

SECTION 15176

MECHANICALLY CLEANED HEAVY DUTY BAR SCREENS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes the furnishing of a front-cleaning, front-return link driven mechanically cleaned bar screen assembly and any auxiliary equipment or accessories to be installed in the location as indicated on the drawings and as specified herein.

Number of units: 1

Equipment designation: FRHD, Heavy Duty

Equipment location: Outdoors

- B. All equipment supplied under this section shall be furnished by or through a single Screening System Supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the screening components. The Screening System Supplier shall have the sole responsibility for the coordination and performance of all components of the screenings system with the performance and design criteria specified herein.
- C. The Contractor shall be responsible to coordinate all details of the screening equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate the equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

1.2 RELATED SECTIONS

- A. The following list of related sections is provided for the convenience of the Contractor and is for reference only to support commonly referenced sections that are in-general applicable to all equipment supplied. (For complete list of sections see specification index.)
1. All sections of Division 1 including but not limited to Submittal Procedures, Shop Drawings, Product Data and Samples, Operating and maintenance information, Protection of Materials and Equipment, Installation, Testing, and Commissioning, Instruction of Operations and Maintenance Personnel, and Spare Parts Maintenance Manuals.
 2. Section [09900]-Painting
 3. Section [16490]-Electric Motors
 4. Section [16470]-Panelboards

1.3 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)

- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Institute of Steel Construction (AISC)
- E. American Bearing Manufacturers Association (ABMA)
- F. American Gear Manufacturers Association (AGMA)
- G. National Electrical Manufacturers Association (NEMA)
- H. Underwriters Laboratory (UL)

1.4 SUBMITTALS

- A. The equipment manufacturer shall submit the following items:
 - 1. (6) Sets of General Arrangement drawings that illustrate the layout of the equipment, equipment weight, principal dimensions with related verifications required for installation including anchorage locations. Other related data including descriptive literature, Electrical Control Drawings, Catalog Cut Sheets for individual components and Drive Motor Data.
 - 2. A list of recommended Spare Parts including any Special Tools required for routine maintenance of the equipment is provided in Section 2.5.
 - 3. (6) Sets of O & M Manuals including As-Built Drawings of the Mechanically Cleaned Bar Screen Arrangement, Controls and Accessories shall be provided in digital format after equipment ship for inclusion in the Close-Out Submittal process.
 - 4. For sites that have (3) ft or greater head differential, equipment manufacturer shall provide Structural Certification from licensed Civil engineer.

1.5 QUALITY ASSURANCE

- A. The Mechanically Cleaned Bar Screens shall be fully assembled and shop tested at the manufacturing facility prior to shipment. Shop testing shall include a minimum of 4 hours of run time.
- B. To assure quality and performance: All equipment furnished under this Section and related sections shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment and demonstrates, to the satisfaction of the Engineer, that the quality is equal to equipment made by those manufacturers specifically named herein. And the screen manufacturer shall have at least 50 installations of the specified model of mechanically cleaned bar screen equipment that has been in successful operation, at similar installations, for at least five (5) years.
- C. The equipment furnished shall be fabricated, assembled, installed and placed in proper operation condition in full conformity with approved drawings, specifications, engineering data, and/or recommendations furnished by the equipment manufacturer.

1.6 WARRANTY

- A. Manufacturer shall provide a written one year standard warranty from the date of use of the mechanically cleaned bar screen equipment to guarantee that there shall be no defects in material or workmanship in any item supplied.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Screen shall be as manufactured by Duperon Corporation, 1200 Leon Scott Court, Saginaw, Michigan, TF 800.383.8479. The screens shall be the FlexRake® Model, FRHD-Heavy Duty. No equal equipment or alternatives will be considered.

2.2 BASIS OF DESIGN

- A. The mechanically cleaned bar screen shall have a head sprocket only, with no sprockets, bearings, idlers, or similar drive components under water to trap the chain. Equipment featuring reciprocating rake arms or lower bearings/sprockets/tracks below the water is not acceptable.
- B. The mechanically cleaned bar screen shall be designed to run continuously (24/7), without operator.
- C. The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. The drive output shaft rotation shall be constant and in one direction in order to reduce maintenance and increase product life. Units which have single raking arms or that require cycle times shall not be allowed. Cleaning mechanisms that utilize shock absorbers, springs or other dampening or hydraulic actuations are unacceptable.
- D. The link system shall have jam evasion capability by flexing around and collecting large objects such as a log, tire or drum as well as other debris such as a 2 X 4, bowling ball, grease balls and surges of solids at peak loading times without overloading and shutting down the unit. The link system shall be such that it bends in one direction only which allows it to become its own lower sprocket and frame and shall have a 1,000 pound lifting capacity.
- E. Designs employing the use of endless moving media or cables and hydraulic cylinders to remove debris from the channel and units utilizing proximity or limit switches for reverse cycles are not acceptable.
- F. Equipment utilizing a greater than ½ HP motor or two or more motors to complete a screen cleaning cycle is not acceptable.
- G. The design shall be such to ensure that all maintenance can be accomplished at the operating floor level or above. No part of the drive system including sprockets shall be located below the water surface at maximum design flow.
- H. Design Conditions:

Site Installation Information:	
Channel Width:	12 ft
Channel Height:	19 ft

(upstream clearance) Channel Depth:	
Bar Opening Size:	2.00 inch
Angle of Installation:	25 degrees
Average Flow:	20,000 GPM
Average Water Level:	8.0 ft
Maximum Flow:	20,000 GPM
Maximum Water Level:	9.0 ft
Maximum Head Differential:	1 ft
Equipment Location:	Outdoors
Outdoor Installation:	Outdoors
Site Access Constraints:	
Installation Area (Envelope) Classification:	Unclassified
Collection and Conveyance	Dumpster
Containment Height:	Refer to dwgs
Debris Bin:	Refer to dwgs
Other:	

2.3 COMPONENTS

- A. Bar screen assembly: Bar screen assembly shall be of stainless steel and designed to withstand 1 foot head differential unless noted otherwise in Section 2.2 J Design Conditions. Unless noted otherwise materials of construction shall be 304 Stainless Steel. The Bar screen assembly shall be shipped in one piece.
1. Screen Bars: Bars shall be stainless steel and be rectangular shaped and the minimum dimensions of 0.375 inch x 2.00 inches welded to horizontal support members as a part of the bar screen assembly.
 2. Side Fabrication: The screen framework shall be 304 stainless steel bent plate with minimum of 3/16 inch cross section. Horizontal members shall be of stainless steel bent plate or stainless steel pipe. Support members and frame shall adequately support the bar screen based on site specific requirements.
 3. Dead Plate: Dead plate shall be 0.25 inch thick 304 stainless steel. The dead plate shall be flat and true; span the entire width of the unit; and transition from minimum operating deck elevation to discharge point mounted behind bars.
 4. Discharge Chute: The discharge chute shall be 11ga. (0.12 inch) 304 stainless steel. The discharge chute shall be bolted to the dead plate and shall be designed to allow debris to be transferred from discharge point into the debris containment.
 5. Link Slides: Link slide assembly shall be provided per manufacturer standard design and shall be constructed of UV Stable UHMW PE rollers and 304 stainless steel supports and components.
- B. Return Guide/Closeouts: Return guide/Closeouts shall be 304 stainless steel and shall assure proper alignment of scrapers as they enter the bar screen and assure that there

is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.

- C. Debris Blade: A 304 stainless steel and UV Stable UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed if applicable to assist in removing debris from the scraper on the mechanically cleaned bar screen unit as recommended by the manufacturer.
- D. Link System: The link system shall be stainless steel castings and have a minimum ultimate strength of 60,000 lbs with a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs each.
 - 1. 304 stainless steel system includes 302 stainless steel retaining rings and 304 stainless steel pins.
- E. Scrapers: Scrapers shall be spaced 63 inches apart. To provide long product life the scraper shall move at no greater than 28 inches per minute at standard operating speed of ½ rpm allowing for approximately 1 debris discharge per 2 minutes. Scrapers shall be a minimum 0.75 inch thick, UV Stable UHMW-PE with a serrated edge and penetrate the screen bars a minimum of 1.00 inch. Scraper options include a brush assembly with nylon bristles to sweep debris between bars at dead plate area.
- F. Drive Head: The Drive Head shall be located at the top of the mechanically cleaned bar screen.
 - 1. Drive Unit: Each mechanically cleaned bar screen unit shall operate independently and shall have its own drive unit and driven components.
 - a. Drive Sprockets and end castings shall be cast 304 stainless steel.
 - b. Drive Shaft shall be 304 stainless steel.
 - c. Gearbox shall be shaft-mounted, right angle type and include spiral bevel gearing. It shall have at least a 1.52 or greater service factor based on machine torque requirements. The gearbox shall not be vented to the outside atmosphere. The gearbox shall be grease filled. Oil filled gearboxes are not allowed.
 - d. For outdoor, unclassified installations the motor shall be AC induction type, 3 phase 480 volt and mounted to the gear reducer. The motor shall be 1/4 hp and derated to 1/8 HP by an Emotron ELFI-M20 series electronic power shaft monitor. The motor must be designed for 1730 RPM base speed and be weatherproof rated or else include a weathershield provided by the bar screen mfr. The motor shall have a TEFC enclosure, NEMA design B with a 56C frame size. The motor shall be protected by an Emotron ELFI-M20 series electronic power shaft monitor, must be UL listed and designed for continuous operation.

e. All drive head components shall be of components available in the United States.

2. Bearing: Bearing shall be greased Timken tapered roller bearings, non self-aligning, dual lip sealed, lubricated, and shall have a 24/7/365 L10 life of 20 years when in compliance with stated O&M recommendations.
 3. Speed Reducer: Speed reducer shall be a double-reduction, cycloidal style and shall comply with all applicable AGMA standards. The speed reducer shall have a gear ratio of 3511:1
- G. Standard Coating: All non-stainless bar screen components shall be coated in strict accordance with the paint manufacturer's specification. Surface Preparation shall be done in accordance with SSPC-SP-10 Near White. The three-part coating system shall be manufactured by Tnemec as follows: Prime Coat Series 90-97 Tneme Zinc at 2.5-3.5 mils DFT, Intermediate Coat Series 27 F.C. Typoxy at 3.0-5.0 mils DFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils DFT. Standard color is 11SF Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.

2.4 ELECTRICAL, CONTROLS, INSTRUMENTATION

- A. General: Controls for each rake shall be in enclosures provided by the bar screen manufacturer. The bar screen manufacturer shall be responsible for proper sizing and function of the controls at 480V, unless specified otherwise.
1. Main control panels shall include internal climate control using a thermostat, air conditioner and heater.
 2. Controls shall be designed to accept 480/3/60 hz incoming power supply per plans/specs and shall include a step-down transformer as needed to achieve 120V.
 3. Control Panel(s) shall be constructed to meet the appropriate NEMA classification requirements and will include a main, lockable disconnect. The panel will be constructed by a UL certified control panel build facility and will be supported by the appropriate UL labeling.
 4. Controls shall be tested prior to shipment to owner. The rake manufacturer shall verify all overload settings in the rake controller to ensure proper overload and speed settings required for the application are properly programmed.
 5. Control panel(s) shall be wired complete with a minimum of #16 MTW wire in the appropriate colors for the circuits being supplied. 120VAC control shall be red, grounded AC neutral shall be white, DC control shall be blue, DC neutral shall be blue with a white tracer, equipment ground shall be green and all incoming and outgoing external power source wires shall be a yellow configuration. All AC power wiring shall be a minimum of #12 Black. All wires shall be labeled at both ends with heat-shrink wire markers. Internal panel wiring shall be contained in non-flammable, covered wire way.

6. All panel(s) and panel mounted devices shall be labeled with engraved I.D. markers that reference back to the system schematics. Tags shall be white with black core, engraved as required.
7. All field wiring and power cables between the bar screen Main Control Panel and the Local Push Button Station shall be provided by others under the Electrical Section.

B. Components:

1. Main Control Panel

- a. Enclosure(s) shall be NEMA 4X 304 SSTL Deadfront panel for outdoor installation.
- b. Enclosure shall not be located in an explosive environment.
- c. Main Control Panel shall be designed with a SCCR rating of 18KA at 480VAC minimum and labeled as such, unless otherwise specified.
- d. All terminals utilized in the main panel shall be 600V rated terminals and 20% spare terminal space shall be provided for any potential future revisions.
- e. The Main Control Panel shall include at a minimum the following
 - Main fusible disconnect with lockable operator, unless otherwise specified.
 - Physical or virtual Hand/Off/Auto (HOA) Selector and Push/pull E-Stop button.
 - Elapsed run-time meter
 - Indication for "Power On", "Forward" and necessary faults.
- f. Relay Based Controls shall included the following:
 - Emotron ELFI-M20 Power Shaft Monitor for Electronic torque control
 - Hard contact SCADA Interlock(s)
 - Adjustable on/off cycle timers

2. Local Control Push Button Station

- a. Enclosure shall be NEMA 4X rated for unclassified installation. Local push button station must be local to the equipment to maintain requirements of local safety codes as determined by the Engineer.
- b. Local station shall be mounted within 10 feet or as close to the equipment as safely possible and be field wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.
- c. The remote pushbutton station shall include Forward, Jog Reverse and

E-Stop buttons.

3. Instrumentation: None, not needed or others to supply

C. Controls Design Conditions:

Incoming Power: (Voltage/Phase)	<i>480/3/60</i>
Enclosures:	<i>1</i>
Installation location:	<i>Outdoors</i>
Approx. distance between main panel and equipment motor	<i>20-foot</i>
Climate controlled location:	<i>No</i>
Outdoor location	<i>By Others</i>
Thermostat, air conditioner and heater	<i>Provided</i>

2.5 SPECIALTY TOOLS, SPARE PARTS AND LUBRICATION

- A. Manufacturer shall provide any specialty tools and recommend spare parts required for maintaining the equipment as follows:

1. Drive Clevis Pin (1)
2. Snap/Retaining Rings (10)
3. Link Clevis Pins (4)
4. Scraper Bolts (4)
5. Scraper Nuts (4)
6. Snap Ring Tool (1)
7. Never Seez, 1 oz. tube (1)

- B. Manufacturer shall provide one tube of Multi-Purpose grease which is a 5-year supply of lubrication, required for maintaining all bar screen components.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.
- B. Anchor Bolts: Anchor bolts and nuts shall be 304 stainless steel and furnished for each item of equipment by the CONTRACTOR.

1. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.
2. Anchor bolt sizes, quantity and requirements will be indicated on the submittal drawings. Quantity is site specific but typically each Barscreen assembly requires (8) to (12) 1/2" dia. x 4 1/2" Lg. embed HILTI HAS RODS w/ RE-500 V3 adhesive system anchor bolts for Mechanical Screen anchorage and typically (8) to (12) 3/8" dia. x 3 3/8" Lg. embed HILTI HAS RODS w/ RE-500 V3 adhesive system anchor bolts for the Return Guide/Closeouts anchorage.

3.2 TESTING

- A. After completion of installation, CONTRACTOR shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.
- B. Field certification shall include inspection of the following:
 1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
 2. Assure controls and instrumentation work in all modes.
 3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.

3.3 ONSITE TECHNICAL ASSISTANCE

- A. Manufacturer shall provide services to include Installation Certification, and shall include (1) day for Start-Up and (1) day for Training. Manufacturer shall be given minimum 14 days notification prior to the need for such services. To assure the best outcome for the Owner and Contractor, the Contractor shall provide certification for completion of the PRE-COMMISSIONING CHECKLIST.