

SECTION 44 42 30
INCLINED ROTATING DRUM SCREENS

EQUIPMENT AND COMPONENT NUMBER(S)

SCR-2111: Influent Screen 1.
SCR-2211: Influent Screen 2.
SCR-2112: Fine Screen 1.
SCR-2212: Fine Screen 2.
LCP-2111: Influent Screen 1 Vendor Control Panel.
LCP-2211: Influent Screen 2 Vendor Control Panel.
LCP-2112: Fine Screen 1 Vendor Control Panel.
LCP-2212: Fine Screen 2 Vendor Control Panel.
LCS-2111: Influent Screen 1 Local Control Station.
LCS-2211: Influent Screen 2 Local Control Station.
LCS-2112: Fine Screen 1 Local Control Station.
LCS-2212: Fine Screen 2 Local Control Station.
LE/LIT-2151: Influent Screen 1 Upstream Level Element and Transmitter.
LE/LIT-2251: Influent Screen 2 Upstream Level Element and Transmitter.
LE/LIT-2153: Fine Screen 1 Upstream Level Element and Transmitter.
LE/LIT-2253: Fine Screen 2 Upstream Level Element and Transmitter.
LE/LIT-2152: Influent Screen 1 Downstream Level Element and Transmitter.
LE/LIT-2252: Influent Screen 2 Downstream Level Element and Transmitter.
LE/LIT-2154: Fine Screen 1 Downstream Level Element and Transmitter.
LE/LIT-2254: Fine Screen 2 Downstream Level Element and Transmitter.
SV-2111a, b, and c, SV-2211a, b, and c, SV2112a, b, and c, SV2212a, b, and c, Washwater Solenoid Valves, Total of 12.

PART 1 GENERAL

1.01 SUMMARY

- A. Contractor shall furnish two influent screens and two fine screens. Screens shall be in-channel, inclined rotating drum screens for removing floating, particulate and fibrous material from raw sewage. Screened material shall be washed and dewatered and discharged from a bagger into a roll-off container as shown.
- B. All equipment called for under this section shall be provided by a single supplier.
- C. Contractor shall coordinate all details of the equipment with other related parts of the Work. Contractor shall verify that all structures, piping, wiring, and equipment components are compatible. Contractor 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. Screens and local control stations will be installed in an indoor unconditioned space and vendor control panels will be installed in an indoor conditioned space and exposed to temperatures and humidity as specified in Section 01 67 00, Product Requirements.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:

1. American Bearing Manufacturers' Association (ABMA): 11, Load Ratings and Fatigue Life for Roller Bearings.
2. American Gear Manufacturers Association (AGMA):
 - a. 2015-1-A01, Accuracy Classification System – Tangential Measurements for Cylindrical Gears.
 - b. 6034-B92, Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors.
 - c. 9005-E02, Industrial Gear Lubrication.
3. American Welding Society (AWS):
 - a. D1.1/D1.1M, Structural Welding Code – Steel.
 - b. QC 1, Standard for AWS Certification of Welding Inspectors.
4. ASTM International (ASTM):
 - a. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - b. C582, Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
 - c. D3917, Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastics Pultruded Shapes.
5. National Electrical Code (NEC).
6. National Electrical Manufacturers' Association (NEMA): MG 1, Motors and Generators.
7. National Fire Protection Association (NFPA): 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
8. UL: 674, Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.

1.03 SUBMITTALS

- A. Action Submittals:

1. Shop Drawings:
 - a. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials for construction.

- b. Detailed structural, mechanical, and electrical drawings showing equipment fabrications and interface with other items including recommended channel sloping and chamfering and coordination with checker plate channel cover.
- c. Dimensions, size, and locations of connections to other work.
- d. Details of attachment and support in channel.
- e. Gear output torque calculations.
- f. Gear reducer data including service factor, efficiency, torque rating, and materials.
- g. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and motor modifications. See Section 26 20 00, Low-Voltage AC Induction Motors, for motor submittal requirements.
- h. Functional description of internal and external instrumentation and controls including list of parameters monitored, controlled, or alarmed.
- i. Control panel elevation drawings showing fabrication and placement of operator interface devices and associated elements.
- j. Power and control wiring diagrams, including terminals and numbers.
- k. See Section 40 99 90, Package Control Systems, for additional submittal requirements.
- l. Shop painting systems, including manufacturer's descriptive technical catalog literature and specifications.
- m. External utility requirements for air, water, power, drain for each component.
- n. Reference installation list with contact information.
- o. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.
- p. Procedures for pickling and passivation.

B. Informational Submittals:

- 1. Factory test reports.
- 2. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
- 3. Manufacturer's Certificate of Compliance of factory-applied coating system.
- 4. Manufacturer's installation instructions.
- 5. Special shipping, storage and protection, and handling instructions.
- 6. Written factory test report of inspection.
- 7. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
- 8. Field functional and performance test reports.

9. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data, including routine maintenance requirements prior to plant startup.

1.04 QUALIFICATIONS

- A. Welding Inspector: Certified in accordance with AWS QC 1, and having prior experience with welding codes specified.
- B. Manufacturer shall have established an ISO 9001 certified quality management system. Manufacturers without an ISO 9001 certified quality management program must provide complete documentation of their existing quality management system with supplemental information clarifying why areas do not meet ISO 9001 standards. Meeting national quality management standards alone shall not be considered an acceptable substitute because ISO standards exceed national quality management standards.
- C. Manufacturer shall have established an ISO 14001 certified environmental protection management system. Manufacturers without an ISO 14001 certified environmental protection management system must provide complete documentation of their existing environmental protection management system with supplemental information clarifying why areas do not meet ISO 14001 standards. Meeting national or local environmental protection management standards alone shall not be considered an acceptable substitute because ISO standards exceed national and local environmental protection management standards.
- D. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material because of forming, manufacture, or handling. After removal from the pickling 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, which is critical to the long life of the stainless steel.
- E. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are fabricated, in order to prevent contamination by rust.
- F. All welding is performed in accordance with American Welding Society (AWS), European Welding Federation (EWF), International Institute of Welding (IIW).
- G. Manufacturer shall provide screen, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.

- H. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or installation, defective workmanship or materials, and breakage or other failure. 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 sizes 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.

1.05 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. Contractor shall be responsible for unloading and shall have equipment onsite at the time of delivery permitting proper hoisting of the equipment.

1.06 SPARE PARTS

- A. The following spare parts shall be included and supplied by the Supplier:
 - 1. One set of hopper cleaning brushes for influent screens.
 - 2. One set of hopper cleaning brushes for fine screens.
 - 3. Two complete solenoid valve rebuild kit for influent screens.
 - 4. Two complete solenoid valve rebuild kit for fine screens.
 - 5. Six plastic rollers for fine screens.
 - 6. Ten boxes with 230 feet endless bags.
- B. One set of all special tools, if required, shall be included and supplied by the Supplier.

PART 2 PRODUCTS

2.01 SUPPLIERS

- A. Equipment and accessories specified in this section shall be products of:
 - 1. Influent Screens:
 - a. Huber Technology, Inc., Ro1 780.
 - b. Or equal.

2. Fine Screens:
 - a. Huber Technology, Inc., RPPS-Star 1000.
 - b. Or equal.
- B. Supplier shall have provided a minimum of 20 in-channel inclined drum screens at municipal wastewater treatment plants in North America. At least five of these installations shall be for 6 mm bar screens. At least five of these installations shall be 1 mm perforated plate screens. All referenced installations shall have been in operation for a minimum of 1 year. Provide reference installation list as a submittal.

2.02 GENERAL SYSTEM CHARACTERISTICS

- A. Physical Characteristics:
 1. Influent Screens:
 - a. Number of Influent Screens: Two.
 - b. Type of Opening: Bar.
 - c. Bar Spacing: 6 mm.
 - d. Nominal Screen Basket Diameter: 780 mm.
 - e. Channel Geometry and Configuration: As shown.
 - f. Inclination: 35 degrees from horizontal.
 - g. Influent screens shall be provided with an internal rotating rake, an integral screw conveyor, and screenings press. Influent screen cleaning shall be accomplished with an internal rotating rake. The rake shall be cleaned by passing in reverse movement through a hinged cleaning comb.
 2. Fine Screens:
 - a. Number of Fine Screens: Two.
 - b. Type of Opening: Perforated Plate.
 - c. Perforation Diameter: 1 mm.
 - d. Nominal Screen Basket Diameter: 1,000 mm.
 - e. Channel Geometry and Configuration: As shown.
 - f. Inclination: 35 degrees from horizontal.
 - g. Fine screens shall consist of a rotating cylindrical screen with an integral screw conveyor and screenings press. Fine screen cleaning shall be accomplished with a spray bar and basket cleaning brush.
 3. The screens shall use a single drive for screening, conveying, dewatering, and compressing the screening material.
 4. Initiation of the screen cleaning mechanism shall be automatically initiated at an adjustable preset high upstream or differential liquid level. Screens which operate continuously or via timer only will not be acceptable. Screenings shall be removed from the screenings basket and deposited into the concentric screw conveyor hopper. The screenings

- shall be transported up the screw conveyor and through a compaction zone and shall be discharged into bags.
5. Each screen unit shall consist of a screen basket, concentric screw conveyor, dewatering screw, screening press with drive unit.
 6. To minimize odors, the conveyance, dewatering and compaction zones shall be completely enclosed.
 7. Discharge at minimum elevation of 4 feet above operating floor.
 8. The spray wash system shall be enclosed such that spray water, aerosols or leakage do not contaminate the operating floor.
 9. Unless otherwise specified in these specifications, the entire equipment shall be manufactured from AISI 316L austenitic stainless steel shapes (rods, angles, and channels), pipes, and sheets. All mechanical parts shall be designed to handle the forces that may be exerted on the unit during fabrication, shipping, erection, and proper operation according to the O&M manual.
 10. The entire equipment shall be manufactured in a stainless steel only factory to prevent contamination of the stainless steel with foreign contaminants.
 11. The equipment, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be classified with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence ensures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection.
 12. The screen shall be complete with electrical control panel and motor starter.
 13. Provide all necessary electrical components and wiring for a complete functional system. Electrical components shall conform with the requirements of Division 26, Electrical.

B. Functional Characteristics:

1. Drive Motor Size: 1.5 hp.
2. The average perforation flow through velocity shall not exceed 3.3 ft/sec (1.0 m/sec) under any flow condition up to the maximum flow specified above. The screen design shall minimize solids deposits in the channel.

C. Performance Characteristics:

1. Material Handled: Raw sewage.
2. Maximum Total Suspended Solids: 500 mg/L at all flows.
3. Location: Indoors.
4. Exposure: Variable concentrations of hydrogen sulfide.
5. Equipment Environment Application Rating: NEC, Class I, Division 1.
6. Influent Screens:
 - a. Average Flow per Screen: 0.3 million gallons per day.
 - b. Maximum Flow per Screen: 2 million gallons per day.
 - c. Maximum Upstream Water Depth: 17 inches at 50 percent blinding.
 - d. Maximum Downstream Water Depth: 11 inches.
 - e. Maximum Flow through Velocity: 3.3 feet per second.
 - f. Wet Screenings Capacity: 70 cubic feet per hour.
7. Fine Screens:
 - a. Average Flow per Screen: 0.3 million gallons per day.
 - b. Maximum Flow per Screen: 1.2 million gallons per day.
 - c. Maximum Upstream Water Depth: 12 inches at 50 percent blinding.
 - d. Maximum Downstream Water Depth: 6 inches.
 - e. Maximum Flow through Velocity: 3.3 feet per second.
 - f. Wet Screenings Capacity: 70 cubic feet per hour.
8. The screens shall be capable of processing spherical objects with a diameter of 3-1/8 inches. Such objects shall be conveyed through the auger and shall be discharged with the screenings. The unit shall be capable of processing the screenings load specified above.
9. The screening equipment shall produce dewatered screenings capable of passing the EPA Paint Filter Test as described in Method 9095 of EPA Publication SW-486.

2.03 EQUIPMENT

A. Screen Basket:

1. Physical Characteristics:
 - a. The screen basket shall have a cylindrical shape, which shall be open at the front and top.
 - b. Influent screens shall be provided with the following:
 - 1) Bars shall be perpendicular to the centerline of the screen. The circular bars shall have a minimum width of 5/32 inch and a minimum depth of 1-11/64 inches, and shall be adequately machined so that the rake's teeth fully penetrate the gaps between the bars to ensure proper cleaning of the full basket depth. Screen bars will be single depth to ensure accurate and uniform engagement with the cleaning rake

- teeth, and to provide the most beneficial hydraulic conditions. Designs which utilize variable height bars with bar depths lower than that stated above, or do not provide machined screen bars will not be acceptable for this Project.
- 2) The main screen basket upper support flange shall be manufactured to mate with the conveyor tube support flange. Flanges shall be bolted together with a set of adjustable mounting bolts nuts and a second set of fixing nuts to allow the plant operators to adjust alignment of the flanges in the field in case of complete basket replacement with a different screening media.
 - 3) A hinged protective stainless steel cover with a thickness of 1/10 inch shall be provided to cover the open top of the screen basket. Materials other than corrosion resistant stainless steel shall not be allowed to ensure maximum operator safety.
- c. Fine screens shall be provided with the following:
- 1) The upper end of the basket shall incorporate a support ring which shall be machined and supported by three guide rollers made of polyamide. The guide rollers shall be attached to an upper support plate. This plate shall match a flange that is attached to the auger tube to ensure proper alignment of the basket. A brush shall be clamped to the upper support plate sealing the gap between the rotating screen basket and the fixed upper support plate.
 - 2) The lower support ring of the basket shall be connected to the shaft of the auger and be driven by a common drive with the auger. The basket shall be connected with a solid support arm at the lower end of the basket which is bolted to the auger shaft.
- d. The screen shall be provided with a support stand allowing for easy removal of the screen from the channel for maintenance purposes. The support stand shall be fabricated from stainless steel Double-C-Channels, each having a minimum thickness of 1/8 inch.
2. Functional Characteristics: A seal plate shall be provided between the circular screen and the channel. The seal plate shall be one-piece fabricated of stainless steel plate. The sealing plate shall be of sufficient height to prevent bypassing of flow around the screen at the maximum screen hydraulic capacity. A polyurethane seal, affixed to the stationary face baffle and fold to the inside periphery of the rotating drum (hydrostatic pressure of the water inside the drum shall aid in the seal), shall be provided to ensure that there will be no bypass of unwanted solids through the screen. Screens using a brush or a combination of brush and a rubber seal attached to the backside of the baffle plate (hydrostatic pressure of water inside of drum counteracts against the

seal) for sealing the gap between the fixed seal plate and the rotating screen basket shall not be allowed.

3. Performance Characteristics: The cylindrical screen shall be designed and built to withstand all static and hydraulic forces exerted by the liquid to the screen. All structural and functional parts shall be sized for the loads encountered during screening, conveying, and pressing operations.

B. Cleaning System:

1. Influent Screens:

a. Physical Characteristics:

- 1) Utilize a Rotating Rake and Cleaning Comb:
- 2) The rotating rake assembly shall include teeth penetrating the depth of the screen bars to ensure positive solids removal. The shape of the teeth and their roots shall exactly match the shape of the basket bars to ensure proper cleaning of the screen. Rake teeth shall be water-jet cut for superior tolerances. Designs which use a screw conveyor with a brush to clean the screen will not be acceptable for this Project.
- 3) The cleaning comb shall be water-jet cut for superior tolerances and shall exactly match the rake profile to ensure complete cleaning of the spaces to the root of each rake tooth. The cleaning comb shall be supported at both ends by brass pins with PTFE bearings and shall pivot and return to its standby position without the use of counterweights.
- 4) A stainless steel backed set of nylon brushes shall be attached to the rake arm and positioned such that they sweep the rim of the screenings hopper to remove material caught on the rim.

b. Functional Characteristics: The rake shall reverse at least once during the cleaning cycle to pass through the topmost (home) position where it shall be cleaned by a stainless steel cleaning comb that is attached by means of a hinge to the top of the screen basket.

c. Performance Characteristics: Rake and comb shall ensure complete removal of all screenings from basket and deposition into the screenings conveyor.

2. Fine Screens:

- a. Physical Characteristics: A stainless steel backed nylon brush shall be attached to the rotating basket and positioned to make contact with the screening trough to sweep material caught on the edges of the trough.
- b. Functional Characteristics: The screen basket shall continuously rotate in one direction and pass through the topmost position where

it shall be cleaned by the stainless steel backed cleaning brush and the spray bar. The cleaning brush shall be mounted upon a holding device which keeps the brush in constant contact with the basket and will automatically adjust to allow for brush wear.

- c. Performance Characteristics: Rake and comb shall ensure complete removal of all screenings from basket and deposition into the screenings conveyor.

C. Screenings Conveyor and Wash Press:

1. Influent Screens:

a. Physical Characteristics:

- 1) The screenings screw conveyor tube shall have a diameter of 10.75 inches, and shall contain two anti-rotation bars each with a minimum thickness of 1/4 inch, welded to the inside of the transport tube along its longitudinal axis. The screenings screw conveyor shall not be in contact with the anti-rotation bars during normal operation.
- 2) A flange with a thickness of 5/8 inch shall be attached to the screenings transport tube to support the screen basket and the screenings hopper. A 30/64-inch thick gear box support flange shall be welded to the upper end of the screenings transport tube for support of the drive assembly.
- 3) A shafted stainless steel screw shall be installed in the tube for conveying and compaction of the screened material with a minimum diameter of 9.6 inches. A replaceable flight section with an angle of about 120 degrees that is bolted to the shaft shall be provided at the bottom of the shaft where the wear is highest. A shaftless screw shall not be acceptable.
- 4) The upper and lower ends of the screw conveyor shaft shall be fitted with shrink fitted solid stubs and welded. After shrink fitting and welding, the finished screw conveyor shaft will be balanced and then machined in a lathe to ensure perfect alignment and prevent metal fatigue. Screw conveyors not manufactured in this method and specifically bolted stub shafts at risk of metal fatigue, are expressly not acceptable.
- 5) The lower stub shall be supported by a bearing that is lubricated for life. The bearing shall include a bronze slide bushing that is provided with a low friction PTFE coating and a pair of lipseals. The entire lower bearing assembly shall be held in place using stainless steel bolted plates; designs that use C-clips or nonmetallic cover method are not acceptable. The lower bearing shall not take any thrust from the screw. Bearings with insufficient sealing that require a

positive internal water pressure to remain clear of debris or for lubrication (with water, oil, or grease) shall not be acceptable for this Project.

- 6) The lower bearing shaft and the rake arm shall be designed such that material wrapping around them is minimized. A seal plate shall be furnished on the rotating arm to prevent material buildup around the lower portion of the shaft. Designs not utilizing such a plate are not acceptable.
 - 7) A compaction zone shall be an integral part of the screenings screw conveyor and transport tube design.
 - 8) The compaction zone shall be provided with split glass fiber reinforced housing, furnished with gaskets and bolts, and easily removable for access. Designs requiring removal of the drive assembly, discharge head, or screw conveyor to gain access to the compaction zone will not be acceptable. The housing shall be provided with a drain connection at its lowest point and a clamped flexible PVC hose for drain water whose other end is connected to a connection through the screen basket's upper support flange to return the drain water into the screen basket. The plastic housing shall also be provided with a 1-inch flush connection.
- b. Functional Characteristics: The compaction zone shall be designed to form a screenings plug of material and to return water released from the screened material back to the wastewater channel through circular holes that are machined into the screenings transport tube.
 - c. Performance Characteristics: Receive, convey, wash and dewater screenings at specified screenings production to meet Paint Filter Test.
2. Fine Screens:
- a. Physical Characteristics:
 - 1) The auger tube shall have a diameter of 10.75 inches. The auger tube shall incorporate two anti-rotation bars which shall be welded to the inside of the transport tube along the longitudinal axis. The screw shall not be in contact with the anti-rotation bars during normal operation, the screw shaft shall be supported by a PTFE lined bronze slide bearing at the bottom and the gear box at the top.
 - 2) A support flange with a minimum thickness of 0.6 inch shall be welded to the screenings transport tube. The screen basket rollers and the screenings collection hopper shall be attached to this plate.
 - 3) A gear box support flange with a minimum thickness of 0.467 inch shall be welded to the upper end of the screenings transport tube for attachment of the drive assembly.

- 4) A shafted auger screw that is entirely made of stainless steel shall be provided to transport and dewater the screened material. A shaft-less screw shall not be acceptable. Screw flights shall be of decreasing pitch approaching the compaction zone to provide a mechanical compressing action on the screenings material. The shaft shall have a diameter of 3.5 inches and shall have flights with a minimum thickness of 0.2 inch in the transport zone and 0.4 inch in the compaction zone. A replaceable flight section with an angle of about 120 degrees that is bolted to the shaft shall be provided at the bottom of the shaft where the wear is highest.
- 5) A compaction zone shall be an integral part of the screenings screw conveyor and transport tube design.
- 6) The compaction zone shall be provided with split glass fiber reinforced housing, furnished with gaskets and bolts, and easily removable for access. Designs requiring removal of the drive assembly, discharge head, or screw conveyor to gain access to the compaction zone will not be acceptable. The housing shall be provided with a drain connection at its lowest point and a clamped flexible PVC hose for drain water whose other end is connected to a connection through the screen basket's upper support flange to return the drain water into the screen basket. The plastic housing shall also be provided with a 1-inch flush connection.
- b. Functional Characteristics: The compaction zone shall be designed to form a screenings plug of material and to return water released from the screened material back to the wastewater channel through circular holes that are machined into the screenings transport tube.
- c. Performance Characteristics: Receive, convey, wash and dewater screenings at specified screenings production to meet Paint Filter Test.
3. Spray Wash System:
 - a. Physical Characteristics:
 - 1) The screen will be provided with a central wash water manifold which shall include a single feed connection of 1-1/4 inches. The manifold shall be designed to evenly distribute wash water to all washing points on the screen utilizing three electrically operated solenoid valves.
 - 2) Automatic screen wash systems shall be provided.
 - 3) The common water connection shall be provided with a brass body Y-strainer. The strainer shall include a removable and washable stainless steel 20-mesh (800 micron) filter element. A water manifold with one input and three output water connections shall be provided.

- 4) Three solenoid valves shall be provided per screen, total of twelve.
- b. Functional Characteristics:
 - 1) The wash systems shall be operated on an intermittent basis only. Wash systems which operate continuously will not be acceptable.
 - 2) The solenoid valves shall be operated by the programmable logical controller. Manual operation of the solenoid valves shall also be possible from the local control station.
 - 3) Solenoid valves shall meet the requirements specified in Section 40 27 02, Process Valves and Operators. Solenoid valves shall be rated for a Class 1, Division 1 space per NFPA 820. Solenoid valves shall be slow closing and fail open.
 - 4) Influent Screens: The screen and screenings wash systems shall be designed for a water supply of 52 gpm with a min pressure of 75 psi (5 bar).
 - 5) Fine Screens: The screen and screenings wash systems shall be designed for a water supply of 31 gpm with a min pressure of 75 psi (5 bar).
- c. Performance Characteristics:
 - 1) The spray wash system shall wash screenings to remove organic material.
 - 2) The dewatered screenings produced shall be capable of passing the EPA Paint Filter Test as described in Method 9095 of EPA Publication SW-486.

D. Screen Drive:

1. Physical Characteristics:
 - a. The rake mechanism and screw shall be driven by a shaft mounted gearbox and motor assembly. The gear reducer shall be bolted to a machined flange welded to the upper end of the conveyor tube. The motor shall be provided with thermostats to provide thermal overload protection in addition to current overload protection.
 - b. Enclosed shaft mounted helical worm-gear or helical level gear type speed reducer directly connected to flanged, gasketed, and integrally mounted electric motor.
 - c. Speed Reducer:
 - 1) Cast-iron housing.
 - 2) Conform to AGMA 6034-B92.
 - d. Minimum service factor rating of 1.0 based upon motor nameplate horsepower, or 1.4 based on design operating load, whichever is greater.
 - 1) Minimum AGMA 2015-1-A01, Service Class 2.

- e. Antifriction bearings with ABMA L-10 life of 100,000 hours minimum. Tapered roller bearings on output shaft.
 - f. Oil fill, drain, and level indicator devices with lubricant in accordance with AGMA 9005-E02.
 - g. The gear reducer shall be driven by a 1,750 rpm, three-phase, 60 Hz, 460 volt, Class 1, Division 2, inverter-duty motor with a conduit box suitable for outdoor operation. Motor power shall be 1.5 hp.
 - h. Provide motors meeting requirements of Section 26 20 00, Low-Voltage AC Induction Motors.
 - i. The influent screens shall have a proximity sensor for locating the rake position shall be mounted to the outer drive housing with a fabricated stainless steel bracket. Limit switches or other electro-mechanical position sensing devices will not be acceptable for this Project.
- 2. Functional Characteristics: None.
 - 3. Performance Characteristics: None.

E. Bagger:

- 1. Physical Characteristics:
 - a. Provide bagger on discharge from each screen.
 - b. A stainless steel adapter flange and a plastic cassette bag holder shall be utilized to mount for the screenings discharge. The adapter flange shall be fitted to the discharge chute such that it is positioned as close to horizontal as possible. The plastic holder shall be attached to the stainless steel adapter and shall hold the continuous cassette bag.
 - c. The adapter flange shall be stainless steel. The holder shall be of ABS plastic and shall consist of two parts, a tube and brim, which shall be held together by a stainless steel ring. The cassette bag shall be 230 feet (70 m) long, non-porous, three-ply, co-extruded polyethylene with a min thickness of 1.8 mils and a dart drop of not less than 1.80 pounds (820 g).
- 2. Functional Characteristics: The bagging system components shall be attached to the screenings discharge. A cassette bag shall be fitted to the end of the bagging system and will collect any discharged material. The end of the cassette bag will be tied in a knot. When the operator decides that the cassette bag is full, the cassette bag shall be cut and the exposed ends tied in knots.
- 3. Performance Characteristics: A continuous bagging system shall be provided to abate odors and to seal dewatered screenings to prevent any direct contact. The discharge bagging system shall provide a clean, odor-free means of collecting and containing the material discharged from the screenings equipment.

2.04 CONTROLS:

A. General Scope and Supply:

1. Provide the following control panels:
 - a. LCP-2111: Influent Screen 1 Vendor Control Panel.
 - b. LCP-2211: Influent Screen 2 Vendor Control Panel.
 - c. LCP-2112: Fine Screen 1 Vendor Control Panel.
 - d. LCP-2212: Fine Screen 2 Vendor Control Panel.
 - e. LCS-2111: Influent Screen 1 Local Control Station.
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 - i. LE/LIT-2151: Influent Screen 1 Upstream Level Element and Transmitter.
 - j. LE/LIT-2251: Influent Screen 2 Upstream Level Element and Transmitter.
 - k. LE/LIT-2153: Fine Screen 1 Upstream Level Element and Transmitter.
 - l. LE/LIT-2253: Fine Screen 2 Upstream Level Element and Transmitter.
 - m. LE/LIT-2152: Influent Screen 1 Downstream Level Element and Transmitter.
 - n. LE/LIT-2252: Influent Screen 2 Downstream Level Element and Transmitter.
 - o. LE/LIT-2154: Fine Screen 1 Downstream Level Element and Transmitter.
 - p. LE/LIT-2254: Fine Screen 2 Downstream Level Element and Transmitter.
2. All controls necessary for the fully automatic operation of the screens shall be provided.
3. Controls: In accordance with general control requirements and component qualities specified in Section 40 99 90, Package Control Systems.

B. Physical Characteristics:

1. Control Panel Enclosure Type:
 - a. Vendor Control Panels: Unclassified, NEMA 4X.
 - b. Local Control Stations: NEC, Class I, Division 2, NEMA 7.
2. Raceways and wiring installed on unit at factory shall be in accordance with requirements for corrosive and hazardous areas as applicable.
3. In accordance with general control requirements and component qualities specified in Section 40 99 90, Package Control Systems.
4. All controls necessary for the fully automatic operation of the screens shall be provided, including one NEMA 4X main control panel per

- screen, total of four, and one NEMA 7 local control station per screen, total of four.
5. The electrical control system shall provide for automatic control of the screen via a high liquid level using an ultrasonic level sensor in combination with an adjustable timer. Additionally, an adjustable timer can trigger automatic control of the screen.
 6. The influent screens shall be provided with a home position sensor.
 7. Main control panel shall be suitable for indoor, floor mounting in a conditioned space. Enclosure shall be NEMA 4X Type 304 stainless steel with continuous hinge and lockable door latch, and shall include the following:
 - a. Door-interlocked and fused disconnect.
 - b. 600V ac terminal block.
 - c. VFD and circuit breaker branch circuit protection for screen motor.
 - d. Control power transformer with 120V ac transient voltage surge compressor (TVSC) and fused primary and secondary
 - e. Provide Programmable Logic Controller (PLC), OIT, and managed Ethernet switch in accordance with Section 40 99 90, Package Control Systems.
 - f. Pilot Lights for:
 - 1) Control power on.
 - 2) Screen running.
 - 3) Screen high level.
 - 4) Screen fault.
 - g. Screen reset pushbutton.
 - h. Door mounted elapsed time meters for the following:
 - 1) Screen drive.
 - i. Digital inputs for the following:
 - 1) High water level.
 - 2) One spare input.
 - j. External Interfaces:
 - 1) Remote dry contact outputs for the following:
 - a) Screen running.
 - b) Screen fault.
 - c) Screen E-stop.
 - d) Screen High level.
 - e) One spare output.
 8. A local control station shall be provided, and shall be suitable for stanchion-mounting. Enclosure shall be NEMA 7 cast aluminum, and shall include the following:
 - a. HAND/OFF/AUTO selector switches for the following:
 - 1) Screen drive.
 - b. Screen FORWARD/OFF/REVERSE: Screen drive.

- c. Spray Wash Pushbuttons:
 - 1) Spray bar.
 - 2) Screenings washing system.
 - 3) Compaction zone flushing.
 - d. E-stop pushbutton.
 - 9. External Interfaces:
 - a. Communications:
 - 1) Screening system shall communicate status to plant SCADA system via Ethernet. At a minimum the following signals must be available:
 - a) Screen running.
 - b) Screen fault.
 - c) Screen E-stop.
 - d) Screen High level.
 - 2) Screening system shall receive remote control commands from SCADA system via Ethernet. At a minimum the following commands must be available:
 - a) Enable Unit Operations.
 - 3) Extent of controls and communications to plant SCADA shall be coordinated during submittal review.
 - 10. Level elements and transmitters shall be ultrasonic and meet the requirements of Section 40 91 00, Instrumentation and Control Components.

C. Functional Characteristics: See Section 40 99 90, Package Control Systems.

D. Performance Characteristics: See Section 40 99 90, Package Control Systems.

2.05 APPURTENANCES

- A. General: Furnish lifting lugs for equipment assemblies and components weighing over 100 pounds.
- B. Provide a polychloroprene skirt at screen penetration of checker plate covering channel. Utilize bolted backing rods to attach skirt to top of checker plate. Attach skirt to screen with band clamp.
- C. Nuts, Bolts, and Other Fasteners:
 - 1. Physical Characteristics: Type 316 stainless steel.
 - 2. Functional Characteristics: None.
 - 3. Performance Characteristics: None.

D. Equipment Identification Plates:

1. Physical Characteristics:
 - a. 16-gauge, Type 16 stainless steel securely mounted on main structural frame and control panel in readily visible location.
 - b. Plate shall bear 1/4-inch-high engraved block type black enamel filled equipment identification number and letters.
2. Functional Characteristics: None.
3. Performance Characteristics: None.

E. Anchor Bolts:

1. Physical Characteristics: Type 316 stainless steel, sized by equipment manufacturer and as specified in Section 05 50 00, Metal Fabrications.
2. Functional Characteristics: See Section 05 50 00, Metal Fabrications.
3. Performance Characteristics: See Section 05 50 00, Metal Fabrications.

2.06 FACTORY FINISHING

A. Physical Requirements:

1. For ferrous metal surfaces, prepare, prime, and finish coat in accordance with Section 09 90 00, Painting and Coating, System No. 4.
2. Stainless steel shall be cleaned and passivated following fabrication in accordance with ASTM A380.

B. Functional Requirements: None.

C. Performance Requirements: None.

2.07 SOURCE QUALITY CONTROL

A. General:

1. Factory Inspections: Inspect control panels for required construction, electrical connection, and intended function.
2. Factory Tests and Adjustments:
 - a. Test each screen assembly, in its operating position, to ensure operational controls and operation of protective devices and override controls.
 - b. Run equipment and test for minimum of 6 hours. Testing shall be done in factory with unit oriented in its installed position.

B. Physical Requirements: None.

C. Functional Requirements: None.

D. Performance Requirements: None.

PART 3 EXECUTION

3.01 INSTALLATION

- A. In accordance with manufacturer's written instructions.
- B. Anchor Bolts: Accurately place using templates provided by manufacturer and as specified in Section 05 50 00, Metal Fabrications.

3.02 FIELD FINISHING

- A. Touchup damaged areas of painted ferrous metal in accordance with and as specified in Section 09 90 00, Painting and Coating.

3.03 FIELD TESTING AND FACILITY STARTUP

- A. Field Testing and Facility Startup shall be in accordance with the requirements of Section 01 91 14, Equipment Testing and Facility Startup.
- B. Facility startup specifies the order and prerequisites for the following tests of the equipment:
 - 1. Field functional testing.
 - 2. Software operational testing.
 - 3. Performance testing.
 - 4. Demonstration testing.
- C. All field testing and facility startup shall be performed using a qualified representative provided by the Manufacturer as specified in Section 01 91 14, Equipment Testing and Facility Startup, Section 01 43 33, Manufacturers' Field Services, and as elaborated upon in this section.

3.04 FIELD QUALITY CONTROL

- A. Functional Test: Conduct on each mechanically cleaned screening unit. Test shall include 6 hours continuous operation of each screen. Confirm functionality of all control and safety features and operation of the equipment.
- B. Performance Test: Conduct on each mechanically cleaned screening unit. While operating with raw sewage, perform the paint filter test on washed and dewatered screenings. Perform test hourly with a total test duration of 4 hours. Time of day for conducting performance test shall be determined by the Contracting Officer.

3.05 MANUFACTURER'S SERVICES

A. Manufacturer's Representative:

1. Present at Site or classroom designated by Contracting Officer, for minimum person-days listed below, travel time excluded:
 - a. 2 person-days for installation assistance and inspection.
 - b. 2 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
 - c. 2 person-days for prestartup classroom and field training.
 - d. 2 person-days for facility startup.
 - e. 2 person-days for post-startup training. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Contracting Officer.

- B. See Section 01 43 33, Manufacturers' Field Services and Section 01 91 14, Equipment Testing and Facility Startup.

END OF SECTION

