SECTION 11216

INFLUENT SCREENING EQUIPMENT - DRUM SCREENS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install drum screen equipment complete and operational.
   2. Included are screen, anchorage systems and all appurtenances.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the drum screen equipment Work.

C. Related Sections:
   1. Section 03600, Grout.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 09900, Painting.
   4. Section 11000, Electric Motors.
   5. Division 13, Applicable Sections on Instrumentation and Controls.
   6. Division 15, Applicable Sections on Piping, Valves and Appurtenances.
   7. Division 16, Electrical.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Bearing Suppliers Association, (ABMA).
   2. American Gear Suppliers Association, (AGMA).
   3. American National Standards Institute, (ANSI).
   4. American Society of Mechanical Engineers, (ASME).
   5. American Society for Testing and Materials, (ASTM).
   6. American Welding Society, (AWS).
      a. AWS D1.1/D1.1M, Structural Welding Code-Steel.
   7. Institute of Electrical and Electronic Engineers, (IEEE).
   8. National Electrical Code, (NEC).
   9. National Electrical Suppliers Association, (NEMA).

1.3 QUALITY ASSURANCE

A. Supplier's Qualifications:
   1. Supplier shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single drum screen Supplier.
   2. The drum screen equipment Supplier to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the drum screen equipment Supplier.

1.4 SUBMITTALS

A. Shop Drawings: Submit the following:
   1. Supplier's literature, data sheets, fabrication, assembly and mounting drawings of the following components showing materials and significant dimensions in sufficient detail to demonstrate compliance with specified requirements.
      a. Screen Mechanism:
         1) Sizes of structural members.
         2) Drum details.
         3) Spray system details.
         4) Headbox details.
         5) Hood and Discharge enclosure.
      b. Gear Reducer:
         1) Model number.
         2) AGMA horsepower rating.
         3) Materials of construction.
         4) Efficiency.
         5) Bearing ratings.
         6) Lubrication details.
         7) Bearing life under maximum loading conditions.
      c. Motor: Complete information on all motors for all equipment as specified in Section 11000, Electric Motors.
      d. For all components of equipment as appropriate, including setting drawings and instructions for installation of anchor bolts, including tolerances.
   2. Detailed drawings of the screens showing relationships and connections to adjoining concrete work and screenings compactor. Drawings shall show all details necessary for coordinating the discharge chute with the screenings compactor.
   3. Detailed drawings showing all piping connections.

B. Support Design Information: Submit for record purposes only:
   1. Weight of the complete assembly.

C. Shop Test Results:
   1. Submit results of running test of gear reducer.
   2. Submit results of required control panel shop tests.

D. Field Quality Control:
   1. Submit a written report giving the results of the required field tests.
   2. Submit Supplier's Installation Certification Form as specified in Section 01732, Installation.

E. Instruction of Operations and Maintenance Personnel:
   1. Comply with the requirements of Section 01821.

F. Operation and Maintenance Data:
   1. Submit complete Installation, Operation and Maintenance Data, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
   2. Furnish Operation and Maintenance Data in conformance with the requirements of Section 01781.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Packing:
      a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
      b. Protect machined surfaces and mating connections.
      c. Protect bearings and gearing with a shop applied corrosion prevention coating.
      d. Cover all openings into gear boxes with vapor inhibiting and water repellent material.
      e. Crate in a manner which will prevent damage during shipment, delivery and storage.
      f. Identify crate contents by a packing slip fastened to the outside of the crate.
   2. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Description:
   1. Furnish equipment to be suitable for the process and design criteria described below and in Schedule of Service Conditions.

B. Schedule of Service Conditions:
   1. Number of Screens: 2.
   2. Maximum Flow/Screen: 8 MGD.
   3. Minimum Flow/Screen: 0.5 MGD.
   4. Inlet Pipe Size: 30 inches.
   5. Perforation Size: 2 mm.
   6. Maximum Spray Water Usage: ~~42 gpm @ 40 psi~~ 67.2 gpm @ 100 psi.
   7. Maximum Cylinder Speed: 6 rpm.

2.2 SUPPLIERS

A. Suppliers: Provide equipment of one of the following:
   1. Hycor Rotoshear RDS60120DVT, Parkson Corporation.
   2. Or equal.

2.3 DETAILS OF CONSTRUCTION

A. General:
   1. Screens shall be internally-fed rotary cylindrical type. Screens shall be cleaned by internal and external spray systems.
   2. Screens shall consist of a screen assembly, base frame, distribution pan, splash guards, hood, trunnion wheels, spray system, cylinder stabilizer and positive drive assembly.
   3. All equipment and components shall be rated for a Class 1, Div 2, Group D hazardous location unless otherwise specified.

B. Screen Assembly:
   1. Screening element shall consist of a cylinder constructed of type 304 stainless steel perforated plate.
   2. Each end of the screen element will be fitted with a type 304 stainless steel ring welded to the screen element. The drive end ring shall provide the necessary attachment to the drive sprocket. The discharge end ring shall have an extended bellmouth to discharge dewatered solids.

C. Base Frame and Hood:
   1. Base frame shall be constructed of 304 stainless steel. Frame shall be designed to withstand the loads imposed by the headbox structure and rotating screen element.
   2. Frame shall provide 4-point support at each corner without excessive deflection over its length.
   3. Hood shall be constructed of 14 gauge type 304 stainless steel. It shall be welded to a support structure constructed of type 304 stainless steel bent angles.

D. Headbox and Distribution Pan:
   1. Headbox components shall be constructed of 10 gauge type 304 stainless steel.
   2. Headbox shall be provided with a 30 inch diameter type 304 stainless steel flange with a bolt pattern compatible with a 125# class flange.
   3. Flow into headbox shall be baffled to reduce velocity and provide flow equalization.
   4. Minimum opening for distribution pan shall be one times the inlet pipe area.
   5. Distribution pan shall have an integral open-tapered header with a minimum length 2/3 the length of the screen element.
   6. Flow distribution to the screen elements shall be by two weirs, each having a maximum hydraulic loading of 35 gallon per minute per lineal inch.
   7. Headbox and distribution pans shall have cleanouts and drain ports for maintenance purposes.
   8. Headbox shall have a removable stainless steel cover.

E. Splash Guards:
   1. Splash guards shall be constructed of 14 gauge type 304 stainless steel.
   2. Splash guards shall be designed to contain the flow through the base discharge opening.
   3. Splash guards shall be attached to sides of hood support structure and be designed to be removed for maintenance.

F. Discharge End Enclosure and Transition Chute:
   1. Discharge end enclosure and transition chute shall be fabricated of 12 gauge, type 304 stainless steel and shall be designed to direct screenings into a hopper.
   2. End enclosure shall mate directly to transition chute with each side a minimum of 60 degrees from horizontal as shown on the Drawings.
   3. Provide access door in end enclosure as shown on the Drawings

4. Transition chute shall bolt directly to Influent Screenings Compactor as shown on the Drawings.

G. Trunnion Wheels:
   1. Each screen assembly shall be provided with four trunnion wheel mounting assemblies. Assemblies shall be mounted to the base frame to provide positive horizontal placement of the screen assembly.
   2. Trunnion wheels shall be constructed of solid polyethylene with a minimum outside diameter of 8 inches.
   3. Flanged ball bearings shall be bolted to each side of the trunnion wheels. Bearings shall be designed to be lubricated through the support shaft.
   4. The trunnion wheel support shaft shall have a minimum diameter of 1-1/2 inches and be constructed of type 304 stainless steel. Each shaft shall be positioned and secured by the trunnion mounting bracket.
   5. Each shaft shall be designed to provide center lubrication to bearings and trunnion wheels and be provided with an alemite grease fitting.

H. Internal and External Spray Systems:
   1. External Spray System
      a. Spray system shall be constructed of type 304 stainless steel.
      b. Spray system shall consist of a header with nozzles mounted parallel to the longitudinal screen axis and external to the screen.
      c. Spray system shall ensure spray penetration between the cylinder wires.
   2. Internal Spray System
      a. Internal spray system shall be constructed of type 304 stainless steel.
      b. Spray system shall consist of a header with nozzles mounted parallel to the longitudinal screen axis and internal to the screen.
      c. An internal deflector, constructed of 16 gauge type 304 stainless steel, shall be provided to cover the internal spray bar. The deflector shall be designed so as not to interfere with the spray pattern yet provide adequate discharge of solids that may accumulate over the spray bar.
   3. Solenoid Valves
      a. Water sprays will be actuated by 115 V, single phase, normally closed, brass body solenoid valves with 1-1/2 inch NPT connections. Electrical housing shall be NEMA 7.

I. Cylinder Stabilizer:
   1. A cylinder stabilizer assembly shall be provided at the inlet end of the cylinder to maintain proper cylinder position along the longitudinal axis of the unit.
   2. Stabilizer assembly shall consist of two UHMWPE guides contacting the cylinder flange. Guides shall be fitted for grease lubrication.
   3. The stabilizer shall be mounted on the base plate and engage the cylinder ring flange. Movement shall be limited to +/- 1/8 inch.

J. Drive Unit:
   1. Drive components shall be designed to withstand the full NEMA stalling torque of the motor, without damage to any part of the drive or the footshaft assembly.
   2. Drive unit shall consist of a motor driven fully housed helical gear reducer. Gears shall be made of steel with teeth cut to accurate shape and enclosed in a heavy case, moisture and oil proof. Reducer shall be equipped with approved type anti-friction bearings throughout.
   3. Reducer shall be sized to maintain a service factor of 1.25 on input brake horsepower.
   4. Reducer output shaft shall be keyed to accept a drive sprocket that provides the rotational motion to the screen cylinder.
   5. Speed reducer moving parts shall be immersed in oil, and bearings shall be anti-friction throughout, with a minimum B-10 rating of 35,000 hours. Casings shall be provided with inspection covers, oil fill, drain connections and means for inspection of oil flow. Inspection, oil fill and drain covers shall be chained to casing.
   6. Roller chain shall be No. 2080 double pitch type fabricated of carbon steel. Sprockets shall be No. 80 single pitch fabricated of carbon steel.
   7. Chain pull and bending moment on output shafts shall not exceed the manufacturer's rating and recommendations.
   8. Drive assembly shall be mounted on a rigid base.
   9. Motors:
      a. Provide motor meeting the requirements of Section 11000, Electric Motors and the additional requirements below:
         1) Horsepower: 2 Hp
         2) Speed: 1800 rpm
         3) Electrical Characteristics: 230/460 V, 3 phase, 60 Hz.
         4) Enclosure type: Enclosure shall be rated for Class 1, Div 2, Group D hazardous areas.

K. Automatic Chain Oiler System:
   1. An automatic lubrication system shall be provided which consists of an electric gear pump, built-in timer, tubing and necessary fittings.
   2. Oil pump shall be supplied with a NEMA 4X enclosure and shall be mounted in a separate room from the drum screen. Pump shall have a minimum capacity of 6 cubic inches per minute at 362 psi.
   3. Include a 3-liter oil reservoir.
   4. Power requirements of pump shall be 115V, 1 Phase, 60 Hz, 50 watts.
   5. System shall deliver a controlled amount of oil to the chains and ensure proper oil coverage on the chains and rollers.

2.4 CONTROLS

A. General:
   1. Provide each screen with its own automatic and manual control as shown and as specified herein. Each screen shall be provided with its own control panel, suitable for installation within the electrical room of the Screening and Dewatering Building, and rated as NEMA 1, Gasketed.
   2. All field mounted instruments and controls shall conform to the applicable Sections of Division 13, Instrumentation and Controls and shall be rated for a Class 1, Div. 2, Group D hazardous classification.

B. Control Panels:
   1. Provide and construct panels in accordance with the requirements of the appropriate Sections of Division 16, Electrical, and Section 13430, Control Panels and Enclosures and as shown. Contractor shall implement the control functions, specified herein and as shown, using industrial controls and relays.
   2. Each Influent Fine Screen Control Panel shall be sized to house the following controls:
      a. Flange mounted disconnect switch with provisions for padlocking the switch in the OFF position.
      b. Power supply shall be 460V, 3 phase, 60 Hz. Surge suppressor (TVSS) to be provided in panel.
      c. Combination magnetic motor starter.
      d. Control power transformer 120 VAC with fused primary and secondary. Size transformer to power all solenoids and other peripherals.
      e. HAND/OFF/AUTO selector switches for the following:
         1) Internal Spray Wash.
         2) External Spray Wash.
      f. Pilot lights for:
         1) CONTROL POWER ON (blue).
         2) SCREEN RUNNING (green).
         3) INTERNAL SPRAY WASH ON (green).
         4) EXTERNAL SPRAY WASH ON (green).
         5) SCREEN OVERLOAD (amber).
      g. Pushbuttons for:
         1) Screen RESET push button (black).
         2) Screen alarm SILENCE push button (black).
         3) Screen EMERGENCY STOP mushroom head push button (red).
      h. Alarm Horn.
      i. All panel mounted components shall conform to the requirements of Section 13440, Panel Mounted Instruments.
   3. Local Control Stations shall contain the following devices:
      a. EMERGENCY STOP pushbutton.
      b. LOCAL/OFF/REMOTE selector switches.
      c. START and STOP pushbuttons.

4. Provide all required control and signaling devices, interlocks and field devices for proper control of all system components.
5. Provide SPDT relay contacts rated for at least 10 Amps at 120 VAC for remote monitoring of each of the following signals:
    a. Influent Fine Screen Running.
    b. Influent Fine Screen Remote Mode.
    c. Influent Fine Screen Fault.
6. Provide the ability to remotely start and stop the screen by means of dry contact closure.

C. Interlock Switch:
1. An interlock switch shall be provided on each side of the splash guards and wired to cause the unit to completely stop rotating upon opening of the splash guard. Switch shall be rated for 120V.
2. Interlock switch shall be rated for a Class 1, Division 2, Group D hazardous area.

D. Zero Speed Switch:
1. The switch shall include a probe, which shall ensure the cylinder is in motion with signals from ferrous blocks mounted at the head of the cylinder. An amplifier shall receive the signal and contacts shall be provided for transmitting the signal to the PLC panel.

E. Operational Description:
1. Screen Operation:
    a. The screen is controlled by a LOCAL/OFF/REMOTE selector switch and START and STOP pushbuttons. In the LOCAL position, the screen is started and stopped by the buttons on the control station. Once started, the screen operates continuously. In the REMOTE position, the screen is started by a remote contact closure from the Plant Control System. When the remote contact is opened, the screen shall run for a short time afterwards which shall be adjustable. In the OFF position, the screen shall not start.
2. Internal Spray Wash:
    a. The internal spray wash solenoid is controlled by its HAND/OFF/AUTO selector switch. In the HAND position, the solenoid opens and the spray wash is on continuously. In the AUTO position, the spray wash shall cycle on/off whenever the screen is running per the setting on a cycle timer.
3. External Spray Wash:
    a. The external spray wash solenoid is controlled by its HAND/OFF/AUTO selector switch. In the HAND position, the solenoid opens and the spray wash is on continuously. In the AUTO position, the spray wash shall cycle on/off whenever the screen is running per the setting on a cycle timer.
    b. Once the remote start contact opens signaling the screen to enter a delay stop procedure, the external spray wash shall energize and remain on until the screen stops.

4. Local Control Stations:
    a. When an EMERGENCY STOP pushbutton is depressed, the respective screen and the ancillary systems associated with the screens shall immediately shut down. Opening the screen hood at any time shall also stop the screen.

2.5 ANCHOR BOLTS

A. Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Provide hooked anchor bolts for direct embedment during placement of concrete. Anchor bolt materials shall be of stainless steel conforming to the requirements of Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

2.6 TOOLS AND SPARE PARTS

A. Furnish and deliver the following boxed and labeled.
    1. One reducer assembly complete with motor.
    2. Chain, #2080 with connecting link (20 ft.)
    3. Wheel assembly, trunion (4 each).
    4. Pad, stabilizer (2 each).
    5. Nozzle, spray (3 each).
    6. Two sets of any special tools required for normal operation and maintenance.

B. 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.

C. Manufacturer shall furnish a list of additional recommended replacement parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.

2.7 SHOP PAINTING

A. See Section 09900, Painting.

2.8 LUBRICANTS

A. Furnish lubricants and oil and grease as required for initial operation. Use products recommended by the manufacturer.

2.9 SOURCE QUALITY CONTROL

A. Running Test: Operate gear reducer at normal operating speed using a rust inhibiting break-in oil prior to shipment to check for proper operation, excessive noise and vibration.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall verify that structures, pipes and equipment are compatible.
   1. Inspect and verify that structures or surfaces on which equipment will be installed have no defects which will adversely affect installation.
   2. Inspect all equipment prior to installation.
   3. Promptly report defects which may affect the Work to Engineer.

B. Make adjustments required to place system in proper operating condition.

C. Apply a minimum ½-inch of grout below equipment base frames before securing.

3.2 INSTALLATION

A. Supplier's representative shall check and approve the installation prior to operation. Supplier's representative shall field test and calibrate the equipment to assure that the system operates to the Owner’s satisfaction.

3.3 FIELD QUALITY CONTROL

A. All equipment will be given running tests by Contractor at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, Contractor shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the Engineer, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.

B. A factory trained representative of the Supplier shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three visits to the Site. The first visit shall be for assistance in the installation of equipment. The second visit shall be for checking the completed installation, to complete field tests, and supervise initial operations. The third visit shall be to instruct the Owner’s personnel in the proper care, operation, and maintenance of the equipment in accordance with Section 01821. Supplier’s representative shall test operate the system in the presence of the Engineer and verify that the equipment conforms to the requirements.

C. Supplier's Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the Owner.

+ + END OF SECTION + +