

SPECIFICATION

MECHANICAL BAR SCREEN
(Single Rake - Front Cleaning)
Hydraulic Drive

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope: This section covers _____ (____) new mechanically cleaned bar screen(s) for installation into ___' ___" wide by ___' ___" deep flow channel(s).
- B. Type: The equipment furnished shall positively clean and remove debris from incoming sewage by means of a bar rack to retain debris and a traveling rake which removes and elevates the debris to a discharge mechanism. The bar rack shall be cleaned by the rake engaging the bar rack from the upstream side of the channel invert and removing debris on its upward travel.
- C. Design Data:
1. Minimum Flow Range (each unit): _____ MGD
 2. Maximum Flow Range (each unit): _____ MGD
 3. Low Water Level in Channel: _____' - _____"
 4. High Water Level in Channel: _____' - _____"
 5. Width of Channel: _____' - _____"
 6. Depth of Channel: _____' - _____"
 7. Clear Space Between Bars:
 8. Rake Speed (ft/min):

1.02 QUALITY ASSURANCE

- A. Standardization: All parts of the complete mechanical installation including the bar rack, the cleaning mechanism, discharge apron and automatic level controls, shall be the product of one manufacturer experienced in the design and fabrication of mechanically cleaned bar screens. The mechanically cleaned bar screen(s) shall be equal to those manufactured by ENVIROQUIP, INC., Austin, Texas.
- B. Coordination: The contract documents provide details of a complete equipment installation for the purpose specified. It shall be the responsibility of the Contractor to coordinate all the details required for a complete operating system, such as protective coatings, piping, pumps and wiring. The Contractor shall provide for all work required to properly install, adjust and place into operation a complete working system.
- C. Manufacturer's Quality Control: The bar screen mechanism shall be factory assembled and tested and shipped to the jobsite as a completely assembled unit. The manufacturer shall be responsible to assure compliance with all material and fabrication requirements of these specifications.

1.03 SUBMITTALS

- A. Information required for approval by the Engineer prior to incorporation into the project shall include the following as a minimum requirement:
 - 1. Certified dimension prints detailing all required anchor bolt locations and conduit stub-outs.
 - 2. Specifications for all electrical and mechanical components and complete wiring diagrams for the automatic level control.
 - 3. Manufacturer's recommended procedures for jobsite storage and handling of equipment.
- B. Operation and Maintenance Manuals: Prior to delivery of equipment and updated as required during installation of the equipment, the manufacturer shall furnish complete and detailed installation, operation and maintenance manuals which shall include the following information as a minimum requirement:
 - 1. Assembly, installation and adjustment instructions.
 - 2. Lubrication and maintenance instructions.
 - 3. Complete descriptive literature of all materials and components furnished.
 - 4. Erection drawings with equipment mark numbers.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Anchorage and Fasteners:
 - 1. All structural fasteners defined as erection bolts 3/8" in diameter and larger shall be of AISI Type 304 stainless steel.
 - 2. All cast-in-place equipment anchorage, including nuts and washers shall be of AISI Type 304 stainless steel. The minimum size of any cast-in-place anchor shall be 3/4" in diameter.
 - 3. All drop-in type anchors (hole size equals bolt size) shall conform to Federal Specifications GSA FF-S-325, Group II, Type 4, Class 1. Anchor bolts to be Type 303 and clips, nuts and washers to be Type 304 stainless steel. The minimum size of any drop-in anchor shall be 1/2" in diameter.

2.02 EQUIPMENT

- A. Bar Screen Rack: The screen bars shall be spaced so as to give the clear opening specified in Section 1.01-C.7. The bars shall be trapezoidal in cross section having a cross section of 3/16" x

3/8" thick by 1 3/4" wide fabricated from AISI Type 304 stainless steel. The bars shall be straight and inclined from the horizontal as shown on the contract plans and shall occupy the full width of the channel. Warped bars or any opening through the screen or between the screen and sidewall which exceed the clear spacing specified shall not be acceptable and shall be removed and replaced with properly fabricated bar screen components. The bar racks shall extend a minimum of 1' - 0" above the maximum water depth in the channel. The deadplate, constructed of 1/4-inch Type 304 stainless steel plate, shall extend from the bar rack to the operating floor. A discharge apron manufactured of 10 gauge Type 304 stainless steel shall extend from the operating floor to the point of discharge.

- B. Mechanism: The mechanism shall consist of a pin rack, rake assembly (with guide rollers, cogwheels, and drive components), and wiper arm. The side frames shall be a minimum 3/8" thick plate construction formed to a channel section 25 inches wide, suitably reinforced to support the required loads and fabricated from AISI Type 304 stainless steel plate. The frame shall be securely fastened to the concrete channel with stainless steel bolts and anchors. A pin rack designed to mesh with the two (2) "cogwheels" of hardened AISI 1045 steel, 50 Rc minimum, shall be installed in each side frame. It shall consist of Type 304 stainless steel bolts fitted with hardened and ground AISI 1018 steel bushings and rollers, 50 Rc minimum. Rollers and bushings shall be free to rotate on the pin bolts to reduce wear between the pin racks and cogwheels. Designs which employ static tooth racks, chain or chain parts are not acceptable. Cog wheels shall be a cycloid involute design; standard sprockets are not acceptable.

The frame and guides shall be designed with a removal section to allow removal of the idler shaft and drive shaft assemblies. The steps required to remove and reposition the idler and drive shaft assemblies must be detailed in the submittals.

The debris shall be removed from the bar rack by a steel rake assembly designed to mesh with the bar rack. The rake assembly shall consist of type 304 stainless steel shelf and teeth a minimum of six inches (6") deep attached to the rake arm fabricated from type 304 stainless steel structural tubing. The rake shall have the capability of lifting a minimum load of 150 lbs/ft of rake width per cycle.

The rake-arm assembly shall be supported by the main drive shaft and attached to the "cogwheels" which rotate on and are supported by the pin rack. The rake-arm assembly shall be held in a fixed position relative to the bar rack by heavy-duty coil springs. Proper alignment of the rake-arm assembly shall be accomplished by guide follower rollers which travel in guide tracks fabricated into the side frame.

The pin rack and drive assembly shall not be located below the top of the channel at any point during operation of the screen or rake.

The mechanism shall be so designed that the rake can climb over and be free of an object encountered that cannot be removed. This motion shall be powered by the rotation of the drive away from the bar rack. After the object has been bypassed, the rake shall again mesh with and continue to clean the bar rack. Positive overload protection against an object which is too large to be bypassed shall be provided by mounting the drive on a spring restrained rotating support. If the load on the rake carriage mechanism increases beyond a predetermined value, the drive and linkage shall rotate, causing a magnetic limit switch activated control circuit to stop the drive. When the overload condition has been corrected, the drive may again be operated.

The minimum travel speed of the rake assembly shall be as specified in Section 1.01-C.8 to ensure efficient screenings removal at peak flows.

The bar screen mechanism supplied shall be designed to be reversed by manually operated electric controls which allow the operator to reverse the rake assembly free of the object which has caused the overload. The mechanism shall be capable of being reversed completely out of the channel to allow for unobstructed removal of the object by other means.

The rake shall be traversed forward over the discharge chute apex by action of the guide follower roller and the accumulated debris shall be removed by a neoprene wiper blade. Designs in which the rake does not articulate over the discharge chute apex are not allowed. The wiper shall be designed to pivot to allow efficient cleaning of the rake on each pass and cushioned during travel to the rest position by shock absorbers.

When the rake assembly is in the top of travel, rest position, the bar rack must be completely accessible for emergency, manual cleaning. For this reason, there shall be no cross-channel components of the machine such as shafts, braces, etc., located closer than 5 feet from the upstream side of the bar rack or above the elevation of the top of the base frame on the downstream side of the Screen unit.

All bearings used in the design of the Screen mechanism shall be sealed. Grease fittings shall be provided on the shaft to permit intermittent greasing of all internal bearings.

All permanent or intermittently wetted parts shall be constructed of Type 304 stainless steel. These parts shall be the rake arm, rake, rake blade, deadplate, discharge chute, wiper blade, bar rack and all fasteners.

C. Drive Unit: The bar screen motor shall be driven by a hydraulic power unit consisting of:

10 gallon reservoir fitted with filler breather, oil level gauge and drain port
Electric motor, minimum 1.5 horsepower, 3/60/230/460, 1.15 sf, TEFC
Hydraulic pump designed to provide 2 gpm
Suction strainer
Pressure relief valve
Pressure gauge
Return filter assembly

The electric motor shall be mounted on the reservoir top cover and close-coupled to the hydraulic pump mounted inside the reservoir to provide quiet operation. The hydraulic power unit shall provide normal pressure of 400 psi for driving the rake carriage assembly but designed to operate at pressures up to 1000 psi without damage to the hydraulic system. The power pack shall be mounted on the concrete structure in close proximity to the mechanical bar screen.

Abrasion resistant stainless steel hoses and tubing shall connect the hydraulic power pack to the bar screen motor. All hoses, tubing and fittings shall be rated for 2000 psi service. The hydraulic motor shall have a brake and a counter balance valve arrangement for insuring a slow decent into the bar screen channel.

D. Power Supply: The power cable to the motor shall be protected by a rectangular conduit cable track flexible in one direction. The cable track shall consist of a series of one piece molded links of glass-filled nylon with mounting brackets. The cable track shall be supported by a guide channel mounted to the side frame of the screening mechanism.

E. Controls: None of the machine-mounted control devices (such as limit switches and local selector switches) are to be interpreted as stand-alone devices. Each requires additional relay logic as described hereafter.

The manufacturer of the bar screen shall provide the following controls for each bar screen:

1. One (1) Primary Control Panel shall be rated NEMA 4X and contain the following logic devices for proper screen operation:
 - a. Relays and timers as required to monitor screen mounted limit switches and perform necessary logic functions.
 - b. Control Power - ON-Off pushbutton.
 - c. "Forward-Off-Reverse" switch with spring return to forward position.
 - d. Screen Failure alarm light (amber) to indicate failure due to torque overload condition and connection for annunciator on plant control panel.
 - e. Time Delay Relay, timing period adjustable over a range of 3 to 180 seconds, contacts shall be rated at least 10 amperes at 120 volts AC for activation of belt conveyor.
 - f. 24-hour Time Clock to automatically initiate operation of bar screen and

adjustable in fifteen minute increments.

g. Alarm switches, running lights and panel control circuits shall be single phase, 60 Hz, 120 volts AC, provided by a control transformer located in the panel.

2. An adjustable float switch with stilling well, located upstream of the bar rack, shall be used to initiate operation, if accumulated trash is clogging the screen.
3. A limit switch shall be mounted to a bracket on the head frame and shall be interlocked with the drive control so that the rakes stop in a predetermined position. The limit switch shall be a NEMA Class 6P submersible.
4. The Contractor is referred to the instrumentation and control diagrams in the electrical plans for additional requirements for this control panel.

F. Spare Parts: The bar screen mechanism manufacturer shall supply the following spare parts:

- ∅ One (1) limit switch
- ∅ One (1) wiper blade
- ∅ One (1) return filter for hydraulic system

2.04 PROTECTIVE COATINGS

- A. All gearboxes, motors, power pack and controls will have manufacturer's standard machinery paint finish, to be top coated with final coatings as per Section 09900 of these specifications. Verify compatibility of coatings.
- B. Prior to shop assembly, the stainless steel frame shall be shop brush blasted with a fine sand to a matte finish to clean the raw metal and provide a uniform finish. All other stainless steel components shall be shop assembled without alternation.

The manufacturer shall provide a heavy duty fabricated steel support stand, hot dipped galvanized, and stainless steel anchorage for mounting the control panel near the bar screen.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Manufacturer's Service Representative: The bar screen(s) shall be furnished complete by the manufacturer and installed by the Contractor as directed by the manufacturer in his working drawings and written instructions. The installation, alignment, and testing shall be checked and approved by a factory representative before acceptance.
 1. The Contractor shall include in his bid the services of a factory trained representative for a period of two (2) days and two (2) trips. The manufacturer's representative shall inspect the completed installation, and assist the Contractor in aligning, start-up and testing. The representative shall also instruct plant personnel in the operation and maintenance of equipment.
 2. A written report shall be furnished by the equipment manufacturer and shall describe the representative's observations. The report shall describe in detail any deficiencies noted. All such deficiencies, whether by the manufacturer or Contractor, shall be corrected at no expense to the Owner.
 3. Prior to final approval, the manufacture shall submit a letter certifying that the installation meets all requirements of the manufacturer.
- B. Lubrication: Lubricants of the type recommended by the equipment manufacturer shall be furnished and applied by the Contractor. The Contractor shall certify that the drive and bearings have received the proper amount of recommended lubricant.
- C. Anchorage: The equipment manufacturer shall furnish all required anchor bolts with leveling

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nuts, washers, and tie-down nuts. The anchorage shall be placed by the Contractor in exact accordance with the manufacturer's certified dimension prints and as directed by the manufacture. The Contractor shall furnish all templates needed to accurately set the anchor bolts to the dimensions and projections specified.

3.02 TESTING

A. The manufacturer shall demonstrate to the Owner and Engineer that the bar screen cleaning mechanism effectively removes debris from the bar rack and that all electrical and mechanical equipment functions as intended.

END OF SECTION