of five (5) years of experience with the operation of and training on this type of equipment.
 - 1. Factory personnel will be required to perform this service. Sales representatives will only be considered acceptable service technicians if they have three (3) years of experience with the operation of and training on this type of equipment from the manufacturer being supplied and have started up 10 units of a similar size and type from the manufacturer.
- C. Field Testing:
 - 1. Testing and startup schedule shall be submitted to ENGINEER for approval.
 - 2. Test Procedure: Verify proper operation.

END OF SECTION

SECTION 11199

SLUDGE DEWATERING BELT FILTER PRESS

PART 1 GENERAL

1.1 SCOPE:

- A. Contractor shall furnish one (1) sludge dewatering belt filter press as indicated on the drawings. The belt filter press shall be manufactured from AISI 304L stainless steel shapes. Fabrication and assembly shall be in conformance with these specifications and drawings.
- B. Contractor shall furnish a complete dewatering system including belt filter press, shaftless screw conveyor, drive motors, gear reducers, support legs, anchor bolts, polymer station, piping and wiring, controls, and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.
- C. Owner shall coordinate all details of the equipment with other related parts of the work. He shall verify that all structures, piping, wiring, and equipment components are compatible. Owner shall be responsible for all structural and other alterations required to accommodate equipment differing in dimensions or other characteristics from these specifications and drawings.
- D. Owner shall install the equipment according to instructions and recommendations of the equipment manufacturer.
- E. Power supply for main control panel is 460 Volts, 60 Hz, 3-phase. The polymer make down system needs a separate 120 VAC, 60 Hz, single phase power supply.

1.2 REFERENCES:

- A. American Society for Testing and Materials (ASTM) Publications:
 - 1. Section A322: Carbon and Alloy Steel Bar Specifications.
 - 2. Section A507-10: Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled.
- B. Anti-Friction Bearing Manufacturers Association (AFBMA) Publications:
 - 1. Standard 9-90 Load Ratings and Fatigue Life for Ball Bearings.
 - 2. Standard 11-90 Load Ratings and Fatigue Life for Roller Bearings.
- C. American Institute of Steel Construction (AISC) Publications.
- D. American Welding Society (AWS) Publications.
- E. American Structures Painting Council (ASPC) Publications.

1.3 SUBMITTALS:

The following information shall be submitted to the Engineer. In accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include the following:

- A. Product Data: Include the following:
 - 1. Descriptive literature, brochures, catalogs, cut-sheets and other detailed descriptive material of the equipment.
 - 2. Motor characteristics and performance information.
 - 3. Gear reducer data including service factor, efficiency, torque rating, and materials.
 - 4. Parts list including a list of recommended spare parts.
- B. Shop Drawings: Include the following:
 - 1. Manufacturer's installation drawings.
 - 2. Wiring and schematic diagrams.
- C. Operations and maintenance manual: See Section 01300.
- D. Detailed installation instructions, with clear step-by-step points on the correct mechanical and electrical installation procedures.
- E. Equipment weights and lifting points.
- F. Recommendations for short and long term storage.
- G. A copy of the manufacturer's warranty.
- H. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001.
- I. Failure to include all drawings applicable to the equipment specified in this section will result in rejection of the entire submittal with no further review.

1.4 QUALITY ASSURANCE:

- A. To ensure quality, conformance, and reliability with regard to the manufacturing and production of the machinery described in this section, the equipment manufacturer shall meet the requirements listed in this section.
- B. Manufacturer shall have established an ISO 9001 certified quality management system.

- C. All stainless steel components and structures shall be submersed in a chemical bath to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the chemical bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer.
- D. Belt Filter Press shall be manufacturer's standard product and only be modified as necessary to comply with the drawings, specifications, and specified service conditions.
- E. All welding is performed in accordance with American Welding Society (AWS) D1.1 Structural Welding Code, or equivalent.
- F. Manufacturer shall provide belt filter press, polymer system, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.
- G. Manufacturer shall provide services by a factory-trained service engineer, specifically trained on the type of equipment specified for two (2) consecutive days with one (1) trip for equipment checkout and startup. Service engineer requirements include, but are not limited to the following:
 - 1. Be present during initial energizing of equipment to determine directional testing as described in Section 4.1(D)(Installation).
 - 2. Inspect and verify location of anchor bolts, placement, leveling, alignment and field erection of equipment, as well as control panel operation and electrical connections.
 - 3. Instruct plant personnel on the operation and maintenance of the equipment, including preventative maintenance, method of controlling equipment and troubleshooting.
- H. Manufacturer shall guarantee all equipment against faulty or inadequate design, improper assembly, defective workmanship or materials, and breakage or other failure. Owner shall guarantee against faulty installation. Materials shall be suitable for service conditions.
- I. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sized and thicknesses so that repair parts can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service prior to delivery, except as required by testing.
- J. Each major component of equipment shall have the manufacturer's name, address and product identification on a nameplate securely affixed to the equipment.

1.5 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT:

- A. Equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
- B. Owner shall be responsible for unloading and shall have equipment on-site at the time of delivery permitting proper hoisting of the equipment.

1.6 PRE-SUBMITTAL OF ALTERNATE EQUIPMENT:

- A. Manufacturers of alternate equipment shall submit a pre-approval package to the engineer at least two (2) weeks prior to bid date. Alternative manufacturers shall submit the following information and supporting documentation:
- B. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of the unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
- C. Detailed installation drawings illustrating how the proposed belt filter press will be installed. The drawings shall include plan, elevation, and sectional views of the installation.
- D. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drive.
- E. Complete reference list of all installations of same and similar equipment including contract names and phone numbers, showing at least 15 installations of the same type and size as specified.
- F. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
- G. Certification that the entire equipment will be passivated by submersion in a chemical bath as specified in Chapter 2.03.
- H. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001.
- I. Details of the control and instrumentation system including wiring diagrams.
- J. Information on equipment field erection requirements including total weight of assembled components and weight of each sub-assembly.
- K. List of recommended spare parts.

- L. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all buy-out items..

1.7 WARRANTY

A. Equipment:

- 1. The equipment furnished under this section will be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of twenty-four (24) months from date of owner's acceptance.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Sentry 3BTP12.93S 3-Belt Unit from Charter Machine Company.

- 1. Polymer System from Charter Machine Company.
- 2. Or Engineer-Approved Equivalent.

B. Klampress AS-H Belt Filter Press G3 100 from Alfa Laval.

- 1. Polymer System from UGSI Chemical Feed Solutions.
- 2. Or Engineer-Approved Equivalent.

C. 1.0m SMX-S8 Belt Filter Press from Andritz.

- 1. Polymer System from Velodyne.
- 2. Or Engineer-Approved Equivalent.

D. 1.5m 3DP Belt Filter Press from BDP Industries, Inc.

- 1. Polymer System from BDP Industries, Inc.
- 2. Or Engineer-Approved Equivalent.

E. Environdyne Belt Filter Press.

- 1. Polymer System: Engineer-Approved Equivalent.

F. Ashbrook Belt Filter Press.

- 1. Polymer System: Engineer-Approved Equivalent.

G. Or Engineer-Approved Equivalents.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS:

- A. Sludge to be dewatered shall be well-mixed and well blended having the following characteristics:

1. Sludge:
 - a. Sludge type: Municipal Sewage.
 - b. Solids concentration: 1%.
 - c. Volatile solids ratio: 68-72%.
 2. Design Wastewater Flow 2.0 MGD
 3. Design BOD₅ 200 mg/L
 4. Design TSS 200 mg/L
 5. Feed Sludge Generation 2,335 lb/day
 6. Feed Sludge TSS Concentration 0.75 to 2.0 percent
 7. Sludge Processing 7 hr/day, 5 day/week
 8. Cake Solids percent d.w.s > 15%
- B. Each dewatering belt filter press shall be capable of dewatering up to 116 gallons per minute (GPM) (average flow of 93 GPM) of the specified municipal wastewater sludge to a final solids content of 15%. The solids capture rate shall be a minimum of 95%. The polymer consumption shall not exceed 25 lbs of active polymer substance per ton of sludge solids fed.
 - C. The sludge dewatering plant consists of the following major parts:
 1. Belt filter press.
 2. Polymer dosing system.
 - D. All parts of the dewatering press shall be designed and appropriate for the service specified and indicated and for continuous operation.
 - E. Sufficient room for inspection, maintenance, repair and adjustment shall be provided. Owner shall provide hoisting equipment to facilitate installation and maintenance work.
 - F. The physical layout shown on the drawings is based on the Charter Machine Company Sentry 3BTP12.93S 3-Belt Unit. If equipment by another manufacturer is to be supplied, contractor shall include in the bid all necessary modifications to the piping, electrical, structural, and mechanical layouts to accommodate the equipment proposed.
 - G. All parts shall be designed and manufactured to handle the forces that may be exerted on the belt filter press during fabrication, shipping, erection, and proper operation according to the O&M manual.
 - H. All components shall be so arranged that they can be serviced from the operating floor.
 - I. All components shall be balanced so that jamming at any point will not result in structural failure, but will cause the drive motor to stall. All components, including the gear reducer, shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor.

2.3 SLUDGE DEWATERING PRESS DESIGN SPECIFICATION:

A. Materials:

1. Sludge dewatering belt filter press shall be manufactured from AISI 304L stainless steel shapes (rods, angles, and channels), pipes, and sheets.
2. Bearings shall be anti-friction, and without the need for grease lubrication.

B. Design:

1. The Combination gravity belt thickener/belt filter press shall be of a three-belt design with three distinct dewatering zones, including an independent gravity-dewatering zone, wedge zone and a shear/pressure zone. The gravity zone shall be independent of the wedge zone and shear/pressure zone making it possible to select different dewatering belts and vary the speed of each area independently of the other for dual use purposes. The separation of the gravity and pressure areas shall optimize throughputs enhancing the hydraulic capacity of the press when processing diluted sludges. Each machine shall be designed to serve both as a belt press and also as an independent gravity belt thickener.
2. The combination 3-Belt Unit shall be designed, fabricated, assembled and tested by the belt filter press manufacturer in their own facility. In order to provide maximum quality assurance, personnel employed by the manufacturer shall perform all aspects of the design, fabrication and assembly. The belt filter press manufacturer shall at the same facility maintain a suitable spare parts inventory.
3. The gravity belt thickener shall be furnished with an upstream sludge-conditioning device consisting of an inline adjustable orifice venturi type mixer complete with polymer injection device. The mixer shall be designed to condition the sludge with polymer to result in a degree of flocculation that will produce the greatest amount of dewatering while maintaining the highest quality filtrate.
4. The gravity-dewatering zone shall consist of a 16.75-foot section of the horizontal filter belt. The minimum dewatering area shall be, 165 square feet. The gravity dewatering zone shall be independent of the belt filter press section and be capable of operating in a thickening mode only, utilizing its own drive, tensioning and tracking systems.
5. A counterweighted doctor blade shall be mounted at the discharge roller for removing sludge cake from the belt. The doctor blade shall be constructed of UHMW polyethylene. The blade shall be rigidly reinforced to provide even, gentle pressure on the belt with a minimal amount of abrasiveness and shall be capable of providing

passage clearance for the belt seam without injuring that seam. The thickener shall be capable of discharging thickened sludge into a screw conveyor for transfer or direct the thickened sludge into the pressure zone of the combination unit.

6. All rollers shall be designed for a deflection of less than 0.05" at mid span under conditions of maximum operational loading. Maximum operational loading shall be defined as the sum of the belt tension load; friction loads; equipment and sludge loads; any loads induced by the elasticity of the belt; and any loads induced by the torque of the drive. Maximum roll deflection shall be (in) 0.0018", which is calculated using the belt tension of 50 PLI, and the drive torque of 1,960 inch pounds. The drive and tracking roller shall be coated with a minimum 3/8" thick synthetic rubber of 60 durometer to provide the friction required for efficient belt drive and tracking. The tensioning roller shall be coated to the point of insertion of the bearing with Rilsan Nylon II to a thickness of 25 mil by the Electro Static, Fusion Bonded Rilsan Powder Dispersion Process.
7. Roller bearings shall have an L-10 rating greater than 25,000,000 hours per AFBMA test procedure under maximum loading conditions and calculated at a belt speed of 20 meters per minute. All bearings shall be double row spherical roller type with all grease fittings located for servicing from the machine exterior. Bearings shall have quadruple lip contact seals. All bearing housings shall be class 30 cast iron one-piece pillow block type with gasketed end cap as manufactured by Charter Machine Company. Bearing housings shall be coated with Rilsan Nylon II to a thickness of 25 mil by the Electro Static, Fusion Bonded Rilsan Powder Dispersion Process.
8. Belt tensioning shall be maintained pneumatically and controlled from the thickener mounted pneumatic control center. The dewatering belt shall be tensioned by a pair of corrosion resistant pneumatic cylinders attached to a rigid tensioning assembly. The tensioning assembly shall be attached to each tensioning cylinder in such a way as to assure parallel movement of the tensioning roller. Belt tension adjustment shall be possible while the machine is in operation. Tensioning pressure shall be gauged at the pneumatic control center. Tensioning cylinders shall be power retractable for belt replacement and emergency detensioning.
9. Belt tracking shall be totally pneumatic and shall function as a continuous automatic belt guidance system. The belt shall be tracked by a type 304 stainless steel paddle arm and analog system sensor that monitors one edge of the belt and pneumatically signals a corrosion resistant pneumatic cylinder for corrective positioning when required. That corrective motion shall be smooth, minimal, and adjustable.
10. All belt thickener pneumatic system controls, belt tensioning, tracking, and sludge plow grid control shall be frame mounted on the thickener in a 304 S/S NEMA 4X enclosure. Low air alarm

switch, tensioning and plow grid lift valves shall be mounted inside the enclosure. Tensioning on/off and plow grid lift levers, tension gauges, and adjustment controls shall extend through the enclosure wall for easy access. The enclosed controls shall be preceded by a three (3) micron air filter/regulator with gage and a 0.1-micron oil coalescing filter. One (1) 1/4" female NPT supply air connection shall be required to the total pneumatic system. Lubrication of the pneumatic system is not required.

11. The filter belt shall be equipped with a belt wash station for constant belt washing. The belt wash station shall include a manifold with removable stainless steel nozzles, internal hand wheel operated brush, hand wheel operated flush valve, and stainless steel neoprene skirted enclosure for containing spray mist. Belt spray water shall be collected in the stainless steel enclosure and plumbed to the base sump. Spray nozzles shall be suitable for use with non-potable water with a maximum solids concentration of 200 mg/l without clogging. The press shall be designed to allow the operator to close the wash water supply solenoid valve to the pressure belts to reduce the belt wash water requirements when utilizing the thickening operation only.
12. The filter belt shall be of polyester monofilament wovenware with minimum tensile strength of 890 pounds per lineal inch. Belt edges shall be chamfered and sealed. The belt seams shall be type 316 stainless steel clipper type. Mesh shall be selected for optimal gravity dewatering of the pertinent sludge.
13. The drive shall be Variable Frequency Drive using AC motor and quadruple gear speed reducer. The inverter along with start/stop and speed control of the drive shall be located in the master control panel.

2.4 DRIVE:

- A. The belt filter press shall be driven by Variable Frequency Drive using AC motor and quadruple gear speed reducer. The inverter along with start/stop and speed control of the drive shall be located in the master control panel.
- B. The drive motor shall be a severe duty, TEFC, type motor of ample power for starting and operating under normal conditions without exceeding the nameplate horsepower. The drive motor shall have a service factor of 1.15.
- C. Power requirements for the belt filter press shall be 460V, 3-phase, 60 Hz.

2.5 POLYMER DOSING SYSTEM FOR LIQUID POLYMER:

- A. Description:
 1. The Polymer preparation/feed unit shall be capable of automatically metering, diluting, activating and feeding an emulsion polymer with water.

2. The Polymer system shall be compatible with the submitted belt filter press system.
3. The system shall be capable of controlling separately the water flow and the polymer injection dosage.
4. The polymer equipment shall be furnished as a complete assembled unit to the Contractor, complete with 304 stainless steel stand.

B. Products:

1. Charter Machine Company.
2. Excell Polymer Systems.
3. Lutz Jesco.
4. Or Engineer-Approved Equal.

C. System Description:

1. Make up water flow shall be variable and measurable by means of a control valve and a sight glass rotometer.
2. The inlet stream shall have an electronic flow sensor with immersed in-line element capable of transmitting a signal for a low/no flow alarm. Element shall be removable without plumbing disassembly.
3. Unit shall have an electric solenoid valve for on/off control of dilution water flow.

D. Polymer Make-up Pump (LMI C121-75HV, 0-4 GPH, OR LMI-C131-25HV, 0-8GPH)

1. A polymer make-up pump shall be integrated in the system. The pump shall be a diaphragm electrical pulsation type, with separate speed and stroke controls.

E. Multi-Zone Acrylic Polymer Blending Chamber (Low Energy)

1. The mixed polymer solution is then transferred to an exclusive acrylic blending chamber allowing the pre-mixed polymer solution to be gently mixed and provide additional retention time to achieve the highest performance.

F. Multi-zone Mixing Chamber (High Energy)

1. Polymer shall be injected in the water stream by the feed pump to a kinetic mixing chamber to create a thorough mixing energy. The design shall include a motor driven impeller to create a high impact energy and low fluid shear. Solution shall undergo a tapered mixing intensity slope as it passes through a second recovery zone. Polymer activation efficiency shall be consistent over the entire dilution water range.

2. A portion of the mixed polymer is then re-circulated through the mixing chamber ensuring optimum mixing has occurred.
3. A transparent section after the mixing chamber shall be provided to observe the solution consistency.

G. Post Dilution System

1. Dilution water shall be split into two streams. Primary water flow shall supply the mixing chamber. Secondary water flow shall be used to post dilute the activated polymer stream. These two streams shall be completely blended by a static mixer prior to exiting the unit.
 - a. The post dilution water flow shall be variable and measurable by means of a control valve and a sight glass rotometer.
 - b. Unit shall have an electric solenoid valve for on/off control of post dilution water flow.

H. Assembly and Frame Work

1. All sheet metal work and frame assemblies shall be of type 304 stainless steel.

I. Controls:

1. A local-off-remote switch for the mixing chamber shall be provided.
2. A hand-off-auto switch for the polymer injection pump shall be provided.
3. The system shall be provided with positive flow logic to signal an alarm in the event of low dilution water flow. This alarm will disable the polymer injection pump from operating when the injection pump is run in the automatic mode.
4. The polymer preparation system shall be capable of remote start/stop operation.
5. A speed potentiometer for the polymer make-up pump speed rate shall be provided.
6. All controls are to be mounted in a NEMA 4X FRP enclosure and wired directly to its components. A common power feed cord (10 ft. min) with a standard male plug for a 120V, 20-amp receptacle shall be furnished. *(Receptacle by others)*

2.6 CONTROLS AND INSTRUMENTATION:

- A. Each belt filter press shall be provided with a control panel that will contain the necessary control devices and equipment for controlling the dewatering process as described herein. The control panel shall meet the following general requirements:
1. The control panel shall accept a 460 volts, 60 hertz, 3-phase ac power input. A main disconnect circuit breaker and operator mechanism shall be included. When the disconnect is in the open position, all power shall be removed from the control system.
 2. IEC rated motor starters shall be provided for the air compressor, belt wash water booster pump, cross conveyor, and the discharge conveyor.
 3. Variable frequency drive (VFD) shall be provided for the pressure belt drive and gravity belt drive. VFD for sludge feed pump and polymer pump can be supplied if specified.
 4. Short circuit protection for each motor shall be accomplished utilizing fuses. Individual thermal overload protection shall be provided (except for the belt drive and sludge feed pump).
 5. A control power transformer shall be included that will provide 120 volts, ac control power to the system.
 6. An industrial programmable logic controller (PLC) located in the control panel shall perform all logic functions for the system.
 7. A CONTROL POWER ON/OFF switch shall be located on the front of the control panel. When in the ON position, the CONTROL POWER ON pilot light will be illuminated and control power shall be distributed to the control system. When in the OFF position, the control system shall be held de-energized.
 8. An EMERGENCY STOP pushbutton shall be located on the control panel. It shall be a mushroom head style pushbutton that when depressed shall immediately de-energize all moving equipment in the system.
 9. An alarm horn shall be included with the control panel for audible alarm annunciation along with a horn silencing button in the front of the panel.
 10. Controls and drives for ancillary equipment will be provided and installed in the master control panel as specified.
- B. Control and Pilot Devices: As a minimum, the following control and pilot devices shall be located on the front of the control panel with nameplates as worded below in UPPERCASE LETTERS:

1. Pushbuttons:

- a. AUTO START
- b. AUTO STOP
- c. SYSTEM RESET
- d. ALARM SILENCE
- e. WASHWATER PUMP START
- f. WASHWATER PUMP STOP
- g. BELT DRIVE START
- h. BELT DRIVE STOP
- i. GRAVITY BELT DRIVE START
- j. GRAVITY BELT DRIVE STOP
- k. SLUDGE PUMP START
- l. SLUDGE PUMP STOP
- m. POLYMER PUMP START
- n. POLYMER PUMP STOP
- o. CROSS CONVEYOR START
- p. CROSS CONVEYOR STOP

2. Selector Switches:

- a. PRESS HAND/OFF/AUTO MODE
- b. CONTROL POWER ON/OFF
- c. AIR COMPRESSOR ON/OFF
- d. DEWATERING MODE THICKENER/PRESS

3. Indicator Lights:

- a. PREWET CYCLE ON
- b. POSTWASH CYCLE ON
- c. AIR COMPRESSOR RUNNING
- d. WASHWATER PUMP RUNNING
- e. BELT DRIVE RUNNING
- f. GRAVITY BELT DRIVE RUNNING
- g. SLUDGE PUMP RUNNING
- h. POLYMER SYSTEM RUNNING
- i. CROSS CONVEYOR RUNNING
- j. LOW AIR PRESSURE
- k. BELT OVERTRAVEL
- l. BELT BROKEN

4. Speed Potentiometers:

- a. BELT DRIVE SPEED
- b. GRAVITY BELT SPEED

5. Signal Input and Output Devices:

- a. Discrete Input Signals: The control panel can receive, if required and specified, the following discrete input signals from normally open dry contacts in external devices (contacts close when the equipment runs or a fault occurs):

- i. POLYMER PUMP RUNNING
 - ii. POLYMER PUMP FAIL
 - iii. SLUDGE FEED PUMP RUNNING
 - iv. SLUDGE FEED PUMP FAIL
 - v. DISCHARGE CONVEYOR RUNNING
 - vi. DISCHARGE CONVEYOR FAIL
 - b. Discrete Output Signals: The control panel shall provide the following discrete signals for transmission using normally open dry contacts (contacts close when the equipment is called to run or a fault occurs):
 - i. SYSTEM RUNNING
 - ii. SYSTEM FAULT
6. Sequence of Operation: (THICKENING MODE)
- a. Automatic Mode of Operation:
 - i. Turn operation selector switch to the thickening position.
 - ii. The thickener may be operated in the automatic mode by placing the HAND/OFF/AUTO selector switch in the AUTO position. The operator will next turn the AIR COMPRESSOR SELECTOR SWITCH to the ON position and allow the pressure to reach normal operating level.
 - iii. After the air pressure has reached operating level, the operator will press the AUTO START pushbutton, this will energize the wash water booster pump and GRAVITY belt drive, illuminate the PREWET CYCLE ON pilot light and start the pre-wet time delay. After the pre-wet timer times out, the sludge pump, polymer system, cross conveyor and the discharge conveyor will be energized.
 - iv. Pressing the AUTO STOP pushbutton will de-energize the sludge pump and polymer pump, illuminate the WASHDOWN CYCLE ON pilot light and start a wash down time delay. After the wash down timer has timed out, the gravity belt drive, washwater pump, cross conveyor and discharge conveyor will be de-energized.
 - b. Manual Mode of Operation:
 - i. To operate the press in the manual mode, the operator will place the HAND/OFF/AUTO selector switch in the HAND position. The operator will next turn the air compressor selector switch to the on

position. After the air pressure has reached operating level, all components or drives can be started individually.

- ii. The system will be stopped by pressing the respective STOP pushbutton for each drive or component.

7. Sequence of Operation: (PRESS MODE)

a. Automatic Mode of Operation:

- i. Turn operation selector switch to the Press position.
- ii. The press may be operated in the automatic mode by placing the HAND/OFF/AUTO selector switch in the AUTO position. The operator will next turn the Air Compressor selector switch to the on position and allow the pressure to reach normal operating level.
- iii. After the air pressure has reached operating level, the operator will press the AUTO START pushbutton, this will energize the washwater booster pump belt drive and gravity belt drive, illuminate the PREWET CYCLE ON pilot light and start the pre-wet time delay. After the pre-wet timer times out, the sludge pump and polymer pump will be energized. (The cross conveyor remains off.)
- iv. Pressing the AUTO STOP pushbutton will de-energize the sludge pump and polymer pump, illuminate the WASHDOWN CYCLE ON pilot light and start a washdown time delay. After the washdown timer has timed out, the gravity belt drive, washwater pump and cross conveyor will be de-energized.

b. Manual Press Mode of Operation:

- i. To operate the press in the manual mode, the operator will place the HAND/OFF/AUTO selector switch in the HAND position. The operator will next turn the air compressor selector switch to the ON position. After the air pressure has reached operating level, all components or drives can be started individually.
- ii. The system will be stopped by pressing the respective STOP pushbutton for each drive or component.

8. Faults:

- a. When any of the following fault conditions occur, in automatic or manual mode, the appropriate fault indicator will be illuminated, the alarm horn will sound and the belt filter press and associated equipment will be de-energized:
 - i. LOW AIR PRESSURE (amber light)
 - ii. BELT OVERTRAVEL (amber light)
 - iii. BELT BROKEN (amber light)
 - iv. LOW POLYMER (amber light) if specified
 - v. BOOSTER PUMP FAULT (flashing run light)
 - vi. GRAVITY BELT DRIVE FAULT (flashing run light)
 - vii. GRAVITY BELT DRIVE (flashing run light)
 - viii. SLUDGE PUMP FAULT (flashing run light)
 - ix. CROSS CONVEYOR FAULT (flashing run light)

9. Components:

- a. Enclosures: Control panel enclosures shall be free-standing, fabricated of type 304 stainless steel and shall be suitable for NEMA 4X service. Enclosures shall be manufactured by Saginaw Manufacturing.
- b. Wiring: All power and control wiring shall be 600 volt, type MTW insulation stranded copper and shall be sized for the required load, 18 AWG minimum.
- c. Circuit Breakers: Circuit breakers for the main disconnect shall be thermal magnetic molded case units. Circuit breakers shall be ABB type
- d. Motor Starters: Motor starters shall be full voltage, nonreversing, IEC style across-the-line units. Coils shall be 120 volts ac. Siemens type Sirius 3RT10.
- e. Selector Switches: All selector switches shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Selector switches shall be Idec Series TWTD.
- f. Pushbuttons: All pushbuttons shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Pushbuttons shall be Idec Series TWTD.
- g. Pilot Lights: Pilot lights shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Units shall be 120 VAC full voltage incandescent type. Pilot lights shall be Idec Series TWTD.

- h. Terminal Blocks: Terminal blocks shall be high density, solderless box lug style, with 600-volt rating. Terminal blocks shall be Allen Bradley type 1492.
- i. Control Relays: Control relays shall be general purpose type with a 10 amp contact rating, miniature square base and internal on status pilot light. Relays shall be IDEC RY series.
- j. Programmable Logic Controller (PLC): The PLC shall be a modular type with discrete and analog capabilities. The CPU shall have 6K minimum RAM for user instructions. The unit shall have battery backed RAM and EEPROM backup. The PLC shall be an Allen Bradley Micrologix Type.
- k. Variable Frequency Drive (VFD): The VFD shall be UL listed and shall be manufactured by Control Techniques.

PART 3 SPARE PARTS

- 3.1 The following Spare Parts shall be included and supplied together with the equipment:
 - A. One (1) set of brushes with mounting hardware (clips) - (brushes are wear parts).
 - B. One (1) bearing assembly for shaft.
 - C. One (1) solenoid valve 1-inch, 110V, Cl.1/ Div.2 for spray bar washing system.
 - D. Ten (10) nozzles for spray bar washing system.
 - E. One (1) spare part kit for neat polymer pump.
 - F. Spare parts shall be packaged with labels indicating the contents of each package, and shall be delivered to Owner as directed.

PART 4 EXECUTION

- 4.1 INSTALLATION, START-UP AND OPERATOR TRAINING:
 - A. Owner shall verify all dimensions in the field to ensure compliance of equipment dimensions with the drawings. Owner shall notify engineer of significant deviations.
 - B. Installation of the equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and shop drawings. Manufacturer shall supply anchor bolts for the equipment. Owner shall install the anchor bolts in accordance with the manufacturer's recommendations.

- C. After Installation touch-up paint shall be applied to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting. Owner shall passivate all field welds.
- D. Supplier shall furnish the services of a factory-trained service engineer for two (2) trips including a total of six (6) workdays to inspect the installation, observe start up, and provide operator training.
 - 1. Equipment shall not be energized, or “bumped” to check the electrical connection for motor rotation without the service engineer present.
 - 2. The service engineer shall make all necessary adjustments and settings to the controls.
 - 3. The service engineer shall demonstrate proper and sequential operation of the dewatering system. The dewatering system shall be able to operate fully automatically.

4.2 WARRANTY:

- A. The manufacturer will warrant against any defects in material or workmanship to the belt filter press and framework. This warranty will commence upon delivery of the products and will expire on the earlier to occur of one (1) year from initial operation of the product or 18 months from delivery thereof (the “Warranty Period”).

END OF SECTION

SECTION 11320

AERATED GRIT AND GREASE REMOVAL UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. A combination aerated grit-grease removal unit to remove grit and grease from sewage.

1.2 REFERENCES:

- A. AGMA Class 12--Gear Finish.
- B. ASTM A36--Structural Steel.
- C. ANSI/ASTM A123-78--Hop-Dip Galvanizing.

1.3 SYSTEM DESCRIPTION:

- A. The aerated grit chamber creates a spiral circulation of sewage causing grit to settle into the grit hopper. The degritted sewage then flows through a baffle-controlled wall to the grease chamber. The grease from the surface of the grease zone and the grit from the grit hopper are then removed to far disposal by means of a traveling bridge equipped with a grit pump and a skimming arm.

- B. Equipment List:

Grit Blower #1	BL-121
Grit Blower #2	BL-122
Grit and Grease Bridge	BR-121
Grit Pump	P-121
Grit Classifier	CSF-121

1.4 SUBMITTALS:

- A. Provide the following information in accordance with Section 01300:
 - 1. Product information including catalog data, dimensional drawings, and material of construction to verify that the equipment provided meets the requirements set forth in the specifications.
 - 2. Results of factory tests including test logs.
 - 3. Layout drawings for all equipment showing installation details and exploded diagrams.
 - 4. Manufacturer's installation, operation, and maintenance instructions to include as a minimum:

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- a. Supplier Identification: The names and addresses of the manufacturer, the nearest representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts.
- b. Lubrication Information: Manufacturer's recommendation regarding the lubricants to be used and the lubrication schedule to be followed.
- c. Control Diagrams: Diagrams shall show internal and connection wiring.
- d. Startup Procedures: These instructions consist of equipment manufacturer's recommendation for installation, adjustment, calibration, and troubleshooting.
- e. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.
- f. Preventive Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.
- g. Overhaul Instructions: These instructions consist of the equipment manufacturer's directions for the assembly, repair, and reassembly of the equipment and any safety precautions that must be observed while performing the work.
- h. Parts List: This list consists of the manufacturer's recommendations of number of parts which should be stored by the Owner and any required special storage precautions.
- i. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed call-outs.
- j. Specific Information: Where items of information not included in the above list are required, provide them.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Store and handle the grit and grease removal equipment and appurtenances in accordance with the manufacturer's written instructions. Protect the equipment and appurtenances from damage.

1.6 SPARE PARTS:

- A. One (1) bridge drive bearing set.

- B. One (1) set of seals for bridge drive.

1.7 SPECIAL TOOLS:

- A. One (1) set of any special tools required for maintenance and operation.

PART 2 PRODUCTS

2.1 SERVICE CONDITIONS:

- A. General: Provide one (1) combination aerated grit-grease removal unit with grit blowers, grit classifier, and controls to remove grit and grease from raw domestic sewage.

- B. Design Criteria:

- | | | |
|----|--|-------------------------------------|
| 1. | Daily Average Flow: | 2.36 million gallons per day (mgd). |
| 2. | Two (2)-hour peak flow: | 8.26 mgd. |
| 3. | Number of grit chambers: | One (1). |
| 4. | Number of grease chambers | One (1). |
| 5. | Grit Chamber Hydraulic Detention Time: | 5.0 minutes. |
| 6. | Grease Chamber Surface Loading Rate: | 1,000 gph/sq ft. |
| 7. | Air Requirements: | 114 scfm at 4.5 psig. |

2.2 MANUFACTURERS:

- A. Schreiber Corporation.
- B. Hi-Tech Environmental.
- C. G-H Systems.
- D. Environdyne.
- E. Or Engineer-Approved Equivalent.

2.3 DETAILS OF CONSTRUCTION:

- A. Air Diffusion Equipment:

- 1. Distribution Pipe:

- a. Provide a 4-inch diameter galvanized steel air header along entire length of tank secured to grit channel wall parallel to and above the maximum water elevation equipped with removable drop legs and aeration diffuser assemblies as shown on the drawings and described below. Threaded tees shall be uniformly spaced for connection of drop legs as shown on drawings.

2. Air Supply Drop Legs:

- a. Provide ten (1)-inch diameter galvanized steel air supply drop leg assemblies to connect to the air distribution header of grit channel.
- b. The upper end of each drop leg shall be provided with a 1-inch isolation valve and a 1-inch standard threaded union, located above the maximum water surface level.
- c. The lower end of each drop leg shall be fitted with a 1-inch galvanized tee with the run horizontal and parallel to the grit channel wall as shown on the Drawings.

3. Aeration Assemblies:

- a. Each aeration assembly shall consist of a galvanized tee connected to a drop leg and two (2) PVC diffuser assemblies. Additionally, a drop leg with one (1) diffuser assembly shall be located in the "dead zone" at the effluent end of the grease channel to keep floatables in front of skimming blade; and a drop leg with one (1) diffuser assembly shall be located at the inlet end of the grit tank to prevent excessive accumulations of grit immediately below the inlet.
- b. Diffusers shall be 1-inch diameter PVC by 30 inches in length, and be provided with a minimum of 15 air discharge points, each 1/8-inch in diameter.

4. Supports:

- a. Two (2) adjustable fabricated supports with V-shaped guides to support each drop leg and enable leveling of diffuser headers for even air distribution shall be furnished.
- b. Attach supports to wall with Type-304 stainless steel anchor bolts.
- c. Supports shall be adjustable, $\pm$ 1-inch, vertically.
- d. Supports shall be designed to bear the entire weight of the drop leg and aeration assembly so that the union between the drop leg and the air supply header can be easily connected or disconnected.

B. Traveling Bridge With Crane Rails:

1. Bridge:

- a. The traveling bridge shall contain and support the grit removal pump, drive mechanism, grease scraper, and explosion-proof start/stop station. Each traveling bridge shall be fabricated of structural steel of welded construction

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and shall span the grit compartment with wheels running on top of standard ASCE steel rails that are attached to the exterior wall and the longitudinal beam. The bridge shall be supported by dual axles, one with two idler wheels, and the other with two drive wheels. Wheels shall be of steel construction, with two being of flanged construction to assure proper tracking on steel rails.

- b. The bridge frame shall be of welded steel construction allowing a maximum deflection of $1/720$ of the span with a 100 lb/ft² live load. Main member shall be braced to assure rigidity.
- c. The traveling bridge walkway shall be 48 inches wide, shall have aluminum grating deck, and shall have handrails on each side of the walkway. Handrails shall be constructed of 1-1/2 square tubing, hot dip galvanized, and stand 42 inches in height.
- d. Maximum Bridge Speed: 10 ft/min.
- e. Bridge stops shall be furnished on channel walls (or steel rails) to limit run of bridge to length of channel and maintain clearance between bridge and adjacent equipment.

2. Bridge Drive:

a. Gears:

- i. Type: Precision-cut helical gears.
- ii. Material: SAE 8620 drop forgings.
- iii. Finish AGMA Class 12.
- iv. Hardness: 58-62 RC.

b. Gearbox:

- i. Material: Cast Iron.
- ii. Designed for maximum rigidity, absorbance of high torsional or linear stresses and noise absorption.
- iii. Gearbox shall be painted on the inside with a corrosion-resistant paint.

c. Bearings:

- i. B-10 Bearing Life: 40,000 hours minimum.
- ii. Lubrication: Run in oil bath or packed with bearing grease.
- iii. Quality: ABEC 1.

d. Seals:

- i. Provide double lip seals on all input and output shafts.
- ii. Material: Nitrile (Buna N).
- iii. Temperature Range: -40°F to 250°F.

e. Rotation: Capable of clockwise or counter-clockwise rotation without restriction.

f. Service Factor: Conform to AGMA standards with a minimum service factor of 1.5 based on nameplate motor horsepower.

g. Operation: Design for continuous duty.

h. Motor:

- i. Type: Non-submersible.
- ii. Maximum motor size: 1/3-hp.
- iii. 460-volt AC, 60-hertz, 3-phase, suitable for Class 1, Division II hazardous locations. Wound Class F with a B temperature rise, sealed anti-Friction type ball or roller or tapered bearings with a minimum B-10 life of 40,000 hours.
- iv. Motors shall be in accordance with all current applicable standards of NEMA, IEEE, AFBMA, NEC, ANSI, and meet Class I, Division II requirements.
- v. Provide motor stator housing and conduit box with weep holes, positioned for drainage, based on the mounting position of the motor.
- vi. Coat the motor stator bore, rotor surface, and conduit box interior with a polyurethane insulator paint.

C. Grease Collection/Removal:

- 1. The grease collection/removal equipment shall include a grease scraper, fabricated of hot-dip galvanized steel, in the grease channel supported on a cantilevered arm extending off the end of the blade to prevent floating grease and scum from escaping at the sidewalls.
- 2. The skimming arm pushes scum along channel and up a scum beach into a scum well. Skimming arm can be raised above the water surface after completion of skimming pass and remain raised as bridge travels away from the scum beach.
- 3. The grease scraper shall be lowered before the bridge starts traveling to the beaching ramp, and the grease scraper shall be held in the raised position as the bridge returns to the park position.

D. Grit Removal Pump:

1. Service Conditions:

- a. Provide submersible grit removal pump with Vortex impeller for handling a grit slurry, supported from and moving with the traveling bridge. Pump shall discharge to grit trough which feeds grit classifier.
 - i. Design Capacity: 120-gpm at 10 ft T.D.H.
 - ii. Type: Submersible.
 - iii. Size: 1.75 HP, minimum.
 - iv. Speed: 1,750 rpm.
 - v. Provide Vortex impeller to handle grit slurry.

2. Materials of Construction:

- a. Pump casing, impeller, and motor housing: Class 30 gray cast iron.
 - b. O-Rings: Nitrile rubber.
 - c. Hardware: Type 316 stainless steel.
- 3. Equip with pump attachment, stainless steel cable and hand cable winch for removal.**
- 4. Arrange discharge piping for automatic draining.**

E. Baffles:

- 1. Provide divider baffles between the grit and grease channels as shown on the drawings.
 - a. Material: PVC.
 - b. Size:
 - i. Width: 4-inch.
 - ii. Length: As shown on Drawings to maintain 12-inch clear opening between bottom of baffle and bottom of wall opening.
 - c. Spacing: 2-inch clear opening.
 - d. Attach baffle to center wall with Type 316 stainless steel bolts.

F. Air Blowers:

- 1. Furnish two (2) rotary lobe, positive displacement blowers. Each blower shall be capable of delivering 114-scfm of air at a discharge gauge pressure of 4.5 psig with 5.0 HP motor. The blowers shall be manifolded with one or all operating as selected by manual valve settings. Each blower shall be Aerzen Model XYZ.

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2. A base frame of structural steel welded construction shall be provided to support each blower and all items of a complete assembly. Vibration isolation mounts shall be provided. Each base frame assembly shall be suitable for shipment as a complete unit, factory-assembled.
3. Each blower shall be a rotary, dynamically balanced three-lobe design. Each lower stage shall have built-in noise control. This feature shall consist of the combination of a pre-inlet chamber cast in the blower housing and the three-lobe blowers. The result shall be a minimum of 20 to 30 dB attenuation at the fundamental frequency. The housing shall be close-grained, high-strength cast iron adequately ribbed to prevent distortion. Each lobe shall be either drop-forged, single piece shafts and rotors, or single piece shaft pressed into rotors and keyed. The rotor shall be machined accurately to final tolerances and the performance data guaranteed must be met without use of any kind of rotor coating. The rotors shall be dynamically balanced per VDI 1060, Q 6.3 or better. The timing gears shall be helical, hardened, and ground, meeting AGMA Grade 12 equivalent quality, with a minimum service factor of 1.7. Gears shall be secured on tapered shaft through using hydraulic expansion and interference fit, which allows for stepless clearance setting and greater efficiency through accurate timing. All shaft bearings shall be ball or roller and shall be splash lubricated. Piston ring-type labyrinth seals shall seal totally between the rotor chamber and all bearing and housing oil sumps. The drive shall be sealed by a lip seal in the housing cover. The housing shall not require other than convection cooling. Internal lip seals are not acceptable. Sheaves and matched V-belts shall be sized to provide a blower speed of the required RPM. Number and size shall be selected according to accepted parameters in the industry and recommendations of the specific manufacturer.
4. A combination intake filter and silencer shall mount directly on the top intake flange of each blower. Each inlet filter/silencer shall be equipped with a washable filter element. A discharge silencer shall be supported from the base frame and shall be of the low-pressure drop-design without diffuser element.
5. A check valve shall be mounted on the outlet end of the discharge silencer. A spring-loaded field-adjustable pressure relief valve shall be mounted vertically downstream of the discharge silencer for longevity. The design of the relief shall allow release of the full flow of air. Each blower stage shall be fully tested under full load for several hours prior to leaving the factory and a "full load" performance test report shall be provided. The blower manufacturer must be an ISO 90001 registered company.
6. Motor shall have a TEFC enclosure suitable for operation on 460 volts, 3-phase, 60 Hz.

G. Sound Enclosure:

1. A fan-ventilated acoustic enclosure of steel segmental construction shall be provided for each blower assembly. It shall be comprised of two side panels, two end panels, and a cover, all secured together with latching closures. One side shall be specially louvered and ducted to channel air directly to the blower intake filter silencer. The other side and end panels shall be louvered such that the movement of air induced by the fan through the enclosure shall pass across the blower and motor for optimum cooling effect. The louvers shall shield against precipitation and airborne debris. A port shall be provided at a convenient location through the enclosure for the blower discharge conduit. Insulating foam material shall line the interior surfaces of the enclosure panels. The exterior shall be 16-gauge galvanized sheet steel and finish painted. A steel shipping/mounting skid, with drip pan, for mounting of the blower assembly and enclosure shall be included.
2. The ventilating fan fractional horsepower motor shall be provided for the same electrical service as the blower motor.

H. Grit Classifier:

1. Size: 12-inch diameter.
2. Type: Inclined screw conveyor-type with inlet/decant housing, support frames, screw conveyor, bearing supports, and drive assembly.
3. Fabrication:
 - a. The Inlet/Decant Housing shall be fabricated at 1/4-inch stainless steel plate and structural members. It shall be of a triangular hopper configuration, shaped to provide a horizontal top perimeter when mounted on top of the screw conveyor housing inclined at 25 degrees above horizontal. A flanged 6-inch pipe stub shall be provided on the top of the hopper or on the end of the grit slurry inlet; another flanged stub of the same size shall be provided in the end of the liquid decant overflow effluent. These flanges shall be located as shown. The entire hopper shall be covered by stainless steel plate with bolted-on access hatch.
 - b. Two support frames shall be provided, fabricated of 1/4-inch stainless steel plate, and structural members. The upper support frame shall be a 1/4-inch stainless steel fabrication "A" provide located beneath the inclined screw housing and near enough to the grit discharge end to ensure stability in the operating mode. Both lower and upper support frames shall have base plates with holes for appropriate anchors into the foundation. (Where required for elevated dumping heights, support frame extensions shall be included to raise the entire classifier assembly.)

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- c. The inclined screw conveyor shall be comprised of a U-shaped trough of 1/4-inch fabricated stainless steel, the bottom semi-circular radius to accommodate a solid-flight, fabricated hardened steel shaftless screw of a nominal (12) inches in diameter. The sides of the trough shall extend vertically from the semi-circular portion, terminating in a top flat flange for bolted attachment of a flat stainless steel cover plate to enclose the screw. The cover plate shall extend from the inlet/decant housing to the top of the inclined trough, adjacent the drive unit. The screw axis shall be offset from the trough axis to avoid jamming between the flights and the trough and to enhance water drainage down the trough as the screw elevates the grit. Lower end of trough to be equipped with four (4) 1/2-inch thick by 2-inch wide stainless steel wear bars to prevent wear of the trough.
- d. Adjacent the upper end of the trough and in the bottom of the semicircular section, there shall be a gravity grit outlet, a welded-on pipe stub of 8-inch diameter terminating with a standard pipe flange in a horizontal orientation.
- e. The spiral screw shall consist of a steel shaftless flight, extending end-to-end. Flight thickness shall be 1/2-inch minimum. The upper end of the torque tube shall include a flange and a bolted-on drive shaft extension.
- f. The shaft-mounted drive assembly shall be mounted to a framework on the upper end of the inclined trough and keyed to the torque tube drive shaft extension on the screw. The drive assembly shall contain case-hardened gearing of AGMA class 12 finished in a rugged, corrosion-proof cast iron housing. Double lip seals shall be provided on both input and output shafts, together with additional gasketing to assure oil leakage protection. The electric motor shall be a 1,750-rpm squirrel cage design with a TEFC enclosure; the nominal speed of the output drive shaft shall be 7.5 rpm.. The unit shall be the Snuggler model by Eurodrive, or approved equivalent.
- g. The grit classifier shall be controlled from the Grit and Grease Removal System Control Panel. In the automatic position, the grit classifier shall start after an adjustable time delay (20 seconds) when grit pump stops.

I. Electrical Controls:

- 1. Provide weatherproof local start/stop station listed for use in a Class I, Division II Environment. Additionally, a remote-mounted NEMA 4X control panel for mounting outside the 10-foot envelope for Class I, Division II will be provided for automatic and manual operation of traveling bridge; control panel shall contain the following items and provide the following required features:

ADDENDUM NO. 1

- a. Main circuit breaker, combination starters for traveling bridge, grit pump, and grit classifier motors, and control power transformer in accordance with the requirements of Division 16.
 - b. External limit switches and relays for forward and reverse travel.
 - c. Front panel-mounted "HAND-OFF-AUTOMATIC" selector switch and separate "START-STOP" pushbuttons with lockout for bridge and grit pump.
 - d. Front panel mounted Power On, Alarm, Bridge Running, and Grit Pump Running lights.
 - e. Timers for automatic timed cycle operation, ATC Series, 355, Series 365, or approved equivalent.
 - f. Relay to stop bridge if grit pump is overloaded.
 - g. Two common failure relays with dry circuit contacts for remote monitoring of external grit pump and traveling bridge common failure alarm.
 - h. Two relays with two sets of dry circuit contacts for remote run status monitoring for grit pump and traveling bridge.
 - i. Relays to interlock operation of either grit pump with the grit classifier.
2. Provide travel limitation switches and four safety stops.
 3. Provide suitable number of conductors for power, control, and grounding sized to carry the required current to all connected motors when operated at rated conditions. Provide No. 14 AWG minimum for power conductors.

2.4 MOTORS:

- A. Motors and other electrical devices shall be designed for NEC-Area electrical classification of Class I, Group D, Division II, if within 10 feet of the agitated liquid within the grit structure, shall be and manufactured as specified in Section 16150 of these specifications and shall have the following characteristics:
 1. Traveling Bridge:
 - a. Horsepower: 1/4.
 - b. RPM: 1,800.
 - c. Enclosure: TEFC.

2. Grit Pump:
 - a. Horsepower: 1.75.
 - b. RPM: 1,800.
 - c. Enclosure: Submersible.
3. Blowers:
 - a. Horsepower: 5.0.
 - b. RPM: 3,600.
 - c. Enclosure: TEFC.
 - d. Space heater.
4. Grit Classifier:
 - a. Horsepower: 1.0.
 - b. RPM: 1,800.
 - c. Enclosure: TEFC.
 - d. Space heater.

2.5 ELECTRIFICATION:

A. Power and Signal Cable System with Festooning:

1. General:
 - a. Provide a festoon cable system to deliver power from the junction box to the control panel on the traveling bridge and signals from the bridge.
 - b. System shall be designed for outdoor applications.
 - c. System shall have adequate cable capacity to provide for continuous travel of full length of tank.
 - d. Cable shall be looped with a 5-foot minimum loop depth with each end of the loop being attached to a separate carrier.
 - e. Upon traveling to the end of the tank, the loops shall be extended to form a draped cable supported by each carrier. As the cable returns, the loop shall be retracted by the action of the outrigger fastened to the moving bridge to two the lead carrier.
2. Cable Description:
 - a. Provide outdoor-duty, flat cable with neoprene jacket, resistant to UV, ozone, oil, water, hydrogen sulfide, and weather.
 - b. Use one 16-gauge conductor, No. 14 AWG cable for power and control.

3. Festoon System:

- a. Primary components of the festooning system shall be stainless steel end clamps, nylon electrical cable carriers, and plastic-coated aircraft cable. A flat, plastic-coated power cable shall be provided sized in accordance with the National Electric Code. Connectors matching the cross section contour of the flat power cable shall be used to provide a closure at the cable entrance in the control panel and junction box.

4. Other Requirements:

- a. Provide an adequate number of cable carriers such that the load power carrier does not exceed 15 pounds.
- b. Festoon system manufacturer shall provide all necessary hangers, supports carriers, clamps, end straps, fixtures, and couplers necessary for a complete system.

2.6 FACTORY ASSEMBLY AND PAINTING:

A. Shop Assembly:

- 1. Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site.
- 2. Disassemble units only to the extent necessary for shipping and handling limitations.
- 3. Clearly mark units for reassembly and coordinated installation.

B. Fasteners:

- 1. Use Type 316-stainless steel fasteners unless otherwise specified.

C. Galvanizing:

- 1. Hot-dip galvanize fabricated and cast steel parts according to ANSI/ASTM A123-78 unless otherwise specified. Do not galvanize stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. Install the equipment in accordance with manufacturer's instructions and as shown.

3.2 FIELD-QUALITY CONTROL:

- A. Provide services of factory-trained manufacturer's representative to inspect, check out, and place system into operation. Representative shall demonstrate satisfactory system operation and provide instructions to Owner's personnel. Visit shall be at least one full working day (8 hours) on-site. Visit to be after water is available. Training time shall be in addition to any time spent testing, debugging, repairing, or otherwise bringing system into service.

END OF SECTION

SECTION 11345

ULTRAVIOLET DISINFECTION EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES:

Furnish all labor, materials, equipment and appurtenances required to provide an open channel, gravity flow, low pressure low intensity ultraviolet (UV) either as vertical lamp, inclined lamp, or horizontal lamp disinfection system complete and operational with all control equipment and accessories as shown and specified. This system will be capable of disinfecting effluent to meet the water quality standards listed in this Section. The existing UV modules will be replaced one at a time to minimize downtime of the UV system.

Equipment Designations:

<u>Number</u>	<u>Description</u>
CP-600	UV Control Panel
05-UVM-1101	UV Lamp Module
05-UVM-1102	UV Lamp Module
05-UVM-1201	UV Lamp Module
05-UVM-1202	UV Lamp Module

1.2 QUALITY ASSURANCE:

A. Design Criteria:

1. Provide equipment that shall disinfect effluent with the following characteristics:
 - a. Peak Flow (per Channel): 3.75 Million Gallons per Day (MGD)
 - b. Average Flow (per Channel): 1.0 MGD
 - c. Total Suspended Solids: 20 mg/L, 20 day average of grab samples
 - d. Annual Effluent Temperature Range: 33 to 85° F
 - e. Ultraviolet Transmittance @253.7 nm: 5%, minimum
 - f. Maximum Mean Particle Size: 30 microns
 - g. Effluent standards to be 126/100 mL E. coli based achieved: on a 30 day Geometric Mean of daily samples.
2. The UV system is to be installed in two existing open channels having the following dimensions:
 - a. Length: 25.5 ft (As shown on Drawings)
 - b. Width: 29 in (As shown on Drawings)
 - c. Depth: 69.6 in (As shown on Drawings)
3. The effluent depth in the channel shall be 58.0 in in at low flow and 62.0 in at max flow.

4. System configuration:

a. The UV system configuration shall be as follows:

Number of Channels:	2
Number of Banks per Channel:	2
Number of UV Modules per Bank:	1
Number of Lamps per UV Module:	40
Total Number of Lamps per Channel:	160
Number of System Control Centers:	1 (existing)
Number of Power distribution Centers:	2 (existing)
Number of Level Controller(s):	1 (existing fixed weir)

B. Performance Requirements:

1. The UV system will be designed to deliver a minimum UV dose of 30,000 $\mu\text{Ws}/\text{cm}^2$ at peak flow, in effluent with a minimum UV Transmission of 65% at end of lamp life. The basis for evaluating the UV dose delivered by the UV system will be the manufacturer's bioassay as carried out by an independent third part. Bioassay validation methodology to follow protocols described in the US EPA Design Manual - Municipal Wastewater Disinfection (EPS/625/1-86/021), without exception.
2. The ultraviolet disinfection system will produce an effluent conforming to the following discharge permit: 126 E. coli /100 ml based on a 30 day Geometric Man of daily grab samples. Grab samples will be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater. 19th Ed.
3. Provide UV disinfection system complete with UV Modules, System Control Center, Power Distribution Center(s), Support Rack(s), and Level Controller as shown on the contract drawings and as herein specified.
4. The system will be able to continue providing disinfection while replacing UV lamps, quartz sleeves, and ballasts, and while cleaning the sleeves.
5. The system will be designed for complete outdoor installation.

1.3 SUBMITTALS:

A. Submit for review, shop drawings showing the following:

1. Complete description in sufficient detail to permit an item comparison with the specification.
2. Dimensions and installation requirements.
3. Descriptive information including catalog cuts and manufacturers' specifications for major components.

4. Electrical schematics and layouts.
5. Hydraulic calculations demonstrating compliance with the required hydraulic characteristics.
6. Experience Documentation.
7. Dose calculations and independent bioassay report.

1.4 GUARANTEE:

A. Equipment:

1. The equipment furnished under this section will be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of twenty-four (24) months from date of owner's acceptance.
2. UV Lamps:
 - a. The UV lamps to be warranted for a minimum of 12,000 hours. On/off cycles are limited to an average of three (3) per day.

PART 2 PRODUCTS

2.1 MANUFACTURER:

- A. The following manufacturer is listed as acceptable in order to set a definite standard of quality and performance. Listed manufacturers and products are expected to fully comply with the specifications.
 1. UltraTech. (Vertical)
 2. Veolia. (Incline)
 3. Wedeco. (Incline)
 4. Trojan. (Incline or Horizontal)
 5. Neotech. (Horizontal)
 6. Glasco. (Vertical)
 7. Or Engineer-approved Equivalent.
- B. To be acceptable, the UV system must operate in an open channel, be of modular design, use low intensity low pressure vertical, inclined, or horizontal UV lamps, electronic ballasts with multiple power settings, and utilize stainless steel cleaning racks for manual cleaning.
- C. If other equipment is proposed, the Contractor will demonstrate to the Engineer and the Owner that all requirements of materials, performance, and workmanship have been met or exceeded by the equipment proposed. Contractors proposing alternate manufacturers will be responsible for all costs associated with system evaluation and redesign including all electrical, mechanical and civil aspects of the installation.

2.2 DESIGN, CONSTRUCTION AND MATERIALS:

A. General:

1. All welded metal components in contact with effluent shall be Type 316L stainless steel.
2. All metal components above the effluent shall be Type 304 stainless steel with the exception of the ballast enclosure, which is constructed of anodised aluminium.
3. All wiring exposed to UV light shall be Teflon coated.
4. All wires connecting the lamps to the ballasts shall be enclosed inside the frame of the UV Module and not exposed to the effluent.

B. Lamp Array Configuration:

1. The lamp array configuration will be the uniform array with all lamps parallel to each other and to the flow. The lamps will be evenly spaced in horizontal and vertical rows with centerline spacing equal in both directions.
2. The single array pattern will be continuous and symmetrical throughout the reactor.
3. Systems with a concentric array or uniform staggered array and having an equivalent UV density will have 30% additional lamps to compensate for the inefficiencies of these arrays.
4. The system will be designed for complete immersion of the UV lamps including both electrodes and the full length of the lamp tube in the effluent. Both lamp electrodes will operate at the same temperature and be cooled by the effluent.

C. UV Module:

1. Each UV module will consist of UV lamps with an electronic ballast enclosure mounted on the Type 316 stainless steel frame. Ballasts housed in a separate enclosure located external to the channel which require mechanical cooling shall not be permitted.
2. Each lamp will be enclosed in its individual quartz sleeve, one end of which will be closed and the other end sealed by a lamp end seal and compressed O-ring. To be considered as an alternate, lamp quartz sleeves that are open at both ends will be supplied with twice the amount of specified spare seals and lamps.
3. The closed end of the quartz sleeve will be held in place by means of a retaining O-ring. The quartz sleeve will not come in contact with any steel in the frame.

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4. The ends of the lamp sleeve will not protrude beyond the stainless steel frame of the UV Module.
5. Lamp wires will terminate in the electronic ballast enclosure located at the top of the UV Module.
6. The electronic ballast enclosure will contain the electronic ballasts and L.E.D. lamp status displays visible through a red plexiglass viewing plate.
7. The ballast enclosure will be anodised aluminum.
8. All wires connecting the lamps to the ballasts will be enclosed inside the frame of the UV Module and not exposed to the effluent.
9. All lamp to ballast connections will be made by and tested by the UV Manufacturer.
10. At the point of exit from the UV Module frame the multiconductor cable will pass through a waterproof strain relief.
11. Each UV Module will weigh no more than 50 lbs and will be individually removable without using mechanical lifting devices.
12. Each UV Module will be connected to a receptacle on the Power Distribution Center by means of a multiconductor cable with a moulded connector.
13. Each UV Module will have a NEMA rating of Type 4.

D. UV Lamps:

1. Low pressure mercury slimline of the hot cathode instant start design. The coiled filamentary cathodes to be heated by the arc current.
2. The filament will be of the clamped design, significantly rugged to withstand shock and vibration.
3. Electrical connections at one end.
4. Each connection will have only two pins.
5. 90% of UV output will be within the wavelengths of 233.7 to 273.7 nm.
6. Rated to produce zero levels of ozone.
7. Lamp bases will be of a metal and ceramic construction resistant to UV and ozone.

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8. The lamp base will incorporate a dielectric barrier or pin isolator. The pin isolator will consist of a non-conductive divider placed between the lamp pins to prevent direct arcing across the pins in moist conditions.

E. Lamp End Seal and Lamp Holder:

1. The open end of the lamp sleeve will be sealed by means of a Type 316 stainless steel sleeve nut which threads onto a sleeve cup and compresses the sleeve O-ring.
2. The sleeve nut will have a knurled surface to allow a hand grip for tightening. The sleeve nut will not require any tools for removal.
3. The lamp will be held in place by means of a moulded lampholder that will incorporate two seals. The lampholder will seal against the inside of the quartz sleeve to act as a second seal in series with the external O-ring seal.
4. The second seal on the lampholder will isolate and seal the lamp from the module frame and all other lamps in the module.
5. In the event of a quartz sleeve fracture the two seals of the lamp holder will prevent moisture from entering the lamp module frame and the electrical connections to the other lamps in the module.
6. The lamp holder will also incorporate a UV resistant plastic stop that will prevent the lamp sleeve from touching the steel sleeve cup.

F. UV Lamp Sleeves:

1. Type 214 clear fused quartz circular tubing as manufactured by General Electric or equal.
2. Lamp sleeves shall be domed at one end.
3. The nominal wall thickness shall be 1.5 mm.

G. UV Lamp Module Support Rack:

1. The module support rack shall be Type 304 stainless steel and be suspended above the effluent in the channel by means of slotted angles allowing adjustment to the precise height of the channel and requiring no fastening of the individual UV lamp modules.
2. The module support rack shall be designed so that no ultraviolet light shall radiate above the channel when the UV lamp modules are energized and fully immersed in the effluent.

H. Electrical:

1. General:

ADDENDUM NO. 1

- a. Each UV module will be powered from the Power Distribution Center through a bus bar and will include a relay board and watertight connectors.
- b. Each ballast will drive two lamps.
- c. Electrical supply to each System Control Center will be 208 Volts, single phase, 2 wire (plus ground), 5 Amps.
- d. Electrical supply to each Power Distribution Center(s) will be no greater than 208 Volts, 1 phase, 2 wire (plus ground), 3.8 kVA.
- e. Forced air cooling of control panels that contain electronic circuit boards will not be acceptable.

2. Power Distribution Center:

- a. Power distribution will be through bus bars to environmentally sealed receptacles to allow for local connection of UV Modules.
- b. Fusing of each UV module circuit will be located inside the Power Distribution Center.
- c. Enclosure material will be fiberglass.
- d. Enclosure will be waterproof.
- e. Cross-sectional dimension will be 8 inches high by 16 inches wide and span the complete channel width.
- f. All Power Distribution Centers to be NEMA approved with a rating of Type 4.
- g. One separate sealed Power Distribution Center will be provided per bank of lamps to ensure complete electrical independence.

I. Control and Instrumentation:

1. System Control Center (SCC) Type B:

- a. UV System control and monitoring will be provided through display screen and message keypad to allow complete operator interface. Hardwired panel devices and meters will not be permitted.
- b. Keypad will have a sealed membrane overlay covering all function keys and numerical keys.
- c. Operator interface will be NEXT and PREV driven with a flashing display upon alarm conditions.

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- d. Minor alarms will be provided to indicate to plant operators that maintenance attention is required. Alarms will include:
 - i. Low Warning UV Intensity will be pre-set at the factory for 25% of the Intensity after 100 hours. Alarm set point will be field adjustable.
 - ii. Individual Lamp Failure will indicate single lamp failures that occur.
 - e. Elapsed time of each bank will be recorded and displayed on the display screen when prompted.
 - f. Panel will be NEMA Type 4 and be 20 inches high by 20 inches wide by 12 inches deep. Panel will be wall mounted at a minimum of 40" above the ground level.
 - g. Digital I/O modules rated for 10 amps will be provided to remotely indicate:
 - i. Common Major Alarm Condition.
 - ii. Bank status (one for each UV bank supplied).
2. SCC shall interface with the overall plant SCADA system as existing system.
- a. Provide status outputs to plant SCADA system.
 - b. Update existing interface screens for the plant OIC.
 - c. All alarms shall be interfaced with the plant SCADA for alerting operating personnel.
 - d. Operation of the UV system by the OIC is not required.

2.3 UV DETECTION SYSTEM:

- A. A submersible UV sensor will continuously sense the UV intensity produced in each bank of UV lamps. The sensor will measure only the germicidal portion of the light emitted by the UV lamps. The detection system will be factory calibrated. Detection systems which can be field calibrated will not be permitted.

2.4 FLOW PACING:

- A. A flow pacing system will be supplied to turn the UV banks on and off in relationship to a 4-20 mA signal from an effluent flow monitor (by Others). The flow pacing system will allow the operator to vary the flow rate setting. Logic and time delay relays will be provided to regulate the UV bank ON/OFF cycle.

ADDENDUM NO. 1

- B. Bank status will be capable of being placed either in Manual, Off or Auto mode.
- C. Banks will be cycled for equal wear and timed off to minimize bank cycling.

2.5 CLEANING SYSTEM:

- A. Cleaning Rack:
 - 1. Reuse existing cleaning rack.

2.6 PROTECTOR CAPS:

- A. Caps will provide a replacement seal for UV Module plugs and Power Distribution Center receptacles when UV Modules are removed from the effluent channel.

2.7 PHOTOMETER:

- A. A single beam UV photometer with front panel and 100% transmittance control adjustment will be supplied to measure the UV transmittance of the effluent.
- B. The range will be 0 - 100% transmittance with a wavelength accuracy of _ 0.16 half band width.

2.8 SPARE PARTS:

The following spare parts and safety equipment will be furnished:

- A. 1 - UV Module (complete).
- B. 6 - UV Lamps.
- C. 6 - Lamp Sleeves.
- D. 6 - Lamp Holder Seals.
- E. 1 - Operators kit including face shield, gloves and cleaning solution.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. In accordance with Drawings and manufacturer's shop drawings and instructions.

3.2 FIELD QUALITY CONTROL:

- A. Retain a qualified representative of the manufacturer to perform the following services:
 - 1. Oversee installation of the equipment specified herein.

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2. Inspect the completed installation and note deficiencies.
 3. Be present and assist the CONTRACTOR during start-up, adjusting, and site testing of completed installation.
 4. Furnish test forms and procedures for field testing.
 5. Instruct OWNER's personnel in the operations and maintenance of the equipment with minimum services as follows.
 - a. Installation assistance: As required.
 - b. Owner personnel instruction, classroom and jobsite: 2 hrs.
 - c. Plant startup: 4 hrs.
 - d. Coordinate training and start-up with Owner's personnel.
 - e. Owner may videotape training.
 - f. Manufacturer shall make four additional trips to the job site, at 3 months, 6 months, 12 months and 24 months to inspect and provide troubleshooting support of the equipment.
 6. Prepare manufacturer's installation report and submit within 30 days after completion of field testing. Include the following information:
 - a. Field testing results.
 - b. Descriptions of installation deficiencies not resolved to the manufacturer's satisfaction.
 - c. Description of problems or potential problems.
 - d. Names of OWNER personnel who attended operations and maintenance training sessions.
 - e. Record copy of materials used for training session including outlined summary of course.
- B. Field representatives shall have a minimum of five (5) years of experience with the operation of and training on this type of equipment.
1. Factory personnel will be required to perform this service. Sales representatives will only be considered acceptable service technicians if they have three (3) years of experience with the operation of and training on this type of equipment from the manufacturer being supplied and have started up 10 units of a similar size and type from the manufacturer.
- C. Field Testing:
1. Testing and startup schedule shall be submitted to ENGINEER for approval.
 2. Test Procedure: Verify proper operation.

END OF SECTION

SECTION 14551

SCREW CONVEYORS

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes Screw Conveyor Tag No. 05-SC-3101, 05-SC-3102:

1. Screw conveyor and appurtenances: Belt Filter Press manufacturer shall be responsible to supply suitable conveyor to transport and dump dewatered solids into dumpsters. The Conveyor configuration will vary and depend on the belt filter press. The contractor shall coordinate to provide and install a complete operating system.

B. Related Sections include but are not necessarily limited to:

1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 - General Requirements.
3. Section 11005 - Equipment: Basic Requirements.
4. Section 11199 – Sludge Dewatering Belt Filter Press

1.2 QUALITY ASSURANCE:

A. Referenced Standards:

1. ASTM International (ASTM).

1.3 SUBMITTALS:

A. Shop Drawings:

1. See Section 01300 for requirements for the mechanics and administration of the submittal process.
2. See Section 11005.
3. Fabrication and/or layout drawings.
 - a. Detailed drawings showing supports, drives, connection details, materials of construction, etc.
 - b. Structural calculations signed by a registered professional Structural Engineer for all structural support members.
4. Product technical data:

- a. Acknowledgement that products submitted meet requirements of standards referenced.
- b. Manufacturer's installation instructions.

B. Operation and Maintenance Manuals:

- 1. See Section 01300 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Shaftless Screw Conveyors:
 - a. KWS Manufacturing Co.
 - b. JDV Inc.
 - c. Custom Conveyor Corporation, Elk River, MN.
 - d. JMS.
 - e. MLM.
 - f. Engineer approved equal.
- B. Submit request for substitution in accordance with Specification Section 01600.

2.2 MATERIALS:

- A. Material Standards:
 - 1. Chutes AISI 304, ASTM A167, 18-8
 - 2. Troughs, end plates, cover & drive AISI 304, ASTM A167, 18-8.
 - 3. Supports AISI 304, ASTM A167, 18-8.
 - 4. Hoppers AISI 304, ASTM A167, 18-8
 - 5. Spiral flighting High strength alloy carbon steel with a minimum hardness of 250 Brinnel
 - 6. Wear liner Ultra high molecular weight polyethylene Sintered with anti-wear filler and Synthetic lubricants.
 - 7. Bolts, Nuts, and washers AISI 304, ASTM A167, 18-8
 - 8. Conveyor troughs, lids and drives AISI 304, ASTM A167, 18-8

2.3 EQUIPMENT:

A. Application:

1. Provide shaftless screw conveyors to transport sludge cakes into two (2) dumpsters. Sludge will be dewatered by a volute dewatering press. The volute dewatering press may produce sludge cakes up to 7.5 yds per hour @ 16% solids content. The sludge cakes may be of 12-20 % solids concentration. Sludge cake will be produced in a Wastewater Treatment Plant from WAS.
2. Two (2) screw conveyors (one horizontal and one inclined) tag (05-SC-3101, 05-SC-3102 will be required.
3. Equipment shall be non-overloading and operate without noise, vibration, heating, or damage. Each conveyor shall not spatter or drip, and shall be capable of being cleared of material and shall continuously remove material that would otherwise cling to walls of trough.
4. All welds shall be continuous unless specified otherwise, with all welded joints sealed watertight. All sharp corners of all cuts and sheared edges shall be edge ground and made smooth. All fasteners will be stainless steel.

B. Physical Properties of Material to Convey:

1. Material: Sludge cake will be produced from a Wastewater Treatment Plant volute dewatering press. Polymer will be added to source sludge before dewatering.

2.4 COMPONENTS:

A. Troughs:

1. Trough:
 - a. Provide U-shaped troughs with an integral double top flange on each side and similar to the dimensional standards of CEMA 350 and enclosure classification IIE. Troughs with break forming will not be acceptable. Troughs shall be fabricated from minimum 4.8 mm plates. Covers shall be provided for any portion of the trough which is not covered by the filling chute. Covers shall be maximum 5 feet long section and made from minimum 2.6 mm plates. The trough cover section on each side of the conveyor inlet chute shall be hinged on one side of the trough with quick disconnect snap lock end handles to allow convenient access to these sections of the conveyor. A stainless expanded metal mesh screen shall be provided between the trough and the cover to allow visual access to this portion of the conveyor but prevent personnel from reaching into the conveyor. The

screen will be removable for cleaning purposes. The cover shall be similar to CEMA Standard No. 300 24. Each conveyor shall be fixed with the appropriate warning labels to call for lock out –tag out of the electrical system before the covers are removed. Inspection hatches or sample ports with finger guards shall be provided. A flanged 4 inch drain outlet (low point) and a 2 inch hose connection (at high point) outlet shall be provided. The contractor shall connect a flush system to the conveyor.

- b. A gland packing ring consisting of two Teflon fiber packing rings shall seal the drive shaft at its penetration through the end plates, along with a greased labyrinth sealing system.
 - c. End seals, shrouds, inlet, discharge, etc., to be constructed from 1/4 IN (minimum) plates.
 - d. The inside trough surface shall have a wear liner consisting of a layer of ultra high molecular weight polyethylene (UHMW-PE). The liner shall be a single piece, formed and bonded two (2) layers of the same material, each of different color to provide a visible indication when the liner is nearing the end of useful life. Liners with a second layer of different material will not be accepted. The liner shall be removable and supplied in maximum 1.0 m long sections. The liner shall be held in place with stainless steel clips. Fasteners shall not be acceptable. The liner shall be 16 mm thick. The wear liner shall be furnished to cover the entire length of the semi circular trough.
 - e. Coordinate opening sizes and connection details with all equipment affected.
- B. The conveyor drive unit shall be equipped with an externally mounted motion failure alarm unit. The location and mounting details shall be as recommended by the conveyor manufacturer. Motion sensors shall be the non-contacting type using a probe with a pre-amplifier and main electronic assembly. The electronic unit shall operate on 120v, single phase, 60 Hz power and shall be housed in NEMA 4X enclosure. A 0-60 second time delay shall be provided.
 - C. The conveyor shall be furnished with an emergency trip cord and safety switch. The cord shall run full length of the conveyor. The trip switch shall immediately stop all conveyors when the switch is actuated.
 - D. Volute dewatering press control panel will provide operation of conveyors. An H-O-A switch at the conveyor will allow local control of the conveyor.
 - E. Chutes will be made from minimum ¼ inch plates and attached to conveyor with stainless steel bolts and gaskets.

- F. Supports: A conceptual supports have been shown on drawings. Equipment manufacturer is responsible to design and furnish supports for the contractor to install. Supports must be robust and capable of handling all possible loads from strong winds and machine malfunction.
- G. The conveyor shall be driven by a constant speed gear reducer direct connected to a 460 V, 3 phase, 60 Hz, TEFC electric motor. The drive shall be rigidly supported. The drive end shafts shall be constructed from SAE 4140, 2025, ST-50 shaft steel. Provide flanged ends and mating bolt holes to match conveyor rotor center. The electric motor shall be 5 HP for SC-01 and 3 HP for SC-02.
- H. All gear shall be AGMA Class II, single or double reduction, helical gear units with high capacity roller bearings. Bearings shall be designed for the thrust loads from the fully loaded start up condition and shall have an AFBMA B-10 life of 100,000 hours. The reducer will be air cooled unit with no auxiliary cooling requirement. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor name plate at the driven shaft speed, whichever is higher. The gear housing shall be of 30,000 psi cast iron with removable inspection ports, oil breathers, oil level indicator, fill and drain holes with plugs, and gearing lubricated through an oil bath for the mounting position and indication required.
- I. Structural Supports:
 - 1. Provide structural supports as required to install conveyors as shown on Drawings.
 - 2. Include beams, angles, etc., as required and anchoring devices to attach conveyors to the concrete floor.
- J. Shaftless Flighting
 - 1. Structural Integrity, Process Specification: The spiral shall be made from hot-rolled micro-alloy steel bar which is cold formed into the final specified diameter, pitch, hardness and strength. To eliminate OD spiral thinning or cracking, the cold-forming process must be a two-stage process. Single-stage cold-forming will not be accepted. Such two stages shall first consist of tightly cold rolling at zero pitch on a mandrel which uses a device to control the plastic flow of the spiral during forming and maintain a uniform outside and inside diameter thickness with no neck-down. The second stage of spiral forming shall consist of pulling the closely wound spiral in tension to the specified pitch in a device permitting free spiral rotation. Spirals manufactured in single forming operations of rolling to diameter and pitch simultaneously will not be accepted.
 - 2. The actual spiral manufacturer (not reseller) shall issue a mill certification verifying the fabrication process herein specified.

3. **Size and Physical Properties:** All spiral fighting for the system shall consist of double spirals consisting of two (2) only concentric spirals, an outer spiral (60-mm width maximum x 25-mm thick minimum) and an inner spiral (50-mm width maximum and x20-mm thick minimum) welded together to form a single contiguous cold formed spiral with a final width of at least 110 mm (4.33 inches). Spirals shall have a minimum cross sectional area of 2500 mm², a minimum strength of 80,000 psi, a minimum hardness of 250 Brinell and shall be concentric to within 1/16 inch. Single width spirals or spirals with smaller cross sectional areas will not be accepted under any circumstances.
4. **Spiral Connection:** The spiral fighting shall be connected to the drive shaft by welding the spirals to a 3/4"-inch (20 mm) minimum circular torque transmission plate welded to the spiral and properly reinforced and welded with a curved gusset plate at 180 degrees. The centerline of the spiral shall be perpendicular to the torque plate within $\pm$ 0.015 inch. A separate 3/4-inch (20 mm) minimum torque transmission plate shall be bored with a countersunk and chamfered hole equal to the 1/4 inch less than the shaft diameter and the drive shaft shall be lathe-turned, keyed and undercut concentrically to a tight fit then welded to the plate with a six pass full penetration weld technique. The shaft shall be perpendicular to the torque plate within $\pm$ 0.015 inch. The torque plates shall be connected with three (3) 3/4-inch No. 8 bolts and no space shall show between the connected plates. Spirals welded directly to a shaft or connected in any other way will not be accepted.
5. **Spiral Welding:** Spiral connections shall be welded according to AISC B-U3-GF and be six full-pass full-penetration welds. Flights shall be welded in a jig or the trough to assure true alignment. The OD of the joined spirals shall be completely concentric with no misalignment. Weld jointed spirals shall be straight and not show any misalignment or thump when rotated.

K. Shaftless Screw:

1. The manufacturer shall provide a minimum 12 inch diameter shaftless screw for this application.

L. Inclined conveyor will require two drop chutes with motorized gate valves to allow for isolation of either chute to allow removal of dumpsters for maintenance.

M. Comply with Section 11005.

PART 3 EXECUTION

3.1 INSTALLATION:

- A. **General:** Install screw conveyors to locations and lengths shown on approved shop Drawings.

- B. Install per manufacturer's written instructions.
- C. Conveyors shall be fully assembled and tested in the factory for at least 15 minutes. A video shall be provided to verify testing in the factory.
- D. Provide services of a factory trained manufacturer's representative to inspect check out and place the conveyor in operation. Representative shall demonstrate satisfactory operation and provide training to Owner's personnel. O & M manual will be used for training.
- E. Provide representative on site for four (4) hours for inspection, check out, and start up.
- F. Provide representative on site four (4) hours to show operation to plant personnel and training. Owner may videotape training.
- G. Provide a certificate that equipment has been installed according to approved shop drawings and are satisfactory for operation.
- H. Contractor shall provide all mounting hardware necessary for the equipment that is specified in this specification section.

END OF SECTION

SECTION 15100

VALVES: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Valving, actuators, and valving appurtenances.

B. Related Specification Sections include but are not necessarily limited to:

1. Division 01 - General Requirements.
2. Section 09800 - Painting and Protective Coatings.
3. Section 11005 - Equipment: Basic Requirements.
4. Section 15060 - Pipe and Pipe Fittings: Basic Requirements.
5. Section 15102 – Plug Valves.
6. Section 15106 – Check Valves.
7. Section 15109 – Air Valves.
8. Section 15114 – Miscellaneous Valves.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. American Society of Mechanical Engineers (ASME):
 - a. B1.20.1, Pipe Threads, General Purpose.
 - b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - c. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - d. B16.34, Valves – Flanged, Threaded, and Welding End.
2. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - b. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - c. D638, Standard Test Method for Tensile Properties of Plastics.
 - d. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

- e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
- f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
- 3. American Water Works Association (AWWA):
 - a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
 - b. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
 - c. C504, Standard for Rubber-Seated Butterfly Valves.
 - d. C507, Standard for Ball Valves, 6 IN through 48 IN (150 MM through 1200 MM).
 - e. C509, Standard for Resilient-Seated Gate Valves for Water Supply Service.
 - f. C542, Standard for Electric Motor Actuators for Valves and Slide Gates.
 - g. C550, Standard for Protective Coatings for Valves and Hydrants.
 - h. C606, Standard for Grooved and Shouldered Joints.
- 4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
 - a. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- 5. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. MG 1, Motors and Generators.

1.3 DEFINITIONS

- A. The following are definitions of abbreviations used in this Specification Section or one (1) of the individual valve sections:
 - 1. CWP: Cold water working pressure.
 - 2. SWP: Steam working pressure.
 - 3. WOG: Water, oil, gas working pressure.
 - 4. WWP: Water working pressure.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Division 01 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Valve pressure and temperature rating.
 - d. Valve material of construction.
 - e. Special linings.
 - f. Valve dimensions and weight.
 - g. Valve flow coefficient.
 - h. Wiring and control diagrams for electric or cylinder actuators.
3. Test reports.

B. Operation and Maintenance Manuals:

1. See Division 1 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

C. Informational Submittals:

1. Verification from valve actuator manufacturer that actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted, and that the valve actuator responds correctly to the valve position command.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, refer to individual valve Specification Sections for acceptable manufacturers.

2.2 MATERIALS

- A. Refer to individual valve Specification Sections.

2.3 VALVE ACTUATORS

A. Acceptable manufacturers:

1. Rotork.
2. AUMA.

3. Beck.
4. Or Engineer Approved Equal.

B. Valve Actuators - General:

1. Provide actuators as shown on Drawings or specified.
2. Counterclockwise opening as viewed from the top.
3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 foot-pounds torque on the operating nut.
5. Unless otherwise specified, actuators for valves to be buried, submerged or installed in vaults or manholes shall be sealed to withstand at least 20 FT of submergence.
6. Extension stem:
 - a. Install where shown or specified.
 - b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
 - c. Pin all stem connections.
 - d. Center in valve box or grating opening band with guide bushing.

C. Buried Valve Actuators:

1. Provide screw or slide type adjustable cast iron valve box, 5 IN minimum diameter, 3/16 IN minimum thickness, and identifying cast iron cover rated for traffic load.
2. Box base to enclose buried valve gear box or bonnet.
3. Provide 2 IN standard actuator nuts complying with AWWA C500, Section 3.16.
4. Provide at least two (2) tee handle keys for actuator nuts, with 5 FT extension between key and handle.
5. Extension stem:
 - a. Provide for buried valves greater than 4 FT below finish grade.
 - b. Extend to within 6 IN of finish grade.
6. Provide concrete pad encasement of valve box as shown for all buried valves unless shown otherwise.

D. Plastic Valve Vault:

1. Provide in non-traffic areas only on valve applications 3-1/2 IN and less.
2. Nominal 7-1/2 IN DIA top section.
3. Design unit for screw type extension section having nominal 9 IN DIA bell.
4. Cast iron ring and lid.
5. Constructed of injection molded polyolefin compound with fibrous inorganic component reinforcing and UV stabilization.
6. Armor Access Boxes.

E. Exposed Valve Manual Actuators:

1. Provide for all exposed valves not having electric or cylinder actuators.
2. Provide handwheels for gate and globe valves.
 - a. Size handwheels for valves in accordance with AWWA C500.
3. Provide lever actuators for plug valves, butterfly valves and ball valves 3 IN DIA and smaller.
 - a. Lever actuators for butterfly valves shall have a minimum of 5 intermediate lock positions between full open and full close.
 - b. Provide at least two (2) levers for each type and size of valve furnished.
4. Gear actuators required for plug valves, butterfly valves, and ball valves 4 IN DIA and larger.
5. Provide gearing for gate valves 20 IN and larger in accordance with AWWA C500.
6. Gear actuators to be totally enclosed, permanently lubricated and with sealed bearings.
7. Provide chain actuators for valves 6 FT or higher from finish floor to valve centerline.
 - a. Cadmium-plated chain looped to within 3 FT of finish floor.
 - b. Equip chain wheels with chain guides to permit rapid operation with reasonable side pull without "gagging" the wheel.

8. Provide cast iron floor stands where shown on Drawings.
 - a. Stands to be furnished by valve manufacturer with actuator.
 - b. Stands or actuator to include thrust bearings for valve operation and weight of accessories.
- F. Submerged Actuators:
 1. Mount the valve actuator on top of an extension bonnet 3 FT above any adjacent personnel access, or as shown.
 2. The valve and bonnet connection shall be flanged and watertight.
 3. Provide a top brace support for the bonnet.
 - a. Mount the brace 6 IN below the top of the wall as shown.
 4. Provide intermediate stem extension guides as required.
 5. Materials:
 - a. Extension bonnet: Cast iron ASTM A126 or steel.
 - b. Braces and anchor bolts: Type 316 stainless steel.
- G. Electric Actuators (480 V, 3 PH) (Valves 6 IN and Larger):
 1. Conform to AWWA C542.
 2. Provide electric valve actuators with integral control devices. Where scheduled, provide a remote pushbutton station.
 3. Furnish electric actuator integral with valve consisting of:
 - a. Motor.
 - b. Gearing.
 - c. Handwheel.
 - d. Limit and torque switches.
 - e. Lubricants.
 - f. Heating elements.
 - g. Wiring.
 - h. Terminals for motor power and controls.
 - i. Drive nut.
 4. Housing/enclosure:
 - a. Provide cast iron gear housing and cast iron load bearing enclosure.
 - b. Non load bearing enclosure and housing: Aluminum or cast iron.

- c. Rated for area classification shown on Drawings.
- d. Provide O-ring seals for covers and entries.
- e. Terminal and limit switch compartment covers are to be fastened to gear housing by stainless steel fasteners with capture device to prevent loss.

5. Motors:

- a. Provide motors that are totally enclosed, high torque design made expressly for valve actuator service and capable of operating the valve under full differential pressure for complete open-close and reverse cycle of travel at least twice in immediate succession without overheating.
- b. Design motors in accordance with NEMA MG 1 standards, with Class B insulation, and to operate successfully at any voltage within 10 percent above or below rated voltage.
- c. Provide positive method to ensure motor bearings are permanently lubricated.
- d. Provide three (3) thermal switches imbedded in windings:
 - i. 120 degrees apart.
 - ii. Provide motor shutdown at high temperature.
- e. Motor housing:
 - i. Aluminum or cast iron.
 - ii. Totally enclosed nonventilated with cooling fins.
- f. Provide motor capable of operating in any position.
- g. Provide motor sealed from gearcase to allow any mounting position.
- h. Provide motors suitable for 480 V, 3 PH, 60 Hz.

6. Gearing:

- a. Provide power gearing consisting of heat treated steel helical gears, carburized and hardened alloy steel worm, and alloy bronze worm gear, all grease or oil bath lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter.
- b. Provide gearing mechanism constructed to permit field changes of reduction gear ratio.

- c. Design actuators so that motor comes up to speed before stem load is encountered in either opening or closing operation.
 - d. Limit switch gears and feedback device reduction gearing:
 - i. Steel or bronze.
 - e. Support rotating shafts with anti-friction bearings.
 - f. Provide separate drive nut/thrust bearing assembly:
 - i. Mounted to base of actuator.
 - ii. High tensile bronze.
 - iii. Quarter turn actuator: Provide 90 degree mounting intervals.
 - iv. Provide grease fitting on drive assembly.
7. Handwheel:
- a. Permanently attached for manual operation.
 - b. Positive declutch mechanism to engage and disengage handwheel.
 - c. Handwheel shall not rotate during motor operation.
 - d. Inoperable motor shall not prevent manual operation.
8. Limit torque and thrust loads in both closing and opening directions by torque limit switches.
- a. Provide torque switches with micrometer adjustment and reference setting indicator.
 - i. Assure adjustment variation of approximately 40 percent in torque setting.
 - b. Provide switches having rating of not less than 6 A at 120 Vac and 2.2 A at 115 Vdc.
 - c. Limit and torque switches shall have totally sealed contacts.
9. Furnish electric actuator with two (2) geared limit switch assemblies with each switch assembly having four (4) separate limit switches:
- a. Assure each limit switch assembly is geared to driving mechanism and is independently adjustable to trip at any point at and between the fully open and fully closed valve position.

- b. Provide minimum of two (2) normally open contacts and two (2) normally closed contacts at each end of valve travel.
 - c. Provide switches with inductive contact rating of not less than 6 A at 120 Vac, 3 A at 240 Vac, 1.5 A at 480 Vac, 2.2 A at 115 Vdc and 1.1 A at 230 Vdc.
 - d. Limit switches shall be fully adjustable when power is applied to actuator.
10. Provide space heating elements sized to prevent condensation in both motor and geared limit switch compartment(s).
- a. Furnish heating elements rated at 120 Vac with heaters continuously energized.
11. Open-close actuator controls:
- a. Provide control assembly with necessary holding relays, reversing starter, control transformers of sufficient capacity to provide control power, space heating element power and valve position transmitter.
 - b. Provide control assembly in an enclosure rated for the defined area classification.
 - c. Controls for open/close actuator:
 - i. Provide remote pushbutton station where scheduled with enclosure rated for area classification shown on Drawings with:
 - Open pushbutton.
 - Close pushbutton.
 - Stop pushbutton.
 - Remote/local switch.
 - Full open light.
 - Full close light.
 - Open and close relays as required.
 - ii. Provide control enclosure to accept:
 - Remote open/close switches.
 - iii. Provide contacts in control enclosure:
 - Remote/local contact.
 - Full open contact.
 - Full close contact.
 - iv. Wire all components to an internal terminal strip and include mounted wiring diagram inside enclosure.

H. Electric Actuators (120 V, 1 PH) (Valves 4 IN and Smaller):

1. General:

- a. Conform to AWWA C542.
- b. Self contained including motor, gearing, torque switch, limit switches and cast housing.
- c. Electrical enclosure: NEMA 4 or NEMA 7 to comply with area rating classification shown on Drawings.
- d. Factory assembled requiring only field connection of power and control wires.
- e. Comply with Specification Section 11005.

2. Motors:

- a. Produce 1.5 times the required torque.
- b. Sized for two (2) complete open-close cycles without overheating.
- c. One (1) fully closed to fully open cycle to occur within 60 SEC.
- d. Class F insulation.
- e. Operate at plus or minus 10 percent voltage.
- f. 120 Volt, single phase, 60 Hz.
- g. Provide thermal cutout switch and internal heater for actuator enclosure.
- h. Control wiring as shown on Drawing control diagrams.

3. Remote pushbutton station (where scheduled):

- a. Enclosure: NEMA 4 stainless steel.
- b. Control relays shall include:
 - i. Open relay.
 - ii. Closed relay.
 - iii. PLC interface relay.
- c. Push-to-test indicating lights shall include:
 - i. Open.
 - ii. Closed.
 - iii. Remote.

- d. Selector switches shall include:
 - i. Local-Remote.
 - ii. Open-Close.
- e. Space heater for enclosure.
- f. Control wiring as shown on control diagrams.
- g. Wire all components to an internal terminal strip and include mounted wiring diagram inside enclosure.

2.4 FABRICATION

A. End Connections:

- 1. Provide the type of end connections for valves as required in the Piping Schedules presented in Specification Section 15060 or as shown on the Drawings.
- 2. Comply with the following standards:
 - a. Threaded: ASME B1.20.1.
 - b. Flanged: ASME B16.1, Class 125 unless otherwise noted or AWWA C207.
 - c. Bell and spigot or mechanical (gland) type: AWWA/ANSI C111/A21.11.
 - d. Soldered: ASME B16.18.
 - e. Grooved: Rigid joints per Table 5 of AWWA C606.

B. Refer to individual valve Specification Sections for specifications of each type of valve used on Project.

C. Nuts, Bolts, and Washers:

- 1. Wetted or internal to be stainless steel (type 316).
 - a. Exposed to be zinc or cadmium plated.

D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.

E. Epoxy Interior Coating: Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Painting Requirements: Comply with Specification Section 09800 for painting and protective coatings.
- C. Setting Buried Valves:
 - 1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
 - 2. Set valves and valve boxes plumb.
 - 3. Place valve boxes directly over valves with top of box being brought to surface of finished grade.
 - 4. Install in closed position.
 - 5. Place valve on firm footing in trench to prevent settling and excessive strain on connection to pipe.
 - 6. After installation, backfill up to top of box for a minimum distance of 4 FT on each side of box.
- D. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.
- E. For grooved coupling valves, install rigid type couplings.
- F. Install electric or cylinder actuators above or horizontally adjacent to valve and gear box to optimize access to controls and external handwheel.
- G. For threaded valves, provide union on one (1) side within 2 FT of valve to allow valve removal.
- H. Install valves accessible for operation, inspection, and maintenance.

3.2 ADJUSTMENT

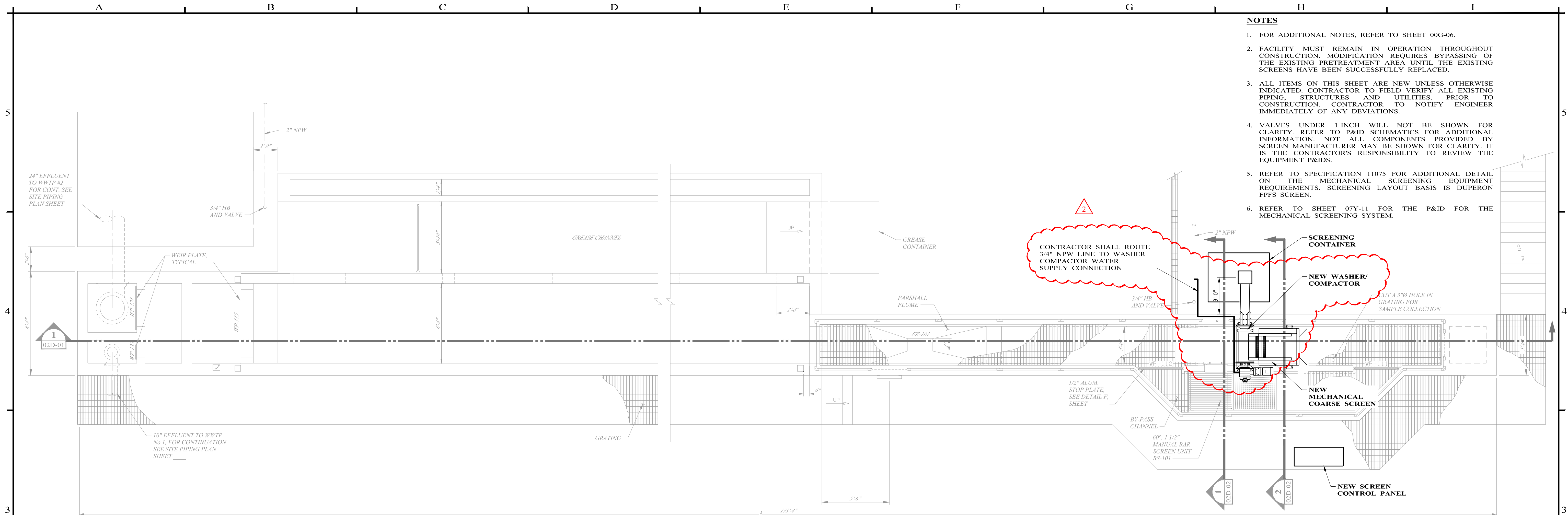
- A. Adjust valves, actuators, and appurtenant equipment to comply with Division 01.
 - 1. Operate valve, open and close at system pressures.
- B. For all 120 Vac and 480 Vac electric actuators, employ and pay for services of valve actuator manufacturer's field service representative to:
 - 1. Inspect valve actuators covered by this Specification Section.

2. Supervise adjustments and installation checks:
 - a. Open and close valves electrically under local manual and demonstrate that all limit switches are properly adjusted and that switch contacts are functioning properly by verifying the inputs are received at the remote input/output (RIO) panels or local control panel as appropriate.
 - b. Simulate a valve position command signal at the RIO panel or local control panel as appropriate and demonstrate that the valve is controlled to the desired position without excessive hunting.
3. Provide Owner with a written statement that the valve actuator manufacturer has verified that the actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted and that the valve actuator responds correctly to the valve position command.

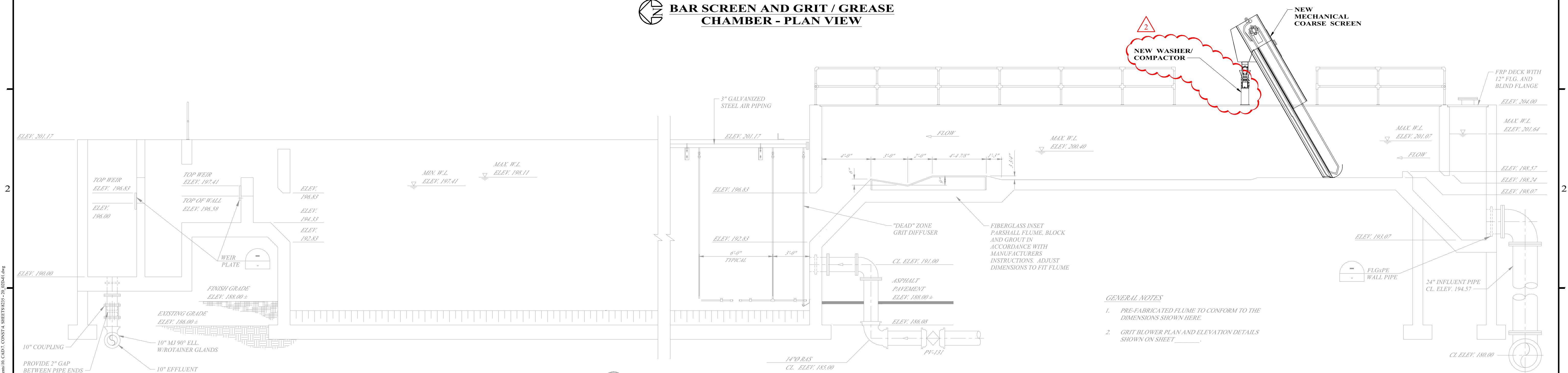
3.3 VALVE SCHEDULE

- A. Reserved.

END OF SECTION

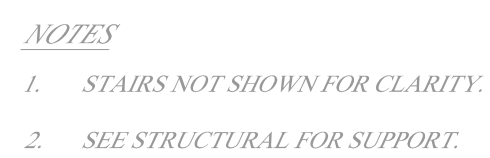


BAR SCREEN AND GRIT / GREASE CHAMBER - PLAN VIEW



SECTION

NO.	REVISION	DATE	08/24/2026		DESIGNED BY B. THOMPSON		SCALE 1/4" = 1'-0"		ROMA WWTP IMPROVEMENTS ROMA, STARR COUNTY, TEXAS		PROJECT NO.: 8235
1	ISSUED FOR BID	08/03/2026									SEQUENCE No. 17 OF 51
2	ADDENDUM #1	08/24/2026							PRETREATMENT STRUCTURE MODIFICATION PLAN VIEW AND SECTION (BASE BID)		SHEET No. 02D-01



2
02D-01



08/24/2026

Bret Thompson



BAR IS ONE INCH ON
ORIGINAL DRAWING



IF NOT ONE INCH ON
THIS SHEET, ADJUST
SCALES ACCORDINGLY

SCALE

$3/8" = 1'-0"$

DATE

08/03/2026

PROJECT NO.:	8235
SEQUENCE No.	19 OF 51
SHEET No.	02D-03