

Section 11370

TRICKLING FILTER ROTARY DISTRIBUTORS

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of one rotating wastewater distributor for trickling filter No. 3 as required. This section also covers the modifications to the existing rotating wastewater distributors for trickling filters No. 1 and 2.

The rotary distributor supplied for trickling filter No. 3 shall consist of a center assembly, distribution arms with flow spreaders, arm supports, anchor bolts, and all appurtenances and accessories required for a complete installation.

Each of the two existing rotary distributors TF#1 and TF#2 shall be modified to operate at the flows indicated in the data sheet. This modification shall consist of converting the four existing distributor arms of each unit into two primary and two secondary flow distribution arms. As part of the submittal process, the manufacturer shall state the expected rotational speeds at the required flows. Under the specified design conditions, the primary arms shall be in operation when handling up to approximately 50 percent of the maximum flow. When handling flows in excess of that distributed by the primary arms, and up to the maximum design flow, the secondary arms shall go into operation.

Modifications to existing rotary distributors for trickling filters No. 1 and 2 shall consist of installation of a baffle in the centerwell and modifications to the flow spreaders and orifice plates in two of the four arms of each rotary distributor.

1-1.01. Terminology. When the phrase "as required" is stated in this section it shall mean "as required in the attached Data Sheet".

1-2. GENERAL. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by ENGINEER.

1-2.01. General Equipment Requirements. The General Equipment Requirements shall apply to all equipment furnished under this section.

1-3. SUBMITTALS. Complete assembly and installation drawings, together with detailed specifications and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted

in accordance with the submittals section. Operation and maintenance manuals shall be furnished for equipment specified herein.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the shipping section. Handling and storage shall be in accordance with the handling and storage section.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS. The trickling filter rotary distributor shall rotate solely from the reaction of the flow through orifices in the two primary arms and shall operate freely over the entire flow range. The rotary distributor shall be designed to uniformly distribute all flows over the entire area of the filter bed. Design criteria shall be as required.

The arms, support rods, center column, manifold and support base, bearings, and other structural members shall be designed in accordance with applicable standards. No reduction shall be permitted for temporary loads. Design shall consider the simultaneous application of all or any combination of the following loads, including the application of ice loads and concentrated loads on single or both pairs of arms.

All equipment dead loads.

Maximum water loads, including plugging the two primary arms.

Ice loads as required.

A concentrated load at each end of each arm as required.

An unbalanced load with one arm full and one arm empty, applied downward at the extreme end of one distributor arm.

2-2. MATERIALS. Materials shall be as follows.

Stationary Base and Bearing
Assembly, Rotating Turntable, Mast,
Center Well, Distribution Arms, All
Other Structural Members.

3003 Series aluminum plate
and 6061-T6 Series structural
aluminum; minimum 1/4 inch
[6.3 mm] thickness, unless
otherwise specified.

Orifices and Flow Spreaders.

Molded polyethylene or
polycarbonate plastic with UV
inhibitors.

Tie Rods and Plates.

Hot-dip galvanized steel or
Stainless Steel 304 or 316 as
required.

Eyebolts, Clips, and Other Fasteners. AISI Type 304 stainless steel.

2-3. ACCEPTABLE MANUFACTURERS. The trickling filter distributor shall be as manufactured by Eimco or WesTech, without exception. The product of other manufacturers will not be acceptable.

2-4. FABRICATION AND MANUFACTURE.

2-4.01. Welding. All welded joints shall be sealed watertight by continuous welds. Fabrication of aluminum distributors shall conform to the latest Aluminum Welding Code AWS D-1.2 and assembled with all stainless steel fasteners.

2-4.02. Edge Grinding. Sharp corners of cut or sheared shapes shall be rounded by at least one pass of a power grinder.

2-4.03. Bolts and Nuts. Field assembly bolts and nuts and anchor bolts and nuts shall be provided for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed.

The bolts shall be at least 3/4 inch [19 mm] in diameter.

All field assembly bolts, nuts, and washers, and all anchor bolts, nuts, and washers, shall be stainless steel or galvanized steel as required.

Anchor Bolts and Nuts and Assembly Bolts and Nuts.

Stainless Steel

AISI Type 304, 305, 384, 304L Bolts ASTM F593, Alloy Group 1;
Nuts ASTM F594, Alloy Group 1.

AISI Type 316, 316L Bolts ASTM F593, Alloy Group 2;
Nuts ASTM F594, Alloy Group 2.

Flat Washers

ANSI B18.22.1; of the same
material as the bolts and nuts.

Two nuts and a washer shall be furnished with each anchor bolt. Anchor bolts shall be long enough to accommodate at least 1-1/2 inches [38 mm] of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

Anti-seize compound will be applied to the threads of all stainless steel bolts before assembly.

2-4.04. Surface Preparation. Welds shall be thoroughly cleaned, ground smooth, and free of defects in accordance with NACE Standard RP0178, Appendix C, Designation C. No surface preparation or coating is required for aluminum and stainless steel surfaces.

2-4.05. Lubrication. Equipment shall be adequately lubricated by systems which require routine maintenance inspection no more frequently than every 6 months during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of the equipment by OWNER.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

2-4.06. Safety Guards. All couplings and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage [1.52 mm] thick or thicker galvanized or aluminum-clad sheet steel or from 1/2 inch [12.7 mm] mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

2-4.07. Equipment Bases. Unless otherwise indicated or specified, all equipment will be installed on concrete bases at least 6 inches [150 mm] high. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates will be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the grout section.

2-4.08. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

2-5. ROTATING SEWAGE DISTRIBUTORS. Distributor TF#3 shall be equipped with primary and secondary arms as required. Under the specified design conditions, the primary arms shall be in operation when handling up to approximately 50 percent of the maximum flow. When handling flows in excess of that distributed by the primary arms, and up to the maximum design flow, the secondary arms shall go into operation.

2-5.01. Center Column Assembly. Each center column assembly shall consist of a stationary base assembly and a rotating assembly. The stationary base assembly shall be provided with sewage inlet and mechanism anchorage facilities, main bearing assembly, and a suitable mechanical seal. The rotating assembly shall be supported on or hung from the main bearing and shall be provided with distributor arm connections, anchorage facilities for arm supports, and steady bearings.

The center column shall be supported by a concrete pier of hollow construction to which will be connected an influent supply line of diameter as required, and a drainage outlet.

Bearings shall be as nearly frictionless as possible and the rotating assembly shall start freely with minimum flow under all conditions of wind and temperature. Bearings shall be self-lubricating and shall not require maintenance more frequently than 6 month intervals.

The mechanical seal shall be suitable for taking the head developed at maximum flow.

2-5.02. Distributor Arms With Flow Spreaders. The distributor arms shall be minimum 1/4 inch [6.3 mm] thick aluminum; either rectangular plate, circular pipe, or trapezoidal plate.

Each arm shall be equipped with orifices and spreaders, vent pipes, end flushing gates, and horizontal and vertical stainless steel tie rods. The number of distributor arms provided shall be as required. They shall be attached to the center assembly by heavy flange connections and stainless steel bolts. Jets which are strapped to the arms will not be acceptable.

The distributor arms shall be tapered to maintain proper flow distribution. Equipment shall be modified as necessary to meet the requirements herein specified.

Each arm shall be arranged with openings to uniformly distribute the flow over the filter bed surface area. Corrosion-resistant spreaders and orifices shall be provided to evenly distribute the flow from each opening. Orifices shall be capable of simple repositioning and replacement for flow adjustment. The last

spreaders as required at the end of each arm shall include vertical deflector plates to prevent splashing of the wastewater on the filter wall.

The arms shall be laterally braced by horizontal galvanized steel tie rods with turnbuckles and end attachments. The arms shall be vertically supported from the mast by stainless steel tie rods, turnbuckles, and end attachments. The tie rods shall be connected to the arms at maximum intervals of 20 feet [6.1 m].

Support struts, brackets, and flanges shall have a minimum thickness of 3/8 inch [10 mm].

Provisions shall be made for the addition of front-mounted reaction orifices or nozzles in the leading edge of the arms to control the velocity of the arms.

Front-mounted reaction nozzles shall be of the same size as the back-mounted and shall use the same size spreaders and orifice plates. The front-mounted nozzles shall be initially equipped with shut off plates that can be relocated to a rear mounted opening. Each front-mounted opening shall be paired with a rear opening.

A wedgetight, quick-opening flush shear gate with handle shall be provided at the end of each arm. Each gate shall have a 3/4 inch [19 mm] diameter drain plug. The gate shall be at least 6 inch [150 mm] diameter or square and shall be aluminum.

For arms with distribution orifices on the side of the arms, each arm shall be provided with minimum 3/4 inch [19 mm] diameter vent pipes to prevent air binding in the arms. Vent pipes shall be aluminum or stainless steel.

2-5.03. Mast Assembly. The mast shall be designed to structurally carry the combined loads specified herein. The mast shall be equipped with connections for the tie rod arms. The mast assembly shall be designed to be stable and to structurally support the distributor under all loads (balanced and unbalanced) which may arise during operation or routine maintenance.

2-5.04. Revolving Assembly. The revolving assembly shall be aluminum and shall revolve around the stationary base. The revolving assembly shall be designed to adequately carry the loads from the mast and the distributor arms and shall be provided with outlets and heavy-duty flanges for the distributor arms. The revolving assembly shall include a center well.

A plugged coupling shall be mounted on top of the manifold, near the center column, to permit the monitoring of the water level in the assembly. As an alternate, the manifold shall be open at the top for monitoring, but at an elevation to prohibit wastewater from overflowing at maximum flow.

2-5.05. Bearing Assemblies. The distributors shall have a mast type bearing assembly mounted and supported on top of a support column to eliminate the possibility of contamination of the bearing by wastewater. The assembly shall be precision spherical roller bearings running in an oil bath. The entire weight of the arms and rotating manifold shall be supported from the roller bearing mounted atop an aluminum pipe column. The main bearing shall be provided with an oil reservoir, fill cap, and dip stick. A ladder shall be attached to the outside of the center column to provide access for lubrication. The main bearing assembly shall be supported by the stationary base.

Easily accessible stainless steel lubricant fill and drain pipes with necessary fittings shall be provided.

All bearings shall have an AFBMA L₁₀ life rating of at least 30 years. Replacement of bearings and/or races shall be possible without having to completely lift off the rotating turntable.

A stabilizing bearing assembly shall be provided. The bearing shall be grease-lubricated sleeve type, protected against contamination from the pumped flow. If the bearing is located at or below the liquid level, double, spring-loaded, grease seals shall be used. The bearing and all grease seals shall be replaceable without removal of the distributor assembly and without the use of a crane. An acetron acetal stabilizing bearing with solid lubricants locked in the acetal matrix is an acceptable alternate.

The rotary distributor shall be sealless design with the inner edge of the rotating manifold extended upward and underneath an overflow flange on the stationary centerpiece. Alternatively, if the junction between stationary and rotating components is below the water surface, a neoprene lap seal mating to a stainless steel machined surface shall be used. Each seal shall be designed, as a minimum, to withstand the maximum hydraulic head in the center well. Each seal shall be replaceable without dismantling the distributor. No mercury seals will be allowed.

2-5.06. Non-Corroding Parts. All rings, seals, bearings (except balls and races), bushings, nozzles and other non-corroding parts, shall be made of stainless steel or another non-corroding material that the manufacturer has used successfully for this service for at least 10 years.

2-5.07. Galvanizing. All iron and steel parts, including cables, cable hangers and clamps, rods, turnbuckles, flange and anchor bolts, and other interior and exterior surfaces on distribution arms and center column assembly (both stationary and rotating section), not otherwise specified to be fabricated from aluminum or stainless steel, shall be hot-dip galvanized in accordance with ASTM A123, A153, and A385. Galvanizing shall be done after all fabrication is

completed including welding, threading, drilling, and punching so that all surfaces, except machined surfaces, are protected with zinc.

2-5.08. Rotating Speed and Control. The design of the unit shall be such that the rotating speed of the unit at any hydraulic flow rate can be set in the field through changes in the arm orifices and flow spreaders. For side-of-arm orifices, sufficient front-of-arm brake ports shall be provided to provide specified speed control by closing and opening corresponding front and back-of-arm orifices. A similar means of redirecting the flow from top-of-arm orifices shall be provided for units using this type of distribution. The rotational speed of the distributor at each specified flow shall be controllable, without the use of an auxiliary drive, from a low speed as required to a maximum speed as required at the maximum hydraulic flow rate.

The unit shall be designed to operate without stalling at the low specified speed at each flow rate.

Sufficient orifice caps and spreaders shall be provided to make field adjustments over the entire range of speeds.

2-6. MODIFICATIONS & EXISTING ROTARY DISTRIBUTORS.

2-6.01. Centerwell Modifications. Stainless steel baffle plates shall be installed in each centerwell, effectively preventing flow from entering the secondary arms until the water level in the centerwell overflows the baffles. The height of the baffles shall be determined by the rotary distributor manufacturer based on the flow conditions identified in the data sheet and as required to start rotation of the mechanism, flow split between primary and secondary arms, orifice settings, head pressures and losses. The baffles shall be minimum 1/4" thickness, shall be bolted in place with stainless steel fasteners, and shall be sealed to the centerwell with neoprene seals.

2-6.02. Spreader and Orifice Plate Replacements. All of the flow spreaders and orifice plates on the existing mechanisms shall be placed with new spreaders and fully adjustable orifice plates. The settings for the primary and secondary arms shall be determined by the rotary distributor supplier for the flows listed in the data sheet. As a minimum, the flow spreaders and orifice plates shall be constructed of UV stabilized polyethylene or polycarbonate plastic material.

PART 3 - EXECUTION

3-1. INSTALLATION. Installation will be in accordance with Section 11060.

Manufacturer's field services shall be provided, which shall consist of an installation check and a distribution test as required.

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3-2. INSTALLATION CHECK. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are required shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation in accordance with Section 01650. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of ENGINEER.

Each manufacturer's representative shall furnish to OWNER, through ENGINEER, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the Contract Price. The duration of the visits and the number of round trips shall be as required.

3-3. DISTRIBUTION TESTS. After each rotary distributor has operated for a minimum time as required, and the installation has been inspected by a representative of the manufacturer and has been adjusted to his satisfaction, a "pan test" shall be run to check the distribution of flow on the filter bed.

Each distributor shall perform in such a manner that approximately uniform distribution will be obtained for each unit area of the exposed media as hereinafter described. The test shall be run at a flow rate as required, and shall conform to the following test procedure.

The size, type and location of pans to be used shall be submitted to ENGINEER prior to the test. The pans shall be set flush with the top of filter media and shall extend from the distributor's pedestal to the wall of the trickling filter.

The test period for the distributor shall include a minimum number of revolutions as required. The test shall not be conducted when wind velocity exceeds the amount as required. The rate of distribution for any unit area shall not vary the mean rate of distribution by more than an amount as required.

If the distributor fails to meet the specified requirements, the manufacturer shall modify distributor until the specified requirements are met.

ENGINEER may elect to pan test all distributors, or he may test only selected units if test results on two distributors indicate compliance with this distribution requirement. All testing equipment and labor to perform the tests, regardless of number, will be furnished by CONTRACTOR at his own expense, and the testing

shall be done at the time designated by ENGINEER and under the supervision of ENGINEER.

All costs for these services shall be included in the Contract Price. The duration of the visits and the number of round trips shall be as required.

End of Section