

SECTION XXXXX

SETTLING BASIN SCREW CONVEYORS FOR THE SLUDGE CROSS COLLECTORS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install, complete and ready for operation, screw conveyors for the sludge cross collection equipment in the settling basin as shown on the Drawings and as specified herein.
- B. Electric motors shall conform to all applicable portions of Division XX.

1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36- Standard Specification for Carbon Structural Steel.
 - 2. ASTM A48- Standard Specification for Gray Iron Castings.
 - 3. ASTM A242- Standard Specification for High-Strength Low-Alloy Structural Steel
- B. American National Standards Institute (ANSI)
 - 1. ANSI B15- Ball Bearing, Load Ratings and Fatigue Life.
- C. Society for Protective Coating (SSPC)
 - 1. SSPC SP-6- Surface Preparation Specification No. 6 Commercial Blast Cleaning.
 - 2. SSPC SP-10- Surface Preparation Specification No. 10 Near White Blast Cleaning.
- D. National Electrical Manufacturers Association (NEMA)
 - 1. NEMA MG-1- Motors and Generators.
 - 2. NEMA 4X- Control Panel Enclosures.
- E. Conveyor Equipment Manufacturers Association (CEMA)
 - 1. CEMA 350- Screw Conveyors.
- F. American Welding Society (AWS)

- G. American Gear Manufacturers Association (AGMA)
- H. American Society of Mechanical Engineers (ASME)
- I. American Bearing Manufacturers Association (ABMA)

1.03 DESCRIPTION OF SYSTEM REQUIREMENTS

- A. All of the equipment specified herein is intended to be standard equipment for use of sludge collection with wastewater. All equipment specified herein must be suitable for operation under the specified conditions.

Each settling basin shall have one screw conveyors installed at the bottom of the basin to convey collected sludge to a sludge sump for removal.

- B. The dimensions given here are design dimensions; the Contractor shall field verify all field dimensions and elevations including side tolerances and tank squareness.
- D. Dimensions of the tanks and equipment are shown on the Drawings.
- A. Cross collectors shall be 18-in diameter screw conveyors. The cross collectors shall operate at a constant speed of 10 rpm.
- F. All miscellaneous fastening hardware such as screws, nuts, bolts, washers, etc. shall be Type 304 stainless steel unless otherwise noted.
- G. All expansion bolt anchors used in the work shall be Type 304 stainless steel.

1.04 QUALITY ASSURANCE

- A. All screw conveyor collection equipment shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods. This Section calls attention to certain features, but does not purport to cover all details entering into the design and construction of the equipment.
- B. Submit certification of 10 years of experience in manufacturing and satisfactory evidence of experience of submerged screw conveyor collection systems.
- C. All components of the equipment to be furnished shall be fully compatible with each other and be designed for extended service.

1.05 SPARE PARTS, OPERATIONS AND SUPPLIER SERVICES

- A. Spare Parts

1. A full inventory of spare parts shall be furnished for all equipment.
2. All spare parts shall be labeled, for identification.
3. All spare parts are to be wrapped or boxed as required for storage. Each individual package is to be labeled with the description and part number.
4. Screw Conveyor spare parts shall include the following:
 - a. Two coupling hangers, hanger hearings and coupling bolts for each screw conveyor.
 - b. One complete set of bearing sand seals for each gear reducer and drive motor.
 - c. One flexible coupling for the gear box output shaft (If Applicable)
 - d. Twelve shear pins. (If Applicable)

B. Services of a Manufacturers Service Representative

1. Provide the services of a factory-trained service representative trained on the type and the size of the equipment specified and in the methods to be used in the installation of all spare parts. The man-days listed are exclusive of travel time and shall not limit or relieve the Contractor of the obligation to provide sufficient service necessary to place the equipment into fully satisfactory and functioning condition.
2. Provide the services of the factory representative for the following, on-site periods of time:
 - a. During installation: assist in location of supports, hanger bearings, etc. leveling and alignment, coordination of utility connections (electrical):

Screw Conveyor Cross Collector	One 8-Hour Day
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 - b. Start-up: Complete review of installation, provide written certification that the installation is complete and operable in all respects, and that no conditions exist which may affect the warranty. Provide written report, summarizing test procedures, tested and measured variable (alignment check, etc.):

Screw Conveyor Cross Collector	One 8-hour Day
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 - c. Field and classroom instruction on operation and maintenance of the equipment, including start-up, shut-down, troubleshooting, lubrication maintenance and safety:

Screw Conveyor Cross Collector	One 8-Hour Day
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PART 2 PRODUCTS

2.01 GENERAL

- A. The screw conveyor cross collection equipment shall be furnished by the same manufacturer providing the sludge collection equipment. The manufacturer shall be responsible for the design, fabrication and provision of adequate installation instructions to assure a fully operational sludge cross collection system in all respect. The equipment design of this Section is based upon equipment furnished by Guardian Environmental Products, Inc., West Chester, PA.
- A. Grease fitting extensions where required, 3/8 inch, shall be provided for all bearings equipped with grease fittings.
- B. Each cross collector screw conveyor shall consist of a screw mounted in a concrete trough. Material settled into the trough shall be moved laterally by the rotation of the screw as shown on the Drawings.
- C. Each cross collector shall be arranged so that conveyor drive shaft is at the location shown on the Drawings.
- D. All bolts, fasteners, anchor bolts and related hardware shall be Type 304 stainless steel.

2.02 MATERIALS

- A. Structural steel shall conform to ASTM A36
- B. Shapes and plates shall have a minimum thickness of ¼ inch and bolts a minimum diameter if ½ inch unless otherwise specified.
- C. Stainless steel connectors shall be Type 304 stainless steel and shall be bolted using locking washers
 - 1. All shop and all field connections shall be made with an approved anti-seize lubricant, designed to reduce the possibility of galling.
- D. Iron casting shall conform to ASTM A48.
- E. All submerged hardware, including fasteners, embedded and expansion anchors shall be Type 304 stainless steel. All stainless steel hardware shall be fastened using an approved non-galling compound furnished by Loctite or equal.
- F. Unless otherwise specified, other submerged metals shall be hot dip galvanized.

2.03 EQUIPMENT

- A. All parts of the equipment shall be proportioned for all stresses that may occur during fabrication, erection and operation. The equipment shall be designed for continuous operation.

2.04 CROSS COLLECTORS (SCREW CONVEYORS)

- A. Three-quarter pitch conveyor flights shall be constructed of steel conforming to medium hard 235 Brinell abrasion resistant plate and hard faced along its entire periphery and 1 inch carrying surface. Flight minimum thickness shall be 3/8 inch before hard surfacing.
- B. Each end wall bearing shall be of cast iron construction, hard iron or bronze sleeved and of the water lubricated, ball and socket, self-aligning type especially designed to prevent the accumulation of settled solids on their surfaces. The bearing shall be bolted directly to the tank wall.
- C. Screw center tubes shall be of A36 steel tube with sufficient wall thickness to give a maximum deflection not exceeding 5/32 inch between any two bearing support points, based upon formulas for a simply-supported tube with a uniform loading equal to the mass of the tube and flight material. Minimum wall thickness shall not be less than the nominal wall thickness for schedule 40 steel pipe. Center tubes for the 18 inch screw conveyors shall be a minimum 4 inch outside diameter. Center tubes shall be sized and selected to handle the rated motor horsepower and shall be greater than the specified minimum diameter and thickness if required to safely transmit motor torque.
- D. The design of the center tube shall include a removable key or other means to disconnect and remove the screw conveyor without disassembling the right angle miter gear box. (i.e. section can be completely removed without disturbing other conveyor components). Provide pipe bushings in all pipe ends. Bushings shall be keyed where required for conveyor section removal.
- E. The center tube pipe at the drive shaft shall be reinforced with an external sleeve welded to the outside of the center tube if required to safely transmit the rated motor horsepower through the center tube-drive shaft connection. Succeeding coupling connections shall also be reinforced if required to safely transmitted rated motor horsepower through succeeding conveyor sections.
- F. Flights shall be of full-faced sectional construction made from precut steel plate, of uniform thickness, formed accurately to the pitch of the screw flights. Pitch tolerance shall be within 7/8 inch or minus 1/2 inch. Radial welds of the sectional flight segments shall be bevel-welded on both sides. All welds shall be full and continuous both sides of the flight junction to center tube.
- G. Each section of the screws shall have the outside diameter of the flights over the entire length of the screw conveyor is within a tolerance of plus 3/16 inch or minus 3/8 inch.
- H. The pitch measured between flights, measured at the outside diameter of the screw flights, along four straight lines parallel to the axial centerline through the

bearings at 0, 90, 180 and 270 degrees, shall not vary more than pitch tolerances specified above.

- I. Each screw shall be inspected at the factory by the manufacturer, prior to shipment to the site, to certify conformance to the specified dimensional tolerances.
- J. Hangers: Hanger bearings shall be hard iron type mounted in heavy steel self adjusting welded frames. Mounting hole in the frame shall be slotted parallel to screw to facilitate assembly and alignment. Hangers shall be self-adjusting expansion type equal to CEMA hanger No. 326.
- K. End Drive and Coupling Shafts: Shafts shall be made of surface hardened low carbon steel securely fastened to conveyor pipe with at least two bolts arranged 90 degrees apart. Drive shaft shall be integral part of bearing block.
 - 1. All shafts shall be a minimum 3 inch diameter. All couplings, end and drive shafts and shaft bolts shall be sized and selected to handle the rated motor horsepower. High strength bolts and shafts shall be provided if required.
- L. Conveyor Drive
 - 1. The screw conveyor shall be driven by a motor and helical bevel gear speed reducer with the output shaft coupled to a minimum 2.5 inch heavy duty torque tube pipe and connected to a right angle gear box to drive the screw conveyor.
 - 2. Each motor shall be ample size to start conveyor when fully loaded and to operate equipment without exceeding motor nameplate rating. Minimum horsepower shall be 3 horsepower. Motor shall be 480 volt, 3 phase and suitable for a Class I, Division 2, Group D area.
 - 3. Each gear reducer shall have a cast-iron housing with integral oil sump. Housing shall be dust-tight and oil-tight. Gear reducer shall conform to AGMA standard. Class II, for 24-hour continuous full-load operation with a 1.50 service factor. Gears helical bevel type, hardened and ground shall be manufactured to AMGA 12 or better. Shafts shall have anti-friction bearings.
 - 4. The driven end of the screw conveyor shall be supported and connected to a right angle miter gear box. The gears shall be straight cut bevel type and the ratio shall be 1:1. The gear box shall have tapered roller bearings for radial and thrust load capabilities and stainless steel shafts. The gear box shall be sealed with lubricant as recommended by the manufacturer intended for drain and refill intervals not less than 12-months and not to exceed 24-months as recommended by the manufacturer.

2.05 SURFACE PREPARATION AND SHOP COATINGS

- A. All iron and steel surfaces shall be blast-cleaned in accordance with SSPC SP-6 and SP-10 and shall be shop primed and finish coated unless specified otherwise herein.

- B. The cross collector screw shall be hot-dipped galvanized after fabrication.
- C. All pre-painted purchase equipment such as electric motors shall be the manufacturers standard finish.
- D. Machined or polished ferrous surfaces such as pipe flanges and machined steel shafts, shall be provided with a temporary protective coating of a nondrying oily-type rust preventative compound.
- E. Fiberglass, plastic, galvanized, and stainless steel surfaces shall not be coated.
- F. Areas to be field welded shall not be shop painted.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to start-up of the cross collector screw conveyor drives, the Contractor shall take all measurements necessary to assure proper clearances for the cross collector flights.

3.02 INSTALLATION

- A. Installation shall be in strict accordance with the respective manufacturer's instructions and recommendations in the locations shown on the Drawings and in coordination with all related equipment systems. Installation shall include flushing of oil and grease chambers and furnishing the required oil and grease for initial operation. Proper disposal of the flushed oil and grease shall be the responsibility of the Contractor. The grades of oil and grease shall be as recommended by the equipment manufacturer.

3.03 FIELD ACCEPTANCE TESTING

- A. Furnish the services of a factory representative who has complete knowledge of proper installation, operation and maintenance to inspect the final installation and supervise a test run of the equipment. These services are provided under Paragraph 1.07 above.
- B. Initial inspection of the completed facilities includes examining, inspecting, measuring and performing a dry running test to assess the overall readiness of the installation for the field performance testing. Provide a complete report certifying the results of the initial inspection.
- C. Working under the direction of the factory representative and in the presence of the Engineer, perform field performance tests for the settling basin, as follows:

1. The equipment shall be operated in a dry tank, only to extent necessary to observe proper alignment of the torque tube and cross collector shaft and flights, and bearings. All underwater water-lubricated bearings shall be lubricated with grease for the test.
2. After the settling tanks are filled with wastewater, the equipment shall be tested to demonstrate proper alignment and level and smooth operation of all components
3. In the event the mechanisms fail to meet the test requirements, the necessary changes and adjustments shall be made and the equipment retested.
4. The Contractor shall be responsible for arrangements and pay for all labor, water and power required for the above testing.

END OF SECTION